

Course contents of Semester-wise papers of BA/B.Sc courses in Anthropology

1st Semester

Elective Paper: AN-E 101: Fundamental of Anthropology

Full Marks: 100

Unit 1: Definition of Anthropology; Historical development: Scope and Main Branches of Anthropology; Physical Anthropology, Social/ Cultural Anthropology, Prehistoric Archaeology and Linguistic Anthropology. 25 Marks

Unit 2: Relationship of Anthropology with other disciplines: Biology, Palaeontology, Geology, Archaeology, Linguistic, Sociology, History, Economics. Essence of study on preliterate Societies in Anthropology. 25 Marks

Unit 3: Man- as biological and social being; Man's place in animal Kingdom; Human society vs animal society, cultural (tangible and intangible), and Cultural relativism. 25 Marks

Unit 4: Concept of single species, Homo sapiens; Understanding variations: biological and cultural; physical characteristics resulted from adaptation and culture as a means of adaptation to different eco-niches. 25 Marks

References:

1. Beals, R, H. Hoizer, and Beals. An introduction to Anthropology, New York, Macmillan Publishing Co. 1975.
2. Das, B.M. 1998. Outline of physical Anthropology. Kitab Mahal, Allahabad.
3. Mair, Lucy. An Introduction to Social Anthropology. London, Oxford University Press (2nd edition, Reprint), 1972.
4. Majumdar, D.N & T.N Madan An Introduction to Social Anthropology, New Delhi, Asia Publishing House, 1975.
5. Barnauw, victor: An Introduction to Anthropology, Vol 1, Physical Anthropology & Archaeology. The Dorsey Press, Illinois, 1971.
6. Buttner Janusch, J., Origin of Man, Wiley eastern Pvt. Ltd., New Delhi 1969.
7. Comas, Juan: Manual of Physical Anthropology, Charles c. Thomas, Illinois, 1960.

8. Montagu, M.F.A.: An Introduction to Physical Anthropology, Charles C. Thomas, Illinois, 1961.
9. Lasker, G.W.: Physical Anthropology. Holt, Rinehart Wiston, New York, 1976.

2nd Semester

Elective Paper: AN-E 202: Physical Anthropology

Full Marks: 100

Theory (75 marks)

Unit1: A. Definition and Scope of Physical Anthropology, its relationship with different branches of Anthropology and other fields. Biology, Demography, Ecology, and Forensic Sciences. B. Salient characters and classification of the order primate; Character and distribution of the anthropoid Apes. 25 Marks

Unit 2: Human Skeleton: Classification and anatomical features; changes due to assumption of erect posture. Skull, Vertebral Column, Pelvic girdle, Femur and Foot. 25 Marks

Unit 3: Theories of Evolution: Theory of Special creation, catastrophism, Organic evolution: Lamarkism, Darwinism, Neo-Lamarkism and Neo-Darwinism.

Hominoid and Non-Hominoid Fossils

Phylogenetic Status and characteristics:

- 1) Ramapithecus (Ramapithecus bevirstris)
- 2) Australopithecines (Australopithecus africanus)
- 3) Homo erectus (Pithecanthropus erectus) (25 Marks)

Unit 4: Practical (25 Marks)

A. Identification of instruments: -

1. Sliding caliper, 2. Spreading Caliper (Blunt and pointed), 3. Anthropometer, 4. Rod Compass, 5. Tubular craniophore, 6. Cubic craniophore, 7. Diagraph. 3 Marks

B. Human Osteology (drawing and description of Bones)

1. Skull: Frontal, Parietal, Occipital, Temporal.
 2. Girdle bones: Clavicle, scapula and pelvic,
 3. Limb bones: Humerus, Radius, Ulna, Femur, Tibia and Fibula
- 3 Marks
- C. Craniometry: (Direct Measurements of 2 Skulls)
- Linear measurements: 1. Maximum Cranial Length, 2. Maximum cranial Breadth, 3. Least Frontal Breadth, 4. Frontal chord, 5. Parietal chord, 6. Occipital chord, 7. Nasal height, 8. Nasal Breadth, 9. Bizygomatic distance, 10. Bigonial breadth, 11, Length of foramen magnum.
- Indices: 1. Cranial index, 2. Nasal index.
- Angular Measurements: -
1. Metopic Angle, 2. Nasal Profile Angle.
- 5 Marks
- D. Osteometric Measurements (to be measured on a pair of bones of each case)
1. Scapula: (i) Anatomical Breadth; (ii) Anatomical Length and (iii) Length of Axillary border
 2. Humerus: (i) Maximum Length (ii) Breadth of Proximal Epiphysis (iii) Breadth of distal epiphysis (iv) Least girth of shaft.
 3. Femur: (i) Maximum Length (ii) Physiological Length (iii) Trochanteric Length (iv) Girth in the Middle of the Shaft.
- 4 Marks
- E.1. Laboratory Note Book 2. Viva-voce. 5+5=10 Marks.

References (Theory)

1. Barnauw, Victor. 1971. An Introduction to Anthropology, Vol. I, Physical Anthropology & Archaeology. The Dorsey Press, Illinois.
2. Brace, C.L. 1967. The stages of Human Evolution. Prentice Hall, Inc. New Jersey.
3. Buttner Janusch, J. 1969. Origin of Man. Wiley Eastern Pvt. Ltd., New Delhi.
4. Comas, Juan. 1960. Manual of Physical Anthropology. Charles C. Thomas, Illinois.
5. Das, B.M. 1998. Outline of Physical Anthropology. Kitab Mahal, Allahabad.
6. Hooton, A.E. 1965. Up From Ape. Macmillan, Delhi.
7. Lasker, G.W. Physical Anthropology. Holt, Rinehart Wiston, New York, 1976.
8. Le Gros Clark, W.E. 1978. Fossil Evidence of Human Evolution. Univ. Press, Chicago.
9. Montagu, M.F.A. 1961. An Introduction to Physical Anthropology. Charles C. Thomas, Illinois.
10. Sarkar, R.M., 1997. Fundamental of Physical Anthropology. Vidyodaya Library Private Ltd. 72- Mahatma Gandhi Road, Calcutta.

11. Seth, P.K. 1986. The Primates. Northern Book Centre, New Delhi.
12. Srivastava, R.P., 2009. Morphology of the Primates and Human Evolution. PHI Learning Private Ltd. New Delhi.

References (Practical)

1. Chaurasia, B.D. 1993. Human Osteology, CBS Publishers and Distributors, Bhola Nath Nagar, Shahdar, Delhi.
2. Nath S 2005. Anthropometry. The measurement of Body Size, Shape and Form. Friends Publication. New Delhi.
3. Sen Tulika, 1994. Guide to Anthropometry. The World Press, Kolkata.
4. Singh IP and Bhasin Mk. 1989. Anthropometry. Kamala Raj Enterprises. Delhi.
5. Singh IP and Bhasin Mk. 2004. A Manual of Biological Anthropology. Kamala Raj Enterprises. Delhi.
6. Singh SP and Pamila Mehta, 2009. Human Body Measurements; concepts and Application; PHI Learning Private Ltd. New Delhi.
7. Weiner JS and Laurie JA 1969. Practical Human Biology. Blackwell Scientific Publications. Oxford.

3rd Semester

Elective paper: AN-E 103: Social Anthropology

Full Marks: 100

Unit 1: Concept and Scope of Social and cultural Anthropology; its relationship of social Anthropology with History, Economics, Psychology, Political Sciences, Linguistics and Sociology. 25 Marks

Unit 2: Concept of Society, Social Groups- Primary, Secondary and Tertiary; Communities- Rural and Urban; Society and Culture. 25 Marks

Unit 3: Kinship: Types of Kinship- consanguineal and affinal; kin group- lineage, clan, phratry and moiety; degree of kinship- primary, secondary and tertiary; Terminology- classificatory and descriptive; kinship behaviour- avoidance, joking relationship, and teknonymy; usages- Avunculate, Amitate, Couvate. Family: Definition, forms of marriage, preferential and prescriptive marriage, ways of acquiring mates, Hypergamy and hypogamy. 25 Marks

Unit 4: Polity- state and stateless societies, forms of government and law.

Economy- Definition, Kula, Potlatch.

Religion: Definition, characteristics, magic, religion, and science, animism, manaism, fetishism and totemism.

Rites and ritual: rites de passage; specialist- Shaman, Priest, Divination. 25 Marks

References:

1. Beals, R.H. Hoizer and Beals. An introduction to Anthropology. New York, Macmillan Publishing Co. 1975.
2. Roy Indrani Basu. Anthropology, the study of Man. S. Chand Company Ltd. Ram Nagar, New Delhi- 110055.
3. Mair Lucy. An introduction to Social Anthropology. London, Oxford University Press (2nd edn. Reprint), 1972.
4. Majumdar, D.N. T.N. Madan. An introduction to Social Anthropology. New Delhi, Asia Publishing House, 1975.
5. McIver and Page. Society, Macmillan, London, 1957.
6. Davis, Kingsley. Human Society. Macmillan, New York, 1949.
7. Hoebel and Frost, Cultural and Social Anthropology, Tata MC. Graw Hill, New Delhi, 1976.
8. Herskovits, M. Cultural Anthropology. IBM Publications, New Delhi, 1951.

4th Semester
Elective Paper AN-E-404: Prehistoric Archaeology
Full Marks: 100
Theory (75 Marks)

Unit 1: Nature and Scope of Prehistoric Archaeology and its relationship with other branches of Anthropology, and allied Sciences – Geology, Palaeontology, Geography, Physics and Chemistry. Basic concepts: artifact, culture, civilization and revolution (Neolithic and Urban). 25 Marks

Unit 2: Geological time scale and appearance of man. Significance of Pleistocene epoch in prehistory, Pleistocene climatic conditions- glacial and pluvials. Cause (Astronomical and plate-tectonic) and Evidences (Moraines, River Terraces and Sea Level changes). Methods of dating: Relative (Stratigraphy and Fluorine test) and Absolute (C14 dating and Potassium Argon dating). 25 Marks

Unit 3: Tool typology and Technology:

Distinguishing features between man-made tool and naturally v- fragmented alleged tool.

Stone tool typology- Concept and classification, stone tool types and their functions.

Stone tool techniques (direct, indirect, pressure, grinding, polishing) and their

identifying characters. Primary and secondary flaking. 25 Marks

Unit 4: Prehistory Practical (25Marks)

- 1) Systematic drawing and description of the following Lower Palaeolithic Tools: 10 Marks
 - a) Chopper-1, Chopping tool-1
 - b) Handaxes: Pyriform type, cordiform type, ovate type (1 each)
 - c) Cleaver: “V” and “U” shaped (1 each)
- 2) Typo-technological and functional identification of the tools belonging to the lower Palaeolithic Culture. 5 Marks
- 3) Laboratory Note Book 5 Marks
- 4) Viva-voce. 5 Marks

References:

1. Bhattacharya, D.K. Old Stone Age Tools (a manual of laboratory technique of analysis). Calcutta: K.P. Bagchi & Co. 1979.
2. Butzer, K.W. Environment and Archaeology. London: Methuen Co. 1964.
3. Crabtree, D.E. An introduction to the Technology of Stone tools. Occasional papers No.28. Pocatello, ID: Idaho State College Museum. 1972.
4. Das, S.R. Stone tools- History and Origins. Calcutta: Pilgrim Publishers.
5. Hester, J.J. and J. Grady. Introduction to Archaeology. (Second edition), New York: Holt, Rinehart and Winston. 1982. (Relevant parts).
6. Hole F., R.F. Heizer. An Introduction to Archaeology. New York: Holt, Rinehart and Winston, Inc. 1965.
7. Michels, J.W. Dating methods in Archaeology. New York Seminar Press. 1973.
8. Oakley, K.P. 1972. Man, the Toolmaker (Sixth edition). London. Trustees of the British Museum (Natural History).
9. Rami Reddy, V. Elements of Prehistory. New Delhi: Mittal Publications. 1982.
10. Sankalia, H.D. Stone Age Tools: their Techniques, names and probable functions. Poona: Deccan College. 1964.
11. Semenov, S.A. Prehistoric technology- an experimental study of the oldest tools and artifacts from traces of manufacture and wear. London: Moonraker Press. 1974.
12. Swanson, Earl (ed.). Lithic Technology: Making and Using Stone tools. The Hague: Mouton Publishers. 1975. (Relevant Parts).
13. Zeuner, F.E. The Pleistocene Period. London: Hutchinson Scientific and Technical. 1959.

Syllabus for BA/B.Sc. Anthropology (General) V & VI semester

Elective Paper: V/ AN: E-505: Ethnography

Unit 1: Ethnography

Definition, scope, its relationship with Biological Anthropology, Social/Cultural Anthropology and Prehistoric Anthropology. 25 Marks

Unit 2: Tribes & Caste in India

Definition of Tribe and Caste

Indian Tribes: Racial, Linguistic and Socio-economic Profiles.

Indian caste system: Characteristics of caste system, concept of dominant caste. 25 Marks

Unit 3: Tribes of Manipur

Demographic Profile: Geographical distribution, Population Trend, Population dynamics (fertility/mortality), Demographic composition and structure. 25 Marks

Unit 4: Tribes of Manipur: A case study

25 Marks

References:

1. Bose A, 2001. Population of India: 2001 census. Result and methodology. Delhi: BR Publishing Co.
2. Census of India, Relevant year.
3. Directorate of Economics and Statistics, Govt. Of Manipur. Economic survey, Manipur. (Relevant year).
4. Ember and Ember, 2003, Anthropology: A Brief Introduction, 5th Edition). Upper Saddle River, NJ: Prentice Hall.
5. Ghurye, G.S. 1963. Caste and Race in India. Bombay: Popular Prakashan.
6. Hutton, J.H. 1963. Caste in India. London: Oxford University Press.
7. Jha, Makhan. 2005. An introduction to social Anthropology. (2nd revised edition). New Delhi: UBS Publishers Distributors Pvt. Ltd.
8. Mair, Lucy. 1975. An introduction to social Anthropology. Oxford: Clarendon Press.
9. Sanajaoba, Naorem. 1995. Manipur Past and Present, Vol. III. New Delhi: Mittal Publications.
10. Srinivas, M.N. 1962. Caste in Modern India and other essay. New Delhi: Asia Publication House.

Elective Paper VI- AN: 606: Research Methods & Techniques

Full Marks: 100

Unit 1: Research Methods & Techniques

25 Marks

- a) Data Collection- Observation, Questionnaire, Schedule, Interview, GT, Case Study
- b) Data analysis- Quantitative vs. Qualitative analysis, Induction, deduction, Classification and Tabulation, Range, Mean, Median, Mode.
- c) Report writing- General outline

Unit 2: Application of Anthropology

25 Marks

Social Planning, Designing, Sports and Cultural Resource Management.

Unit 3: Field work

50 Marks

Field work to be conducted in a village community for a minimum period of five days and submit a report.

References:

1. Cronyn, JM. 1999. The Element of Archaeological Conservations (5th Edition). London: Routledge.

2. King, T. 2004. Cultural Resources, Laws and Practice: An introductory Guide. (2nd edition). Walnut Creek: Altamia Press.
3. Kothari, CR, 2004. Research Methodology: Methods and Techniques. New Delhi: New Age International.
4. Neuman, TW and RM Sanford, 2001. Cultural Resources Archaeology. Walnut Creek: ALtamia Press.
5. Young, PV. 1973. Scientific Social Survey and Research. New Delhi: Prentice Hall.

SCHEME OF EXAMINATION

&

DETAILED SYLLABUS

for

**BACHELOR OF COMPUTER
APPLICATIONS**

(BCA) DEGREE - 2010

(SEMESTER PROGRAMME)

MANIPUR UNIVERSITY

CANCHIPUR, IMPHAL

Bachelor of Computer Applications (BCA)

There will be 100 marks for each paper of each semester except major project and for theory papers there will be Internal Assessment Mark(IAM) carrying 25% & End Semester Mark(ESM) carrying 75%. There will be 50% each for IAM and ESM for practical papers. There is no IAM for project papers.

FIRST SEMESTER EXAMINATION

Code No. Paper	IAM	ESM	Total
BCA 101 Mathematics – I	25	75	100
BCA 102 Business Communication	25	75	100
BCA 103 Programming with C	25	75	100
BCA 104 Fundamentals of Information Technology	25	75	100
BCA 105 Basics of Physics	25	75	100

PRACTICAL

BCA 106 Practical – I	50	50	100
Total	175	425	600

SECOND SEMESTER EXAMINATION

Code No. Paper	IAM	ESM	Total
BCA 201 Mathematics – II	25	75	100
BCA 202 Business Organization & Management	25	75	100
BCA 203 Digital Electronics	25	75	100
BCA 204 Data Structures using C	25	75	100
BCA 205 Database Management Systems	25	75	100

PRACTICALS

BCA 206 Practical – II	50	50	100
Total	175	425	600

THIRD SEMESTER EXAMINATION

Code No. Paper	IAM	ESM	Total
BCA 301 Mathematics – III	25	75	100
BCA 302 Computer Architecture	25	75	100
BCA 303 Front End Design Tools	25	75	100
BCA 304 Financial Accounting	25	75	100
BCA 305 Object Oriented Programming	25	75	100

PRACTICALS

BCA 306 Practical – III	50	50	100
Total	175	425	600

FOURTH SEMESTER EXAMINATION

Code No. Paper	IAM	ESM	Total
BCA 401 Mathematics – IV	25	75	100
BCA 402 Software Engineering	25	75	100
BCA 403 Java Programming & Website Design	25	75	100
BCA 404 Operating Systems	25	75	100
BCA 405 Business Economics	25	75	100
PRACTICALS			
BCA 406 Practical – IV	50	50	100
Total	175	425	600

FIFTH SEMESTER EXAMINATION

Code No. Paper	IAM	ESM	Total
BCA 501 Computer Networks	25	75	100
BCA 502 .net Programming	25	75	100
BCA 503 Linux Environment	25	75	100
ELECTIVES (select any One)			
BCA 504 E-Commerce	25	75	100
BCA 505 Design and Analysis of Algorithms	25	75	100
BCA 506 Computer network Security	25	75	100
PRACTICALS			
BCA 507 Practical –V	50	50	100
BCA 509 Minor Project -	0	100	100
Total	150	450	600

SIXTH SEMESTER EXAMINATION

Code No. Paper	IAM	ESM	Total
BCA 601 Management Information Systems	25	75	100
BCA 602 Computer Graphics & Multimedia Applications	25	75	100
ELECTIVES (select any One)			
BCA 603 Mobile Computing	25	75	100
BCA 604 Internet Programming	25	75	100
BCA 605 Knowledge Management&New Economy	25	75	100
BCA 606 Artificial Intelligence	25	75	100
PRACTICALS			
BCA 607 Practical –VI	50	50	100
BCA 608 Major Project	0	200	200
TOTAL	125	475	600

INSTRUCTIONS TO CLASS TEACHERS:

1. Internal Assessment Mark carries 25% for the theory and 50% for the practical of the total marks.
2. Internal Assessment Mark should be based on unit test/home assignment/viva voce/practical test etc.
3. A student is allowed to appear end semester examination if she/he gets at least 10 marks or above out of 25 marks in theory papers and 25 marks out of 50 marks in practical papers in the internal assessment.

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 15 marks.
2. Apart from Question No. 1, rest of the paper shall be from units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 15 marks.

Detailed Syllabus

BCA FIRST SEMESTER

Code No.: BCA 101

Paper: Mathematics -1

IAM	ESM	Total
25	75	100

UNIT I

DETERMINANTS: Definition, Minors, Cofactors, Properties of Determinants

MATRICES: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Cramers Rule, Rank of Matrix Dependence of Vectors, Eigen Vectors of a Matrix, Caley-Hamilton Theorem (without proof)

UNIT II

LIMITS & CONTINUITY: Limit at a Point, Properties of Limit, Computation of Limits of Various Types of Functions, Continuity at a Point, Continuity Over an Interval, Intermediate Value Theorem, Type of Discontinuities

UNIT III

DIFFERENTIATION: Derivative, Derivatives of Sum, Differences, Product & Quotients, Chain Rule, Derivatives of Composite Functions, Logarithmic Differentiation, Rolle's Theorem, Mean Value Theorem, Expansion of Functions (Maclaurin's & Taylor's), Indeterminate Forms, L' Hospitals Rule, Maxima & Minima, Concavity, Asymptote, Singular Points, Curve Tracing, Successive Differentiation & Liebnitz Theorem.

UNIT IV

INTEGRATION: Integral as Limit of Sum, Riemann Sum, Fundamental Theorem of Calculus, Indefinite Integrals, Methods of Integration Substitution, By Parts, Partial Fractions, Integration of Algebraic and Transcendental Functions, Reduction Formulae for Trigonometric Functions, Gamma and Beta Functions.

VECTOR ALGEBRA: Definition of a vector in 2 and 3 Dimensions; Double and Triple Scalar and Vector Product and their Applications.

Text Books:

1. Kresyig E., "Advanced Engineering Mathematics", 5th Edition, John Wiley & Sons, 1999.

Reference Books:

1. B.S. Grewal, "Elementary Engineering Mathematics", 34th Ed., 1998..

2. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Company, 9th Revised Edition, 2001.

3. Shanti Narayan, "Integral Calculus", S. Chand & Company, 1999

4. Shanti Narayan, "Differential Caluculs", S.Chand & Company, 1998

Code No.: BCA 102

Paper: Business Communication

IAM	ESM	Total
25	75	100

UNIT-I

Concepts and Fundamentals: Meaning of communication, Importance of communication, Communication scope, Process of communication, Communication models and theories, Essentials of good communication - The seven Cs of communication, Factors responsible for growing importance of communication, Channels of communication, Verbal and Non-Verbal communication, Formal and Informal communication, Barriers of communication

UNIT-II

Written Communication: Objectives of written Communication, Media of written communication, Merits and demerits of written communication, Planning business messages. Writing Letters: Business letters, Office memorandum, Good news and bad news letters, Persuasive letters, Sales letters, Letter styles/ layout.

Report Writing: Meaning & Definition, Types of report (Business report & Academic report), Format of report, Drafting the report, Layout of the report, Essential requirement of good report writing.

Language Skills: Improving command in English, Choice of words, Common problems with verbs, adjectives, adverbs, pronouns, conjunctions, punctuation, prefix, suffix etc.

UNIT-III

Oral Communication: Principles of effective oral communication, Media of oral communication, Advantages of oral communication, Disadvantages of oral communication, Styles of oral communication.

Interviews: Meaning & Purpose, Art of interviewing, Types of interview, Interview styles, Essential Features, Structure, Guidelines for Interviewer, Guide lines for interviewee.

Meetings: Definition, Kind of meetings, Advantages and disadvantages of meetings/ committees, Planning and organization of meetings.

Job Application: Types of application, Form & Content of an application, drafting the application, Preparation of resume.

Project Presentations: Advantages & Disadvantages, Executive Summary, Charts, Distribution of time (presentation, questions & answers, summing up), Visual presentation, Guidelines for using visual aids, Electronic media (power-point presentation).

Arts of Listening: Good listening for improved communications, Art of listening, Meaning, nature and importance of listening, Principles of good listening, Barriers in listening

UNIT-IV

Business Negotiation: Definition of negotiation, Factors that can influence negotiation, what skills do we need to negotiate, Negotiation process (preparation, proposals, discussions, bargaining, agreement, implementation).

TEXT BOOK:

1. Rayudu, "C.S- Communication", Himalaya Publishing House, 1994.

REFERENCE BOOKS:

1. Reuben Ray, "Communication Today: Understanding Creative Skill", Himalaya Publication House, 2001

2. Malra Treece, "Successful Communication for Business and Management", Prentice Hall, 1997.

3. Bovee & Thill, "Business Communication Today", McGraw Hill, 2003

4. Murphy and Hildebrandt, "Effective of Business Communication", 5th Ed., New York McGraw, 1988.

5. Rajendra Pal and J.S Korlahalli, "Essential of Business Communication", Sultan Chand and sons, 1997.

6. K. K. Sinha, "Business Communication", Galgotia, 2003

UNIT I

C basics: C character set, Identifiers and keywords, Data types, constants, variables and arrays, declarations, expressions statements, symbolic constants, compound statements, arithmetic operators, unary operators, relational and logical operators, assignment operators, conditional operators, bit operators.

C constructs: If statement, if...else statement, if....else if...else statement, while statement, do....while statement, for statement, switch statement, nested control statement, break operator, continue operator, comma operator, goto statement.

UNIT – II

C Functions:Function: declaration, definition & scope, recursion, call by value, call by reference.

Storage Classes: automatic, external (global), static & registers.

Arrays: Arrays, pointers, array & pointer relationship, pointer arithmetic, dynamic memory allocation, pointer to arrays, array of pointers, pointers to functions, array of pointers to functions, Preprocessor directives: #include, #define, macro's with arguments, the operators # and ##, conditional compilations, multiple file programming.

UNIT – III

Structures:Structures, unions, structure passing to functions, bit fields, file handling [text (ascii), binary],

UNIT – IV

Standard library functions from stdio.h, stdlib.h, conio.h, ctype.h, math.h, string.h, process.h

TEXT:

1. Yashwant Kanetkar, "Let us C", BPB Publications, 2002

REFERENCES:

1. E. BalaGuruswamy, "Programming in ANSI C", TMH, 1999.
2. Al Kelly and Ira Pohl, "A Book on C", (4th Ed.), Addison Wesley, 1999.
3. B. Kernighan and D. Ritchie, "The ANSI C Programming Language", PHI., 2000.

Code No.: BCA 104

Paper: Fundamentals of Information Technology

IAM	ESM	Total
25	75	100

UNIT - I

What are computers? The evolution of computers, Classification of computers.

Block Diagram: Input-output devices, Description of Computer Input Units, Other Input Methods, and Computer Output Units.

Computer Memory: Memory Cell, Memory Organization, Read Only Memory, Serial Access Memory, Physical Devices Used to construct Memories, Magnetic Hard disk, floppy Disk Drives, Compact Disk Read Only Memory, Magnetic Tape Drives.

UNIT - II

Low level and high level languages, assemblers, compilers, interpreters, linkers, algorithms, flow charting, decision tables, pseudo code, software concepts: system & application software packages.

Computer Generation & Classifications: First Generation of Computers, The Second Generation, The Third Generation, The fourth Generation, The Fifth Generation, Classification of Computers, Distributed Computer System, Parallel Computers.

UNIT - III

Operating System concepts, different types of operating systems, structure of operating system, DOS/UNIX/LINUX commands, working with Windows, Windows 9x/NT/XP, Data Processing, File Systems and Database Management Systems, different types of Database Management System.

UNIT – IV

Basic elements of a communication system, Data transmission modes, Data Transmission speed, Data transmission media, Digital and Analog Transmission, Network topologies, Network Types (LAN, WAN and MAN), OSI & TCP/IP Model, Internet: Network, Client and Servers, Host & Terminals, TCP/IP, World Wide Web, Hypertext, Uniform Resource Locator, Web Browsers, IP Address, Domain Name, Internet Services Providers, Internet Security, Internet Requirements, Web Search Engine, Net Surfing, Internet Services, Intranet.

TEXT:

1. Alex Leon & Mathews Leon, "Fundamentals of Information Technology", Leon Techworld, 1999.
2. Vikas Gupta, "Comdex Computer Kit", Wiley Dreamtech, Delhi, 2004
3. P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 1992.

REFERENCES:

1. V. Raja Raman, "Introduction to Computers", PHI, 1998.
2. Alex Leon & Mathews Leon, "Introduction to Computers", Vikas Publishing House, 1999.
3. Norton Peter, "Introduction to computers", 4th Ed., TMH, 2001.

Code No.: BCA 105
Paper: Basics of Physics
UNIT - I

IAM	ESM	Total
25	75	100

Law of Motion: Force and Inertia, The law of inertia or Newton's first law of motion, Newton's Second law of Motion, Newton's third law of Motion Equilibrium of concurrent forces, Friction, Lubrication

UNIT – II

Work, Energy & Power: Work, Kinetic Energy, Potential Energy, Power, Collisions, Different Forms of Energy, conservation of Energy

UNIT - III

Electricity and Electromagnetism: Electric Forces, charges & Fields: Frictional electricity, properties of electric charge, conductors and insulators, coulomb's law, electric field, lines of force.

Electrostatics: Gauss's theorem, applications, electrostatic potential, potential energy, electrostatics of conductors, capacitors and capacitance, effect of dielectrics in capacitors.

Current Electricity: Current, voltage, resistance, ohm's law and resistivity of materials, electrical circuits & Kirchhoff's rule, measurement of voltages, currents and resistance

UNIT – IV

Thermal and Chemical effects of current: Heating effects, Thermo Electricity, Chemical effects, Magnetic effects of currents, Oersted's discovery, Magnetic field due to current forces on current and the Lorentz force. Ampere's Circulate law, Solenoid, Electromagnetic Induction: Faraday's experiments, Faraday's Law, Lenz's Law and conservation of energy, discussion of Faraday's Law, Electromagnetic induction and Lorentz force, Semiconductors and their property.

TEXT BOOK:

1. S. K. Gupta, "Modern ABC of Physics", Vol. I & II, Modern Publishers, 2002.
2. Pradeep, "Fundamental Physics", Class XI, XII, 2000.

REFERENCE BOOKS:

1. Kumar Mittal, "Physics, Part – I", Published by Nageen Publications, Meerut.
2. Kumar Mittal, "Physics, Part - II", Published, By Nageen Publications, Meerut.

Code No. : BCA 106
Paper: Practical – I

IAM	ESM	Total
50	50	100

Practical will be based on following Papers:

1. Programming with C (50%)
2. Fundamentals of Information Technology (50%)

BCA SECOND SEMESTER

Code No.: BCA 201

Paper: Mathematics II

IAM	ESM	Total
25	75	100

UNIT-I

SETS: Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Intersection and Complements of Sets, Cartesian Product, Cardinality of Set, Simple Applications.

RELATIONS AND FUNCTIONS: Properties of Relations, Equivalence Relation, Partial Order Relation Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions, Introduction of Trigonometric, Logarithmic and Exponential Functions.

UNIT-II

PARTIAL ORDER RELATIONS AND LATTICES: Partial Order Sets, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal Point, Glb, lub, Lattices & Algebraic Systems, Principle of Duality, Basic Properties, Sublattices, Distributed & Complemented Lattices.

UNIT-III

FUNCTIONS OF SEVERAL VARIABLES: Partial Differentiation, Change of Variables, Chain Rule, Extrema of Functions of 2 Variables, Euler's Theorem.

3D COORDINATE GEOMETRY: Review of 2D Coordinate Geometry: Equations of Straight Lines, Circle, Ellipse, Parabola, Hyprbola. 3D Coordinate Geometry: Coordinates in Space, Direction Cosines, Angle Between Two Lines, Projection of Join of Two Points on a Plane, Equations of Plane, Straight Lines, Conditions for a line to lie on a plane, Conditions for Two Lines to be Coplanar, Shortest Distance Between Two Lines, Equations of Sphere, Tangent plane at a point on the sphere. Equations of Ellipsoid, Paraboloid, Hyperboloid and Cylinder in Cartesian coordinate.

UNIT-IV

MULTIPLE INTEGRATION: Double Integral in Cartesian and Polar Coordinates to find Area, Change of Order of Integration, Triple Integral to Find Volume of Simple Shapes in Cartesian Coordinates.

TEXT BOOKS:

1. Kolman, Busby and Ross, "Discrete Mathematical Structure", PHI, 1996.

REFERENCE BOOKS:

1. H.K. Dass, "Advanced Engineering Mathematics"; S.Chand & Co., 9th Revised Ed., 2001.

2. S.K. Sarkar, "Discrete Maths"; S. Chand & Co., 2000

Code No.: BCA 202

Paper: Business Organization & Management

IAM	ESM	Total
25	75	100

UNIT I

Business –Meaning and Contents, Business as a system, Business and Legal and Economic Environment, Forms of Business Organization (meaning, merits & demerits).

UNIT II

Management- Management Principles, Henry Fayol’s principles of management, Taylor’s Scientific Management, Management Process, Basic Functions (in short), Meaning, Nature and Process, Role of Manager.

Organizational Behavior- Need of Understanding human behavior in organizations, Challenges and opportunities for OB, Contributing disciplines to the field of OB, Conceptual Models of OB.

UNIT III

Managing Personnel- HRM- Meaning and Functions, Manpower Planning, Job Analysis and Design, Training, Career Planning & Development, Motivation, Compensation Management. Managing Finance-Concept of Fixed and Working Capital, Main Sources of Finance, Accounting: Meaning, Users, Budgeting- Meaning, Type of Budgets.

UNIT IV

Managing Production- Basic Concepts, Objectives, Elements of Productions, Planning and Control.

Managing Sales and Marketing- Basic Concepts of marketing, Sales Promotions (including Salesmanship)

TEXT BOOKS:

1. Kotler, “Philip, Marketing Management”, 9th Ed., Prentice Hall of India, 2000
2. Maheshwari S.N., “Financial Management – Principles and Practice”, 6th revised Ed. S. Chand & Sons, 1992.

REFERENCE BOOKS:

1. Chadha N.K., “Human Resource Management- Issues, Case Studies & Experimental Exercises”, 2000
2. John W. Newstrom and Keith Davis, “Organisational Behaviour–Human Behaviour at work”, 10th Ed., 1997.
3. Koontz and Weihrich, “Management - A global perspective”, 10th Ed., McGraw Hill International Ed., 1993.
4. Maheshwari S.N and Maheshwari S.K, “An introduction to Accountancy”, 5th Ed, Vikas publishing house Panneerselvam, Production and Operations Managemnet, PHI-1999
5. Robbins, Stephen P., “Organisational Behaviour”, 8th Ed.. Prentice Hall of India, 1998.
6. Singh B.P. & Chabbra T.N., Business Organisation and Management Functions, Dhanpat Rai & Co. 2000.

Code No.: BCA 203
Paper: Digital Electronics

IAM	ESM	Total
25	75	100

UNIT-I

Boolean Algebra

Basics Laws of Boolean Algebra, Logic Gates, Simplifications of Boolean equations using K-maps, Code Conversion, (Binary, Octal, Hexadecimal), Overview of Gray codes and Excess – 3 codes.

UNIT-II

Arithmetic Circuits

Adder, Subtractor, Parallel binary adder/Subtractor, binary multiplier and divider.

Combinational Circuits

Multiplexers, De-Multiplexers, decoders, encoders, Design of code converters.

UNIT-III

Flip-flops

S-R, D, J-K, T, Clocked Flip-flop, Race around condition, Master slave Flip-Flop,

Realisation of one flip-flop using other flip-flop.

Shift Registers

Serial-in-serial-out, serial-in-parallel-out, parallel-in-serial-out and parallel-in-parallel-out,

Bi-directional shift register.

UNIT-IV

Counters

Ripple counter, Synchronous Counter, Modulo Counters, Ring Counter, Twisted Ring Counter.

Memory Devices - RAM, ROM, PAL & PLA

TEXT BOOKS

1. Moris Mano, "Digital Logic and Computer Design", PHI Publications, 2002
2. R. P. Jain, "Modern Digital Electronics", TMH, 3rd Edition, 2003.

REFERENCES:

1. R.L.Tokheim, "Digital Electronics, Principles and Applications", Tata McGraw Hill, 1999.
2. W.Gothman, "Digital electronics", PHI.
3. S. Salivahanan & S. Ariviyhgan. "Digital circuits and design", Vikas Publication, 2001
4. Malvino Leach, "Digital Principles and Application", TMH, 1999.

Code No.: BCA 204

Paper: Data Structures Using C

IAM	ESM	Total
25	75	100

UNIT-I

Arrays: Representation of single and multidimensional arrays; sparse arrays - lower and upper triangular matrices and Tri-diagonal matrices

Stacks and Queues: Introduction and primitive operations on stack; Stack application: Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion from infix to postfix. Introduction and primitive operation on queues, D-queues and priority queues.

UNIT-II

Lists: Introduction to linked lists; Sequential and linked lists, operations such as traversal, insertion, deletion, searching, Two way lists and Use of headers

Trees: Introduction and terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion, deletion;

UNIT-III

Multilevel indexing and B-Trees: Introduction: The invention of the B-tree; Statement of the problem; Indexing with binary search trees; Multilevel indexing, a better approach to tree indexes; B-trees: working up from the bottom; Example for creating a B-tree.

UNIT-IV

Sorting Techniques: Insertion sort, selection sort, merge sort, heap sort.

Searching Techniques: linear search, binary search and hashing

TEXT:

1. E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Booksources Pvt. Ltd, 2003
2. R. S. Salaria, "Data Structure & Algorithms", Khanna Book Publishing Co. (P) Ltd., 2002.

REFERENCES:

1. P. S. Deshpande and O.G. Kakde, "C & Data Structure", Wiley Dreamtech, 1st Edition, 2003.
2. Y. Langsam et. al., "Data Structures using C and C++", PHI, 1999.
3. Schaum's outline series, "Data Structure", TMH, 2002

Code No.: BCA 205

Paper: Database management System

IAM	ESM	Total
25	75	100

UNIT – I

Introduction: Characteristics of database approach, data models, DBMS architecture and data independence.

E-R Modeling: Entity types, entity set, attribute and key, relationships, relation types, roles and structural constraints, weak entities, enhanced E-R and object modeling, Sub Classes:, Super classes, inheritance, specialization and generalization,

UNIT – II

File Organization: Indexed sequential access files, implementation using B++ trees, hashing, hashing functions, collision resolution, extendible hashing, dynamic hashing approach implementation and performance.

UNIT – III

Relational Data Model: Relational model concepts, relational constraints, relational algebra.

SQL: SQL queries, programming using SQL

EER and ER to relational Mapping: Data base design using EER to relational language.

UNIT – IV

Data Normalization: Functional dependencies, Normal form up to 3rd normal form.

Concurrency Control: Transaction processing, locking techniques and associated, database recovery, security and authorization.

Recovery Techniques, Database Security

TEXT BOOKS:

1 R. Elmarsri and SB Navathe, “Fundamentals of Database Systems”, Addison Wesley, 4th Ed., 2004

REFERENCE BOOKS:

1. Abraham Silberschatz, Henry Korth, S. Sudarshan, “Database Systems Concepts”, 4th Edition, McGraw Hill, 1997.

2. Jim Melton, Alan Simon, “Understanding the new SQL: A complete Guide”, Morgan Kaufmann Publishers, 1993.

3. A. K. Majumdar, P. Battacharya, “Data Base Management Systems”, TMH, 1996.

4. Bipin Desai, “An Introduction to database Systems”, Galgotia Publications, 1991.

Code No. : BCA 206

Paper: Practical – II

IAM	ESM	Total
50	50	100

Practical will be based on following Papers:

1. Data Structure with C (50%)

2. Database Management System (50%)

BCA THIRD SEMESTER

Code No.: BCA 301

Paper: Mathematics - III

IAM	ESM	Total
25	75	100

UNIT-I

COMPLEX VARIABLES: Complex Number System, Algebra of Complex Numbers, Polar Form, Powers and Roots, Functions of Complex Variables, Elementary Functions, General Power of Functions, Inverse Trigonometric and Hyperbolic Functions.

SEQUENCE, SERIES AND CONVERGENCE: Sequence, Finite and Infinite Sequences, Monotonic Sequence, Bounded Sequence, Limit of a Sequence, Convergence of a Sequence, Series, Partial Sums, Convergent Series, Theorems on Convergence of Series, Leibnitz Test, Comparison Test, Ratio Test, Cauchy's Root Test, Convergence of Binomial and Logarithmic Series, Raabe's Test, Logarithmic Test, Cauchy's Integral Test (without proof)

UNIT II

VECTOR CALCULUS: Differentiation of Vectors, Scalar and Vector Fields, Gradient, Directional Derivatives, Divergence and Curl and their Physical Meaning, Line Integral and Green's Theorem.

UNIT III

FOURIER SERIES: Periodic Functions, Fourier Series, Fourier Series of Even and Odd Functions, Dirichlet Condition, Half Range Series.

UNIT IV

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER: Variable- Separable Method, Homogeneous Differential Equations, Exact Differential Equations, Linear Differential Equations, Bernoulli's Differential Equations, Differential Equations of First Order and First Degree by Integrating Factor.

ORDINARY DIFFERENTIAL EQUATIONS OF SECOND ORDER: Homogenous Differential Equations with Constant Coefficients, Cases of Complex Roots and Repeated Roots, Differential Operator, Solutions by Methods of Direct Formulae for Particular Integrals, Solution by Undetermined Coefficients, Cauchy Differential Equations, (only Real and Distinct Roots) Operator Method for Finding Particular Integrals, (Direct Formulae).

TEXT BOOKS:

1. A.B. Mathur and V.P. Jaggi, "Advanced Engineering Mathematics", Khanna Publishers, 1999.
2. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Co., 9th Revised Ed., 2001.

REFERENCE BOOKS:

1. R. K. Jain, SRK Iyengar, "Numerical Methods for Scientific & Engineering Computation", New Age International Pvt. Ltd., 3rd Edition, 1999.

Code No.: BCA 302

Paper: Computer Architecture

IAM	ESM	Total
25	75	100

UNIT-I

Register Transfer and Micro-operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Microoperations,

Arithmetic logic shift unit

Basic Computer Organizations and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control,

UNIT-II

Basic Computer Organizations and Design: Instruction Cycle, Memory-Reference Instructions, Register reference instructions, Input - Output Instructions, Design of Accumulator Logic Shift Unit

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes,

UNIT-III

Computer Arithmetic: Introduction, Multiplication Algorithms, Division Algorithms, for fixed point-members.

Input-Output Organization: Peripheral Devices, Input-Output Interfaces, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA)

UNIT-IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware

TEXT BOOKS :

1. Morris Mano, Computer System Architecture, 3rd Edition, Prentice-Hall of India Private Limited, 1999.

REFERENCE BOOKS:

1. William Stallings, Computer Organization and Architecture, 4th Edition, Prentice Hall of India Private Limited, 2001

2. Harry & Jordan, Computer Systems Design & Architecture, Addison Wesley, Delhi, 2000.

3. Malvino, "Digital Computer Electronics: An Introduction to Microcomputers", McGraw Hill, 1993.

Code No.: BCA 303
Paper: Front End Design Tools

IAM	ESM	Total
25	75	100

UNIT-I

Visual Basic: Variable Names, Data Types, Assignment, If-then, If-then-else, if then-elseifelse, expression, print statement, arrays, variable declaration, built-in & User defined types, Subroutine and functions, Boolean Operators, Arithmetic Operator, For- .next, do loop, while-wend, procedure/Public, Private and Static & Dim Statement.

UNIT-II

Structure of VB program, Forms & built in controls, Properties and events, Code Module, Scale Modes, Printer Object (Printing text, setting Fonts, graphics), Common dialog Boxes, picture controls, image-controls, send keys, MS-Common Controls, Error Handling, Classes, Control Arrays, MDI, SDI.

File Handling – Text and Binary Files, Files System Orbit Object.

UNIT-III

Database Interface: Review of ANSI SQL, ODBC, Pass through ODBC, DAO, MS-Jet Engine, DB-Engine, Workspaces, Databases, recordsets, Data bound controls, ActiveX controls, ADO, Active X Data controls, RDO

Data view Window, Data Environment Designer, Crystal Report and Data Report Utility Using Visual Basic (VB) for Transaction Management, Concurrency Control, Interfacing with RDBMS, Backend Stored procedure Usage.

UNIT-IV

Help Writing: Building a help, System, Building & Topics File, Labeling the topics, Creating a help project, primary & secondary help window, linking to internet, Adding Multimedia, Using HTML help workshop, content sensitive help, help file.

Overview of COM/DCOM using Windows API Functions, MAPI interface, Microsoft Transaction Server, Visual source safe, VB Script.

TEXT:

1. E. Petroutsos, "Mastering Visual Basic 6.0", BPB Publications, 1998.
2. Perry, Greg, "Teach Yourself Visual Basic 6 in 21 Days", Techmedia, 1998.

REFERENCES:

1. E. Petroutsos, "Mastering Database Programming with Visual Basic 6", BPB Publications, 2000
2. Norton Peter, "Peter Norton's Guide to Visual Basic 6", Techmedia, 1998.

Code No.: BCA 304

Paper: Financial Accounting

IAM	ESM	Total
25	75	100

UNIT – I

Meaning and Nature of Financial Accounting, Scope of Financial Accounting, Financial Accounting & Management Accounting, Accounting concepts & convention, Accounting standards in India.

UNIT – II

Basis of accounting-cash & accrual, Journalizing transaction, Introduction to Ledger posting and trial balance, Capital and revenue items. Application of computers in accounting, Accounting procedure used for recording cash, Bank and journal transactions using appreciate vouchers, Introduction to ledger accounting, Cash Book, Journal and bank account, Introduction to trial balance, Profit and Loss account and balance sheet.

UNIT – III

Financial statement analysis: Ratio analysis, Funds flow analysis, concepts, uses, Preparation of funds flow statement, simple problem, Cash flow analysis, Concepts, uses, preparation of cash flow statement, simple problem, Break-even analysis.

UNIT – IV

Inventory valuation: Objectives, Introduction to FIFO, LIFO & Weighted Average method of inventory valuation, Valuation of inventory on balance sheet date, inventory accounting and control, Introduction to stocks & shares, Concept of cost of capital, introduction, importance, explicit & implicit cost, Measurement of cost of capital, cost of debt.

Theory of working capital: Nature and concepts

TEXT BOOKS:

1. Maheshwari & Maheshwari, “An Introduction to Accountancy”, 8th Edition, Vikas Publishing House, 2003

REFERENCES BOOKS:

1. Gupta R. L., Gupta V. K., “Principles & Practice of Accountancy”, Sultan Chand & Sons, 1999.
2. Khan & Jain, “Financial Accounting”
3. Maheshwari S. N., “Principals of Management Accounting”, 11th Edition, Sultan Chand & Sons, 2001.
4. Shukla and Grewal, “Advanced Accounts”, 14th Edition, Sultan Chand & Sons.

Code No.: BCA 305

Paper: Object Oriented Programming

IAM	ESM	Total
25	75	100

UNIT – I

Introduction: Introducing Object-Oriented Approach, Relating to other paradigms (functional, data decomposition).

Basic terms and ideas: Abstraction, Encapsulation, Inheritance, Polymorphism, Review of C, Difference between C and C++ - cin, cout, new, delete operators.

UNIT – II

Classes and Objects: Encapsulation, information hiding, abstract data types, Object & classes, attributes, methods, C++ class declaration, State identity and behavior of an object, Constructors and destructors, instantiation of objects, Default parameter value, object types, C++ garbage collection, dynamic memory allocation, Metaclass/abstract classes.

UNIT – III

Inheritance and Polymorphism: Inheritance, Class hierarchy, derivation – public, private & protected, Aggregation, composition vs classification hierarchies, Polymorphism, Categorization of polymorphism techniques, Method polymorphism, Polymorphism by parameter, Operator overloading, Parametric polymorphism,

UNIT – IV

Generic function – template function, function name overloading, Overriding inheritance methods, Run time polymorphism, Multiple Inheritance.

Files and Exception Handling: Persistent objects, Streams and files, Namespaces, Exception handling, Generic Classes

TEXT:

1. A.R.Venugopal, Rajkumar, T. Ravishanker “Mastering C++”, TMH, 1997.
2. S. B. Lippman & J. Lajoie, “C++ Primer”, 3rd Edition, Addison Wesley, 2000.

REFERENCE:

1. R. Lafore, “Object Oriented Programming using C++”, Galgotia Publications, 2004.
2. D. Parsons, “Object Oriented Programming with C++”, BPB Publication.
3. Steven C. Lawlor, “The Art of Programming Computer Science with C++”, Vikas Publication.
4. Schildt Herbert, “C++: The Complete Reference”, 4th Ed., Tata McGraw Hill, 1999.
5. Tony Gaddis, Watters, Muganda, “Object-Oriented Programming in C++”, 3rd Ed., Wiley Dreamtech, 2004.

Code No. : BCA 306

Paper: Practical – III

IAM	ESM	Total
50	50	100

Practicals will be based on following Papers:

1. Front End Design Tools (50%)
2. Object Oriented Programming (50%)

BCA FORTH SEMESTER

Code No.: BCA 401

Paper: Mathematics IV

IAM	ESM	Total
25	75	100

UNIT-I

STATISTICS

COMBINATORICS: Permutation and Combination, Repetition and Constrained Repetition, Binomial Coefficients, Binomial Theorem.

PROBABILITY: Definition of Probability, Conditional Probability, Baye's Theorem

UNIT II

PROBABILITY DISTRIBUTIONS: Review of Mean & Standard Deviation, Mathematical Expectation, Moments, Moment Generating Functions, Binomial, Poisson and Normal Distributions.

CORRELATION: Karl Person Coefficient of Correlation, Spearman's Rank Correlation, Least Square Method: Straight Line, Parabola and Exponential Curves: Regression Analysis.

UNIT III

INTERPOLATION: Operators: Shift, Forward Difference, Backward Difference Operators and their Inter-relation, Interpolation Formulae-Newton's Forward, Backward and Divided Difference Formulae: Lagrange's Formula.

SOLUTION OF NON LINEAR EQUATION: Bisection Method, False Position Method, Newton – Raphson Method for Solving Equation Involving One Variable only.

UNIT IV

SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS: Gaussian Elimination Method with and without Row Interchange: LU Decomposition: Gauss - Jacobi and Gauss-Seidel Method; Gauss – Jordan Method and to find Inverse of a Matrix by this Method.

NUMERICAL DIFFERENTIATION- First and Second Order Derivatives at Tabular and Non-Tabular Points, Numerical Integration, Trapezoidal Rule, Simpsons 1/3 Rule: Error in Each Formula (without proof).

TEXT BOOKS:

1. H.K. Dass, "Advanced Engineering Mathematics"; S.Chand & Co., 9th Revised Edition, 2001.
2. S.K. Sarkar, "Discrete Mathematics"; S. Chand & Co., 2000.
3. S.S. Sastry, " Numerical Analysis"; Prentice Hall of India, 1998.

Code No.: BCA 402
Paper: Software Engineering

IAM	ESM	Total
25	75	100

UNIT – I

Introduction: Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models

Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

UNIT – II

Software Project Management Concepts: The Management spectrum, The People The Problem, The Process, The Project

Software Project Planning: Size Estimation like lines of Code & Function Count, Cost Estimation Models, COCOMO, Risk Management.

UNIT - III

Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design

Software Metrics: Software measurements: What & Why, Token Count, Halstead Software Science Measures, Design Metrics, Data Structure Metrics,

UNIT - IV

Software Testing: Testing Process, Design of Test Cases, Types of Testing, Functional Testing, Structural Testing, Test Activities, Unit Testing, Integration Testing and System Testing. Debugging Activities

Software Maintenance: Management of Maintenance, Maintenance Process, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

TEXT:

1. K. K. Aggarwal & Yogesh Singh, “Software Engineering”, 2nd Ed., New Age International, 2005.
2. R. S. Pressman, “Software Engineering – A practitioner’s approach”, 5th Ed., McGraw Hill Int. Ed., 2001.

REFERENCE:

1. Stephen R. Schach, “Classical & Object Oriented Software Engineering”, IRWIN, 1996.
2. James Peter, W. Pedrycz, “Software Engineering: An Engineering Approach”, John Wiley & Sons.
3. I. Sommerville, “Software Engineering”, Addison Wesley, 2002.

Code No.: BCA 403

Paper: Java programming and website design

IAM	ESM	Total
25	75	100

UNIT-I

Java Programming: Data types, control structured, arrays, strings, and vector, classes (inheritance, packages, exception handling), multithreaded programming,

UNIT – II

Java applets, AWT controls (Button, Labels, Combo box, list and other Listeners, menu bar), layout manager, string handling (only main functions),

UNIT – III

Networking (datagram socket and TCP/IP based server socket), event handling, Drivers in java, JDBC, ODBC connectivity (database connectivity)

UNIT - IV

HTML: use of commenting, headers, text styling, images, formatting text with , special characters, horizontal rules, line breaks, table, forms, image maps, <META> tags, <FRAMESET> tags, file formats including image formats.

TEXT BOOKS:

1. Patrick Naughton and Herbertz Schildt, “Java-2 The Complete Reference”, 1999, TMH
2. Rick Dranell, “HTML 4 unleashed”, Techmedia Publication, 2000.

REFERENCE BOOKS: -

1. H.M.Dietel, P.J.Dietel, T.R.Neito, Internet and world wide web – how to program, Addison Wiley, 2000.
2. H.Schildt, “The complete Java 2 reference”, TMH, 1998.
3. Shelley Powers, “Dynamic Web Publishing”, 2nd Ed., Techmedia, 1998.

Code No.: BCA 404

Paper: Operating System

IAM	ESM	Total
25	75	100

UNIT – I

Introduction, What is an Operating System, Simple Batch Systems, Multiprogrammed Batches systems, Time-Sharing Systems, Personal-computer systems, Parallel systems, Distributed Systems, Real-Time Systems

Memory Management: Background, Logical versus Physical Address space, swapping, Contiguous allocation, Paging, Segmentation

Virtual Memory: Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing, Other Considerations

UNIT – II

Processes: Process Concept, Process Scheduling, Operation on Processes

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling,

Process Synchronization: Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization

UNIT – III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices; Input or Output Devices, Storage Devices, Buffering, Secondary-Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Reliability

UNIT – IV

Information Management: Introduction, A Simple File System, General Model of a File System, Symbolic File System, Basic File System, Access Control Verification, Logical File System, Physical File System File-System Interface: File Concept, Access Methods, Directory Structure, Protection, Consistency Semantics File-System Implementation: File-System Structure, Allocation Methods, Free-Space Management

TEXT:

1. Silberschatz and Galvin, “Operating System Concepts”, Pearson, 5th Ed., 2001
2. Madnick E., Donovan J., “Operating Systems”, Tata McGraw Hill, 2001

REFERENCES:

1. Tannenbaum, “Operating Systems”, PHI, 4th Edition, 2000

Code No.: BCA 405

IAM	ESM	Total
25	75	100

Paper: Business Economics

UNIT I

The Scope and Method of Economics, The Economic Problem: Scarcity & Choice, The Price Mechanism, Demand & Supply Equilibrium: The concept of Elasticity and its Applications. The Production Process: Output decisions – Revenues, Costs and Profit Maximisation Laws of Returns & Returns to Scale; Economies and Diseconomies of Scale.

UNIT II

Market Structure: Equilibrium of a Firm and Price, Output Determination Under Perfect Competition, Monopoly, Monopolistic Competition & Oligopoly.

UNIT III

Macro Economic Concerns: Inflation, Unemployment, Trade-Cycles: Circular Flow upto Four Sector

Economy, Government in the Macro Economy: Fiscal Policy, Monetary Policy, Measuring National

Income and Output.

UNIT IV

The World Economy – WTO, Globalisation, MNCs, Outsourcing, Foreign Capital in India, Trips, Groups of Twenty (G-20), Issues of Dumping, Export- Import Policy 2004-2009.

TEXT BOOKS:

1. Ahuja H.L., “Business Economics”, S. Chand & Co., New Delhi, 2001
2. Ferfuson P.R., Rothschild, R and Ferguson G.J. “Business Economics”, Mac- Millan, Hampshire, 1993.
3. Karl E. Case & Ray C. Fair, “Principles of Economics”, Pearson Education, Asia, 2000
4. Nellis, Joseph, Parker David, “The Essence of Business Economics”, Prentice Hall, New Delhi, 1992.

Code No. : BCA 406

IAM	ESM	Total
50	50	100

Paper: Practical – IV

Practical will be based on following Paper:

1. Java Programming & Website Design (100%)

BCA FIFTH SEMESTER

Code No.: BCA 501

Paper: Computer Networks

IAM	ESM	Total
25	75	100

UNIT – I

Basic Concepts: Components of data communication, distributed processing, standards and organizations. Line configuration, topology, transmission mode, and categories of networks.

OSI and TCP/IP Models: Layers and their functions, comparison of models.

Digital Transmission: Interfaces and Modems: DTE-DCE Interface, modems, cable modems.

Transmission Media: Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon Capacity, comparison of media.

UNIT – II

Telephony: Multiplexing, error detection and correction: Many to one, one to many, WDM, TDM, FDM, circuit switching, packet switching and message switching.

Data Link control protocols: Line discipline, flow control, error control, synchronous and asynchronous protocols, character and bit oriented protocols, Link access procedures.

Point to point protocols: Transmission states, PPP layers, LCP, Authentication, NCP.

ISDN: Services, historical outline, subscriber's access, ISDN, Layers, and broadband ISDN.

UNIT – III

Devices: Repeaters, bridges, gateways, routers, The Network Layer, Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internetworking, Network-Layer in the Internet.

UNIT – IV

Transport and upper layers in OSI Model: Transport layer functions, connection management, Functions of session layers, Presentation layer, and Application layer.

TEXT BOOKS:

1. A. S. Tanenbaum, "Computer Networks"; Pearson Education Asia, 4th Ed., 2003.
2. Behrouz A. Forouzan, "Data Communication and Networking", 3rd edition, Tata Mc Graw Hill, 2004.

REFERENCES:

1. D. E. Comer, "Internetworking with TCP/IP", Pearson Education Asia, 2001
2. William Stallings, "Data and computer communications", Pearson education Asia, 7th Ed., 2002.

Code No.: BCA 502

Paper: .net programming

IAM	ESM	Total
25	75	100

UNIT – I

.Net architecture, Namespaces, Assemblies, object oriented features, memory management, interoperation with IOM, transaction in .NET, Structured exception handling, code access security.

UNIT – II

VB.NET

Similarities & differences with Visual Basic, windows focus, ADO.NET, working with databases, object oriented features.

UNIT – III

ASP.NET

Similarities & difference with ASP, Architecture, web-form, development, XML, databases interface.

UNIT – IV

C++ .NET

Similarities & differences with C/C++, Creating components, window four, menus, validation, database interface.

TEXT:

1. A. Chakraborti et. al., "Microsoft .NET framework", PHI, 2002
2. M. Reynolds et. al., ".NET Enterprise", Wrox/SPD, 2002

REFERENCES:

1. Richard Blaur & Mathew Reynolds, "Beginning VB.net 2003", 3rd Edition, Wiley Dream Tech., 2003
2. Chris Willman, John Kauffman, "Beginning ASP.net 1.1 with VB.NET 2003", Wiley Dream Teach, 2003
3. Chris Ullman, John Kauffman, "Beginning ASP.NET with Visual #.net 2003", Wiley Dream Tech, 2003

Code No.: BCA 503**Paper: Linux Environment**

IAM	ESM	Total
25	75	100

UNIT-I

UNIX & LINUX:- Overview of UNIX and LINUX Architectures editors and commands, shell scripts, system administration.

LINUX Internals:

Introduction: - Data structures in LINUX kernel, process management, systems calls

Memory Management:- Architecture independent memory model, virtual address space for a process, block devices, caching, paging under LINUX.

UNIT-II

Inter Process Communication:- Synchronization in kernel, communication via files, pipes, ptrace, system V IPC, and sockets.

UNIT-III

LINUX File System: - Representation of file system in the kernel, Proc and Ext2 file system.

Modules: - Modules in LINUX, debugging.

UNIT-IV

Multiprocessing: - Multiprocessing, symmetric multiprocessing, Changes with respect to kernel initialization, spooling, message exchange between processes, interrupt handling

TEXT BOOKS:

1. A. Silberschatz, P. B. Galvin, "Operating System Concepts", John Wiley & Sons (Asia) Pte. Ltd, 2000
2. Neil Mathew, Richard Stones, "Beginning Linux Programming", 3rd Edition, Wiley Dream Tech, 2005

REFERENCES:

1. B. W. Kernighan & R. Pike, "The UNIX Programming Environment", Prentice Hall of India, 2000
2. Cox K., "Red Hat Linux Administrator's Guide", PHI, 2001
3. M. Beck, "LINUX Kernel Internals", Addison Wesley, 1997

Code No.: BCA 504

Paper: E-commerce

IAM	ESM	Total
25	75	100

UNIT-I

Introduction to E-Commerce: The Scope of Electronic Commerce, Definition of Electronic Commerce, Electronic Commerce and the Trade Cycle, Electronic Markets, Electronic Data Interchange, Internet Commerce, E-Commerce in Perspective.

Business Strategy in an Electronic Age: Supply Chains, Porter's Value Chain Model, Inter Organizational Value Chains, Competitive Strategy, Porter's Model, First Mover Advantage, Sustainable Competitive Advantage, Competitive Advantage using E-Commerce, Business Strategy, Introduction to Business Strategy, Strategic Implications of IT, Technology, Business Environment, Business Capability, Existing Business Strategy, Strategy Formulation & Implementation Planning, E-Commerce Implementation, E-Commerce Evaluation.

UNIT – II

Business-to-Business Electronic Commerce: Characteristics of B2B EC, Models of B2B EC, Procurement Management Using the Buyer's Internal Marketplace, Supplier-Oriented Marketplace, Intermediary-Oriented Marketplace, Just-in-Time Delivery, Other B2B Models, Auctions and Services from Traditional to Internet-Based EDI, Integration with Back-end Information Systems, The Role of Software Agents for B2B EC, Electronic Marketing in B2B, Solutions of B2B EC, Managerial Issues, Electronic Data Interchange (EDI), EDI: The Nuts and Bolts, EDI & Business.

Intranet and Extranet: Automotive Network Exchange, The Largest Extranet, Architecture of the Internet, Intranet, and Extranet, Intranet Software, Applications of Intranets, Intranet Application Case Studies, Considerations in Intranet Deployment, The Extranets, The Structure of Extranets, Extranet Products & Services, Applications of Extranets, Business Models of Extranet Applications, Managerial Issues.

UNIT – III

Electronic Payment Systems: Is SET a Failure, Electronic Payments & Protocols, Security Schemes in Electronic Payment Systems, Electronic Credit Card System on the Internet, Electronic Fund Transfer and Debit Cards on the Internet, Stored-Valued Cards and E-Cash, Electronic Check Systems, Prospect of Electronic Payment Systems, Managerial Issues.

Public Policy: From Legal Issues to Privacy: EC-Related Legal Incidents, Legal, Ethical & Other Public Policy Issues, Protecting Privacy, Protecting Intellectual Property, Free Speech, Internet Indecency & Censorship, Taxation & Encryption Policies, Other Legal Issues: Contracts, Gambling & More, Consumer & Seller Protection in EC.

UNIT – IV

Infrastructure for EC: It takes more than Technology, A Network of Networks, Internet Protocols, Web-Based client/ Server, Internet Security, Selling on the Web, chatting on the Web, Multimedia delivery, Analyzing Web Visits, Managerial issues.

Economics, Global & Other Issues in EC: Competition in Marketspace, Some Issues in Digital Economy and Success Factors, Impacts on Industry Structure, Intermediaries, and w.e.f. session 2005-2006 41

Others, virtual Communities, Global Electronic Commerce, Electronic Commerce in Small companies, Research in EC, The Future of EC

TEXT BOOKS:

1. David Whiteley, "E-Commerce", Tata McGraw Hill, 2000
2. Eframi Turban, Jae Lee, David King, K. Michale Chung, "Electronic Commerce", Pearson Education, 2000

Code No.: BCA 505**Paper: Design and Analysis of Algorithms**

IAM	ESM	Total
25	75	100

UNIT – I

Mathematical Preliminaries: Review of growth functions, Solution of difference equations. Sorting and Order Statistics Merge sort, Heap sort, Quick sort, radix sort, bucket sort, median and order statistics.

UNIT – II

Advanced Data Structures Review of binary search trees, dynamic set operation, red black trees, binomial heap.

Dynamic Programming Matrix multiplications, longest common subsequence and optimal polygon triangulation problems.

UNIT – III

Greedy Algorithms: Activity selection, Huffman coding, and task scheduling problem.

Amortized Analysis Aggregate, accounting, and potential methods.

UNIT – IV

String Matching, Naïve String Matching, Rabin karp and KMP algorithms.

TEXT:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Clifford Stein, “Introduction to Algorithms”, 2nd Ed., PHI, 2004.

REFERENCES:

1. A. V. Aho, J. E. Hopcroft, J. D. Ullman, “The Design and Analysis of Computer Algorithms”, Addison Wesley, 1998.
2. Ellis Horowitz and Sartaz Sahani, “Computer Algorithms”, Galgotia Publications, 1999.
3. D. E. Knuth, “The Art of Computer Programming”, 2nd Ed., Addison Wesley, 1998

Code No.: BCA 506**Paper: Computer Network Security**

IAM	ESM	Total
25	75	100

UNIT - I

Introduction: Attacks, Services and Mechanism, Model for Internetwork Security.

Cryptography: Notion of Plain Text, Encryption, Key, Cipher Text, Decryption and cryptanalysis; Public Key Encryption, digital Signatures and Authentication.

UNIT – II

Net Work Security :

Authentication Application: Kerveros, X.509, Directory Authentication Service, Pretty Good Privacy, S/ Mime.

UNIT – III

IP security Architecture: Overview, Authentication header, Encapsulating Security Pay Load, combining Security Associations, Key Management.

Web Security: Requirements, Secure Socket Layer, Transport Layer Security, and Secure Electronic Transactions.

UNIT – IV

Network Management Security: Overview of SNMP Architecture-SMMPV11 Communication Facility, SNMPV3.

System Security: Intruders, Viruses and Related Threats, Firewall Design Principles.

TEXT BOOKS:

1. W. Stallings, Networks Security Essentials: Application & Standards, Pearson Education, 2000
2. W. Stallings, Cryptography and Network Security, Principles and Practice, Pearson Education, 2000.

Code No. : BCA 507

Paper: Practical – V

IAM	ESM	Total
50	50	100

Practicals will be based on following Papers:

1. .net Programming (50%)
2. Linux Environment (50%)

Code No. : BCA 509

Paper: Minor Project

IAM	ESM	Total
0	100	100

Evaluation will be based on Summer Training held after fourth semester and will be conducted by the college committee only.

BCA SIXTH SEMESTER

Code No.: BCA 601

Paper: Management Information Systems

IAM	ESM	Total
25	75	100

UNIT – I

The meaning and role of MIS: What is MIS?. Decision support systems, systems approach, the systems view of business, MIS Organization within the company.

Management Organizational theory and the systems approach:

Development of organization theory, management and organizational behavior, management, information, and the systems approach.

UNIT – II

Information Systems for decision making: Evolution of an information system, Basic Information Systems, decision making and MIS, MIS as a technique for making programmed decisions, decision assisting information systems.

Strategic and project planning for MIS: General business planning, appropriate MIS response, MIS planning – general, MIS planning – details.

UNIT – III

Conceptual system design: Define the problems, set system objectives, establish system constraints, determine information needs, determine information sources, develop alternative conceptual designs and select one, document the system concept, prepare the conceptual design report.

UNIT – IV

Implementation, evaluation and maintenance of the MIS: Plan the implementation, acquire floor space and plan space layouts, organize for implementation, develop procedures for implementation, train and operating personnel, computer related acquisitions, develop forms for data collection and information, dissemination, develop the files, test the system, cut over, document the system, evaluate the MIS, control and maintain the system.

Pitfalls in MIS development: Fundamental weaknesses, soft spots in planning, design problems, implementation: The TAR PIT.

Text book:

1. R. G. Murdick, J. E. Ross and J. R. Clagget, “Information Systems for Modern Management”, 3rd Edition by, PHI – 1994.
2. Parker, Charles Case, Thomas, “Management Information System: Strategy & Action”, 2nd Edition, TMH, 1993.

Code No.: BCA 602

Paper: Computer Graphics & Multimedia Applications

IAM	ESM	Total
25	75	100

UNIT – I

Introduction: The Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Classification of Applications, Development of Hardware and Software for Computer Graphics, Conceptual Framework for Interactive Graphics, Overview, Scan Converting Lines, Scan Converting Circles, Scan Converting Ellipses.

Graphics Hardware

Hardcopy Technologies, Display Technologies, Raster-Scan Display Systems, The Video Controller, Random-Scan Display Processor, Input Devices for Operator Interaction, Image Scanners, Working exposure on graphics tools like Dream Weaver, 3D Effects etc.

Clipping

Southland-Cohen Algorithm, Cyrus-Beck Algorithm, Midpoint Subdivision Algorithm

UNIT – II

Geometrical Transformations

2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composition of 2D Transformations, The Window-to-Viewport Transformation, Efficiency, Matrix Representation of 3D Transformations, Transformations as a Change in Coordinate System.

UNIT – III

Representing Curves & Surfaces

Polygon Meshes, Parametric Cubic Curves, Quadric Surfaces.

Solid Modeling

Representing Solids, Regularized Boolean Set Operations, Primitive Instancing, Sweep Representations, Boundary Representations, Spatial Partitioning Representations, Constructive Solid Geometry, Comparison of Representations, User Interfaces for Solid Modeling.

UNIT – IV

Introductory Concepts: Multimedia, Definition, CD-ROM and the multimedia highway, Uses of Multimedia, Introduction to making multimedia – The stages of Project, the hardware & software requirements to make good multimedia, Multimedia skills and training, Training Opportunities in Multimedia, Motivation for Multimedia usage

TEXT BOOKS:

1. Foley, Van Dam, Feiner, Hughes, Computer Graphics Principles & Practice, 2000.
2. Ralf Skinmetz and Klana Naharstedt, “Multimedia: Computing, Communications and Applications”, Pearson, 2001

REFERENCES BOOKS:

1. D. Harn & Baker: Computer Graphics, Prentice Hall of India, 1986.
2. D.J. Gibbs & D.C. Tschritzis: Multimedia Programming Object, Environment & Framework, 2000
3. Foley, J.D. & Van Dam, A: Fundamentals of Interactive Computer Graphics.
4. Rogers & Adams, “Mathematical Elements for Computer Graphics”, McGraw Hill, 1989.
5. Tay Vaughan, “Multimedia: Making it Work”, TMH, 2000.

Code No.: BCA 603

Paper: Mobile Computing

IAM	ESM	Total
25	75	100

UNIT 1:

Introducing the Mobile Internet: The Mobile Internet is here, The Rise of Mobile data. Key Services for the mobile Internet, Business opportunities.

UNIT 2:

WAP: the Mobile Internet Standard: Making the Internet Mobile: Challenges and Pitfalls, Overview of the Wireless Application Protocol

UNIT 3:

Implementing WAP Services: The Wireless Markup Language, Enhanced WML: WML Script and WTAI, User Interface Design: Marking Wireless Applications Easy to Use.

UNIT 4:

Advanced WAP: Tailoring Content to the Client, Push Messaging, Wireless Telephony Applications, Building and Deploying End-to-End WAP Services. Where Next: The Mobile Internet Future

TEXT BOOK:

1. Sandeep Singhal, "The Wireless Application Protocol, Writing Applications for Mobile Internet", Pearson Education, 2000

Code No.: BCA 604

Paper: Internet Programming

IAM	ESM	Total
25	75	100

UNIT – I

Microsoft Visual InterDev: Web servers, Creating a project, Use of project Explorer, Toolbox window, Site design

Java Script., Data types, Control structures, Functions, Arrays, and Objects.

UNIT – II

DHTML: CSS, Object Model collection, event model, filter and transitions, data binding with tabular data control.

VB script and its utility functions.

UNIT – III

Web servers- PWS set up, publishing information, and publishing Internet information server.

Database: registering ODBC, database, ADO (active X data objects)

ASP-Active server pages, client side and server side programming.

UNIT – IV

XML-Structuring data, DTD's using XML with HTML and CSS, XML parsers. Servlets.

TEXT BOOKS:

1. H.M.Dietel, P.J.Dietel, T.R.Neito, "Internet and worldwide web – how to program", Addison Wiley, 2000.

2. H.Schildt, The complete Java2 reference, TMH, 1998.

Code No.: BCA 605

Paper: Knowledge Management & New Economy

IAM	ESM	Total
25	75	100

INSTRUCTIONS TO PAPER SETTERS:

UNIT – I

Business Intelligence and Business Decisions; Modelling Decision Processes; Decision support systems; Group decision support and Groupware Technologies.

UNIT – II

Executive Information and support Systems; Business Expert System and AI, OLTO & OLAP; Data Warehousing; Data Marts..., Data Warehouse architecture; Tools for data warehousing.

UNIT – III

Multi-dimensional analysis; Data mining and knowledge discovery; Data mining and Techniques; Data Mining of Advance Databases.

UNIT – IV

Knowledge Management Systems: Concept and Structure KM systems, techniques of knowledge management appreciation & limitation.

TEXT BOOKS:

1. Decision support system, EIS, 2000
2. W. H. Inmon, "Building Data Warehousing", Wiley, 1998.
3. Han, Jiawei, Kamber, Michelinal, "Data Mining Concepts & Techniques", Harcourt India, 2001

Code No.: BCA 606

Paper: Artificial Intelligence

IAM	ESM	Total
25	75	100

UNIT - I

Overview of A.I: Introduction to AI, Importance of AI, AI and its related field, AI techniques, Criteria for success.

Problems, problem space and search: Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem
Heuristic search techniques :Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction

UNIT - II

Knowledge representation: Definition and importance of knowledge, Knowledge representation, Various approaches used in knowledge representation, Issues in knowledge representation

Using Predicate Logic :Represent ting Simple Facts in logic, Reprising instances and isa relationship, Computable function and predicate.

UNIT - III

Natural language processing :Introduction syntactic processing, Semantic processing, Discourse and pragmatic processing

Learning: Introduction learning, Rote learning, Learning by taking advice, Learning in problem solving, Learning from example-induction, Explanation based learning

UNIT - IV

Expert System: Introduction,Reprising using domain specific knowledge,Expert system shells.

LISP and other AI Programming Language

Text Book:

1. E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1999.

Reference:

1. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1999
2. Nils J Nilsson, "Artificial Intelligence -A new Synthesis" 2nd Edition (2000), Harcourt Asia Ltd.

Code No. : BCA 607

Paper: Practical – VI

Practical will be based on following Paper:

1. Computer Graphics & Multimedia Applications (50%)
2. Electives (50%)

IAM	ESM	Total
50	50	100

Code No. : BCA 608

Paper: Major Project

IAM	ESM	Total
0	200	200

Evaluation of the major project will have weight on following criteria

- (I) Internal examiner (30%)
- (II) External examiner (20%)
- (III) Project Report (15%)
- (IV) Presentation & Viva voce (35%)



MANIPUR UNIVERSITY
COURSE STRUCTURE
FOR UNDER GRADUATE COURSE: B.Sc. (Hons)
(Semester System)

Subject: BOTANY

Semester	Paper No.	Title of the paper	Marks allotted Theory/Practical
I	BOT – 101 ELECTIVE	Botany – I (Virus, Bacteria & Cryptogams) I. Virus & Bacteria II. Algae III. Fungi and Plant Pathology IV. Bryophytes V. Pteridophytes	75 15 15 15 15 15
	BOT – 101(P)	Practical	25
II	BOT – 202 ELECTIVE	Botany – II (Gymnosperms, Angiosperms, Applied Botany & Embryology) I. Gymnosperms & Palaeobotany II. Angiosperms III. Applied Botany & Ethnobotany IV. Anatomy of Angiosperms V. Embryology & Palynology	75 15 15 15 15 15
	BOT – 202 (P)	Practical	25
III	BOT – 303 ELECTIVE	Botany – III (Plant Geography, Ecology, Plant Physiology & Molecular Biology) I. Plant Geography II. Principles of Ecology III. Plant Physiology IV. Biochemistry V. Molecular Biology	75 15 15 15 15 15
	BOT – 303 (P)	Practical	25
IV	BOT – 404 ELECTIVE	Botany – IV (Cytogenetics, Biotechnology & Biometrics) I. Cytology II. Genetics III. Plant breeding IV. Biotechnology V. Biometrics	75 15 15 15 15 15
	BOT – 404 (P)	Practical	25
V	BOT – 505 HONOURS	Botany – V (Microbial Diversity, Plant Pathology & Embryophyta) I. Microbial Diversity II. Microbes and Human Welfare III. Plant Pathology IV. Plant disease management V. Bryology and Pteridology	100 20 20 20 20 20

V	BOT - 506 HONOURS	Botany – VI (Advance Plant Taxonomy, Anatomy, Embryology and Palynology) I. Primitive seed plants & Paleobotany II. Advance Plant Taxonomy III. Plant Resources– Management & Utilizations IV. Anatomy of Angiosperm V. Plant Embryology & Palynology	100 20 20 20 20 20 20
V	BOT – 507 (P) HONOURS	Botany – VII Practical (Based on theory papers BOT–505 and BOT–506)	100
VI	BOT – 608 HONOURS	Botany – VIII (Ecology, Plant Physiology & Molecular Biology) I. Vegetation & Natural resources II. Ecosystem & Pollution III. Plant Physiology IV. Biochemistry V. Molecular biology	100 20 20 20 20 20
VI	BOT – 609 HONOURS	Botany – XI (Cell Biology, Genetics, Plant breeding, Biotechnology & Computer Application) I. Cell Biology II. Genetics III. Plant Breeding IV. Biotechnology. V. Computer Application & Bioinformatics	100 20 20 20 20 20
VI	BOT – 610 (P) HONOURS	Botany – X Practical (Based on Theory papers BOT–608 and BOT–609)	100

MANIPUR UNIVERSITY
COURSE STRUCTURE
FOR UNDER GRADUATE COURSE: B.Sc

SUBJECT – BOTANY

SEMESTER – I

BOT – 101/BOTANY PAPER – I (Virus, Bacteria and Cryptogams)

Marks: 75

- Unit I :** Virus – General structure, viral components, classification, nomenclature, viral replication (TMV)
Bacteria – General characters, prokaryotic cell organization, brief account of Bergey's classification system, reproduction, brief account on genetic recombination in bacteria, types of nutrition, autotrophism (phototrophism and chemotrophism) and heterotrophism.
Marks: 15
- Unit II :** Fungi – General characters, classification (Ainsworth), asexual and sexual reproduction, life cycles of *Saprolegnia* (Mastigomycota), *Mucor* (Zygomycota), *Neurospora* (Ascomycota), *Puccinia* (Basidiomycota) and *Penicillium* (Deuteromycota), economic importance of fungi.
Lichens – Thallus structure, reproduction and economic importance
Plant Pathology – Concepts and classification of plant diseases, causes of plant disease, principles of plant disease management
Marks: 15
- Unit III :** Algae – General characters, classification (Fritsch), range of vegetative and reproductive structure of different classes, life cycles of *Oscillatoria* (Cyanophyceae), *Oedogonium* (Chlorophyceae), *Vaucheria* (Xanthophyceae), *Cyclotella* (Bacillariophyceae), *Ectocarpus* (Phaeophyceae) and *Polysiphonia* (Rhodophyceae), economic importance of algae.
Marks: 15
- Unit IV :** Bryophytes – General characters, classification, alternation of generation, range of structural organization of gametophytes and sporophytes, methods of reproduction, life cycles of *Riccia*, *Marchantia*, *Anthoceros*, *Pellia*, *Porella*, *Sphagnum* and *Funaria*
Marks: 15
- Unit V :** Pteridophytes – General characters, classification, anatomy of sporophytes, reproductive methods, life cycles of *Lycopodium*, *Selaginella*, *Equisetum*, *Isoetes*, *Marsilea* and *Dryopteris*.
Marks: 15

BOT-101(P)/BOTANY PRACTICAL – I

Marks: 25

1. Gram staining of bacteria
2. Microscopic study of vegetative and reproductive structures of algal genera included in theory syllabus
3. Microscopic study of vegetative and reproductive structures of fungal genera included in theory syllabus.
4. Study of lichen thalli – crustose, foliose and fruticose
4. Study of locally important plant diseases
5. Morphology and microscopic study of vegetative and reproductive structures of bryophyte genera included in theory syllabus
6. Morphology and microscopic study of vegetative and reproductive structures of pteridophyte genera included in theory syllabus.

Recommended books:

1. Introduction to Mycology : C.J. Alexopoulos and C.W. Mims
Willey Eastern Ltd., New Delhi
2. An Introduction to Mycology : R.S. Mehrotra and K.R. Aneja
New Age International (P) Ltd., New Delhi
3. The Structure and Reproduction of the : F.E. Fritsch
Algae Vol. I & II Cambridge University Press, London
4. Introductory Phycology : H.D. Kumar
East-West Press Pvt. Ltd., New Delhi
5. Introduction to Embryophyta : N.S. Parihar
(a) Vol. I. Bryophyta Kitab Mahal, Allahabad
(b) Vol. II. Pteridophyta
6. The Morphology of Pteridophytes : K.R. Sporne
B.I. Publications, Bombay
7. Microbiology : Principles and Explorations : J.G. Black
John Wiley and Sons, Inc. USA
8. The Algae : V.J. Chapman and D.J. Chapman
Memillan India Ltd.

SEMESTER – II

BOT-202/BOTANY-II (Gymnosperms, Angiosperms, Applied Botany and Embryology)

Mark: 75

Unit I : Gymnosperms and Palaeobotany:
General account of Gymnosperms and their Classification; Morphology, Reproduction and Life cycle of *Cycas*, *Pinus* and *Gnetum*. Economic importance of Gymnosperms. Palaeobotany: Fossil formation and types. Geological time scale and dominant fossil flora of different ages.

Marks: 15

Unit II : Angiosperm Taxonomy:
Introduction to Plant Taxonomy
Importance of field work, observation, herbarium preparation.
Concept of species, genus and family. Keys of identification. Rules of nomenclature (validity, effectivity and priority). Classification systems of Linnaeus, Bentham and Hooker, Engler and Prantle and Hutchinson.
Taxonomic studies of the following Families: Ranunculaceae, Brassicaceae, Malvaceae, Fabaceae, Rosaceae, Apiaceae, Asteraceae, Solanaceae, Lamiaceae, Euphorbiaceae, Liliaceae and Poaceae

Marks: 15

Unit III : Applied Botany & Ethnobotany:
Origin of cultivated plants, Vavilov's centre of origin.
Origin, cultivation and improvement of Rice and Potato.
History, cultivation and processing of Tea.
Characteristics and uses of timber yielding plants: Teak and Pinus.
Medicinal plants: *Cinchona*, *Rauwolfia* and *Adhatoda*.
Ethnobotany: Concept, Classification and interdisciplinary approaches

Marks: 15

Unit IV : Plant Anatomy:
Cell structures, cell wall and cell inclusion.
Organisation of apical meristem. Structure and distribution of simple and complex tissues. Primary and Secondary growth in plant
Anomalous growth in *Amaranthus*, *Mirabilis* and *Dracaena* stem

Marks: 15

Unit V : Embryology and Palynology:
 Plant embryology, Micro and mega sporogenesis, development of male and female gametophytes, fertilization, embryo and endosperm development.
 Palynology: Pollen and spore morphology. Aerobiology and pollen allergy. Marks: 15

BOT-202(P)/BOTANY PRACTICAL – II

Marks: 25

Gymnosperms and Palaeobotany:

1. Temporary stained preparation of the reproductive structures of Gymnosperms included in the theory.
2. Examination of the available specimens/slides of the fossil plants
3. Description and classification of a representative species from each of the angiosperm families mentioned in the theory.

Ranunculaceae: *Ranunculus*

Apiaceae: *Coriandrum*

Asteraceae: *Ageratum*, *Gynura* & *Spilanthes*

Solanaceae: *Solanum*

Lamiaceae: *Leucas/Ocimum*

Enphorbiaceae: *Castor*

Liliaceae: *Onion/Asparagus*

Poaceae: *Dactyloctenium/Cynodon*

Malvaceae: *Sida/Urena*

Identification of collected plants from the field

4. Collection and identification of three plants each from cereals, pulses, fiber yielding plants, medicinal plants available in Manipur.
5. To prepare a chart containing the starch contains from five important crop plants and protein contains from five pulses by using internets.
6. Preparation of temporary slides for the study of anomalous secondary growth in plants included in the theory paper.
7. Preparation of stained squashed of pollen motile cells, pollen grains and dissection of endosperm and embryo.
8. Field observation of local vegetation and submission of report is compulsory.

Recommended books

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| 1. Economic Botany | : A. F. Hill
Tata McGraw-Hill Publishing Co., New Delhi |
| 2. The Embryology of Angiosperms | : S.S. Bhojwani & S.P. Bhatnagar
Vikas Publishing House Pvt. Ltd., New Delhi |
| 3. Palynology | : M.R. Saxena
Oxford & IBH Publ. Co. Ltd., New Delhi |
| 4. Morphology of Gymnosperms | : J.M. Coulter & C.J. Chamberlain
Central Book Depot, Allahabad |
| 5. Taxonomy of Vascular Plants | : G.H.M. Lawrence
Oxford & IBH Publ., New Delhi |
| 6. A Handbook of Field and Herbarium Methods | : S.K. Jain & R.R. Rao
Today & Tomorrows Print. & Publ., New Delhi |
| 7. A Manual of Ethnobotany | : S.K. Jain
Scientific Publications, Jodhpur. |
| 8. Plant Anatomy | : K. Esau
John Wiley & Sons Inc., New York. |
| 9. An Introduction to Palaeobotany | : C.A. Arnold
Tata McGraw-Hill Co., New Delhi |

SEMESTER III

BOT-303/BOTANY – III (Plant Geography, Ecology, Plant Physiology & Molecular Biology)

Marks: 75

- Unit I : Plant Geography- Its scope and importance; phytogeographical regions of India; factors affecting distribution; plant dispersal, migration methods, endemism and barrier of distribution. Marks: 15
- Unit II : Principles of Ecology: Ecosystem concept, structure and function, ecological pyramids, energy flow and mineral cycling (CNP), food chain, food web and trophic levels, structure of plant community, ecological factors (abiotic and biotic factors), ecological adaptation of xerophytes, hydrophytes, ecological succession- hydrosere and xerosere. Marks: 15
- Unit III : Plant Physiology: Plant water relationship-diffusion, imbibitions, osmosis, water potential and its component; absorption and translocation of water; ascent of sap (theories); mineral nutrition; transpiration-significance, factors affecting transpiration, mechanism of stomatal movement; Translocation of solutes; Growth and development; concept of photoperiodism and vernalization; Photosynthesis: Photosynthetic pigment system, cyclic and non-cyclic photophosphorylation, C₃, C₄ and CAM pathways, factors affecting photosynthesis; respiration – aerobic, anaerobic, factors affecting respiration; biological Nitrogen fixation-symbiotic and non-symbiotic. Marks: 15
- Unit IV : Biochemistry: Chemical bonds, pH, buffer; structure, classification and function of biomolecules (carbohydrates, lipids, amino acids, proteins, nucleic acids and vitamins), enzyme-properties, nomenclature and classification as per ECIUB, mechanism of enzyme action, respiration-glycolysis, krebs cycle, electron transport system. Marks: 15
- Unit V : Molecular Biology: Gene organization of prokaryotes and Eukaryotes, structure and physical properties of DNA and RNA; biosynthesis of nucleic acids; DNA – replication; RNA translation, mechanisms of protein synthesis. Marks: 15

BOT-303(P)/ BOTANY PRACTICAL– III

Marks: 25

1. Preparation of map of phytogeographical regions of India
2. Determination of the minimum size of the quadrat by species area curve method
3. Determination of frequency of vegetation in a community by quadrat method.
4. Determination of osmotic potential of vacuolar sap by plasmolytic method using *Rhoeo/Tradescantia* leaf and onion peel.
5. Determination of rate of transpiration by Gangong's potometer
6. Extraction of chlorophyll pigments from leafy plants by paper chromatographic Technique.
7. Study of rate of photosynthesis under different light intensities.
8. Determination of RQ of plant materials having fats, protein.
9. Simple tests for carbohydrate, protein, fats and nucleic acids
10. Preparation of buffer-Phosphate and Tris acetate buffer
11. Isolation of DNA from plant seedlings
12. Field observation of local vegetation and submission of report is compulsory

Recommended Books

1. Basic Ecology : Odum, E.P.
Saunders, Philadelphia, USA
2. Concepts of Ecology (3rd Ed.) : Kormondy, E.
Prentice Hall of India, New Delhi

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| 3. Ecology, Environment and Resource Conservation | : Singh J.S., Singh S.P. and Gupta S.R.
Anamaya Publishers, New Delhi |
| 4. Fundamentals of Ecology | : Odum E.P.
Prentice Hall of India, New Delhi |
| 5. Plant Physiology | : Salisbury F.B. and Ross C.W.
Wassworth Publ. Co.,/CBS Publ. & Dist., Delhi |
| 6. Plant Physiology | : Bidwell R.G.S.
Macmillan Publication Co. New York. |
| 7. Plant Physiology | : Devlin RM & Francis H. Witham
Fourth Edn. CBS, New Delhi |
| 8. Outlines of Biochemistry | : Conn E.E., P.K. Stumft, G. Bruerning and R.H. Doi
John Willey & Co., New York |
| 9. Biochemistry | : Stryer L.
W.H. Freeman & Co., New York |
| 10. Principles of Biochemistry | : Lehninger A.I., Nelson D.L. & Cox M.M.
CBS Publ., Delhi |
| 11. Cell and Molecular Biology | : De Robertis EMF & EDP De Robertis
BI Waverly Pvt. Ltd. |
| 12. Molecular Biology of Cell | : Bruce Alberts et. al.
Garland Publications |

SEMESTER IV

BOT-404/BOTANY-VI (Cytogenetics, Biotechnology and Biometrics)

Marks 75

- Unit I : Cytology:**
General accounts of organisation and function of cell and its components: Cell wall; plasmalemma; endoplasmic reticulum; golgi apparatus; ribosomes; mitochondria, plastids and nucleus. Structure and function of chromosome. Mitosis and meiosis – their significance. Marks: 15
- Unit II : Genetics:**
Mendelism: Law of segregation and independent assortment; back cross and test cross; Gene interaction; Gene expression; Structure of gene; transfer of genetic information: transcription; translation. Protein synthesis; t-RNA. Linkage and Crossing over; mutation and mutagens; chromosome alterations – deletions, duplications, translocations, inversions; variation in chromosome number: aneuploidy, polyploidy. Extra-nuclear inheritance: Sex chromosome and sex determination in plants. Marks: 15
- Unit III : Plant Breeding:**
Principles of plant breeding: breeding behaviour, sexual, asexual, apomixis; polyembryony; breeding methods – conventional; methods of breeding in self and cross pollinated crops; heterosis. Marks: 15
- Unit IV : Biotechnology:**
Basic aspects of plant tissue culture; cellular totipotency; differentiation and morphogenesis; Genetic engineering in plant improvement; application of plant biotechnology in medicine, agriculture and human welfare. Marks: 15
- Unit V : Biometry:**
Scope and application; collection of data. Sample and sampling – theory and methods; mean, mode, median and standard deviation; probability; chi-square test and analysis. Marks: 15

BOT-404(P)/BOTANY PRACTICAL -IV

1. To study cell structure from Onion leaf peel, demonstration of staining and mounting methods
2. Comparative study of Cell structures in Onion cells, *Spirogyra*, Study of Cyclotels in *Tradescantia* staminal Cells.
3. Study of plastids to examine pigment distribution in plants (e.g. *Cassia* and *capsicum*)
4. Examination of electron micrographs of eukaryotic cells with special reference to organelle.
5. Examination of various stages of mitosis and meiosis using appropriate land material (e.g. Onion root tips, Onion flower buds, *Rheos*, *Tradescantia*).
6. Working out the law of inheritance using seed mixtures.
7. Callus induction, organogenesis and plant regeneration (rice mature embryo)
8. Protoplast isolation e.g. tobacco, proteins
9. Preparation of tissue culture media, sterilization and inoculation of plant material.
10. Analysis of data for mean, mode, median and standard deviation.

Recommended Book

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| 1. Molecular Biology of Cell | : Albers, G.B., Bray, D., Lewis, J., Raf, M., Roberts, K. & Naten, L.D. Garland Publ. Co., New York |
| 2. Molecular Cell Biology | : Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. & Darnel, J. W.H. Freeman & Co., New York |
| 3. Principles of Genetics | : Gardner E.J., Snustad, D.P. & Simmons S, M.J. John Wiley & Sons, USA |
| 4. Molecular Cell Biology | : Nofe, S.H. Wadsworth Publ. Co., California |
| 5. Plant Tissue Culture: Applications & Limitations | : Bhojwani S. S. Elsevier Science Publ., New York |
| 6. Breeding Field Crops | : Pachlmann, J.M. & Sleeper, D.R. Longman, London & New York |
| 7. Principles & Practice of Plant Breeding | : Sharma, J.R. Tata McGraw-Hill Publ. Co., New Delhi |
| 8. Ecology Work Book | : Misra, R. Oxford University Press, Calcutta |
| 9. Plant Microtechnique | : Johansen, D.A. McGraw-Hill Book Co., New York |
| 10. Chromosome Technique (Theory & Practice) | : Sharma, A. & Sharma, A. Butterworths, London. |

SEMESTER - V

BOT-505/BOTANY -V (Microbial Diversity, Plant Pathology and Embryophyta) Marks: 100

Unit I : Microbial Diversity – History of microbiology, five kingdom system of classification, Carl Woese's Three Domains of living organism (Archaeobacteria, Bacteria and Eukaryotes), microbial forms- viruses (including prions and viroids), archaeobacteria, bacteria, algae, fungi and protozoa – their characteristic features, microbiology of soil, air and water.

Marks : 20

- Unit II : Microbes and Human Welfare – Role of microbes in industry (alcohol, antibiotics, organic acids, enzymes, proteins, vitamins, biofuel), agricultural microbiology (biofertilizers and biopesticides), food microbiology (food spoilage and food preservation), medical microbiology (microbes as pathogenic organisms). Marks: 20
- Unit III : Plant Pathology – History of plant pathology, Koch's postulates of Host pathogen interrelation, classification of plant diseases on the basis of causal organisms and symptoms, studies on symptoms, disease cycles and control measures of the following diseases – damping-off of seedlings, late blight of potato, white rust of crucifers, powdery mildew of pea, blast of rice, stem rust of wheat, leaf blight of paddy, citrus canker and TMV. Marks: 20
- Unit IV : Plant Disease Management – Plant quarantine, seed certification, cultural practices, fungicides (classification on the basis of chemical nature and mode of action), biological control, breeding for resistant varieties, genetically modified plants (merits and demerits), concept of integrated pest disease management. Marks: 20
- Unit V : Bryology and Pteridology – Bryophytes as the first land plants, evolutionary trend, ecological and economic importance of bryophytes, brief account on the development of Bryology in India. Origin and evolution in pteridophytes, relationship of pteridophytes with bryophytes and gymnosperms, heterospory, seed habit and stellar evolution in pteridophytes, ecological and economic importance of pteridophytes. Marks: 20

Recommended Books

1. Plant Diseases : R.S. Singh
Oxford & IBH Publ. Co., New Delhi
2. Introduction to Principles of Plant Pathology : R.S. Singh
Oxford & IBH Publ. Co., New Delhi
3. Plant Pathology : R.S. Mehrotra
Tata McGraw-Hill Publ. Co., New Delhi
4. The Microbial World : R.Y. Stanier, J.L. Engrahan, M.L. Wheelis and P.R. Painter: Prentice-Hall of India, New Delhi
5. Text Book of Microbiology : R. Ananthanarayan & C.K.J. Paniker,
Orient Longman, Bombay
6. An Introduction to Embryophyta (Bryophyta) : N.S. Parihar
Kitab Mahal, Allahabad
7. An Introduction to Embryophyta (Pteridophyta) : N.S. Parihar
Kitab Mahal, Allahabad
8. Morphology of Pteridophyta : K.R. Spome
B.I. Publications, Bombay
9. Diseases of Crop Plants in India : G. Rangaswamy
Prentice Hall of India, New Delhi
10. Lab Manual of Microbiologist : G. Gunasekaran
New Age Publication

BOT-506/BOTANY-VI (Advanced Plant Taxonomy, Anatomy, Embryology and Palynology)

Marks: 100

- Unit I : Primitive seed plants and Palaeobotany:
Concept of Progymnosperms. Diversity among Gymnosperms and their distribution in Indian sub-continent. Origin and Evolution of Gymnosperms. Salient features and life cycle of *Ginkgo*, *Taxus* and *Ephedra*.
Fossil algae and fungi. Primitive land plants: *Rhynial*, *Lepidodendron*, *Calamites* and *Sphenophyllum*. Fossil Gymnosperm orders. Cycadofilicales, Bennettitales and

- Cordaitales. Fossil Angiosperm: *Palmoxylon*, *Enigmocarpon*, *Sahnianthus*
 Palaeobotany in the exploration of fossil fuels. Marks: 20
- Unit II : Advanced Plant Taxonomy
 Objective, Principles and Practices of Plant taxonomy. Methods and techniques of herbarium preparation. Development of chemotaxonomy, Cytotaxonomy and Numerical taxonomy. Biosystematics, Taxonomy on the web: Molecular Taxonomy: Application of DNA hybridization technique in plant Taxonomy; Importance of biochemical markers and DNA markers in taxonomic studies. Role of Botanical survey of India and Taxonomic Literatures. Classical system of Classification: Bentham and Hooker Taxonomic studies affinities and economic importance of the following families: Magnoliaceae, Asteraceae, Rutaceae, Anacardaceae, Myrtaceae, Cucurbitaceae, Dipterocarpaceae, Polygonaceae, Moraceae, Rubiaceae, Apocynaceae, Asclepeadaceae, Acanthaceae, Verbinaceae. Aracaceae, Scitamineae (Musaceae, Zingiberaceae, Cannaceae and Marantaceae) Orchidaceae and Cyperaceae. Marks: 20
- Unit III : Plant Resources – Management and Utilization
 Classification of economic plants, based on their uses. Cyanobacteria: *Spirulina*. Origin, cultivation and improvement of Maize, Mustard, Pea and Banana. History, cultivation and processing of Rubber. Characteristics and uses of timber yielding plants: *Dipterocarpus*, *Phoebe* and *Melanorrhoea*. Medicinal Plant: *Ephedra*, *Carthamus*, *Aloe vera* and *Vinca*. Pharmacognosy: Aims and objects, Collection and preparation of drugs. Importance of ethnobotany in genepool and germplasm conservation. Marks: 20
- Unit IV : Anatomy of Angiosperm:
 Apical meristem and histological theories of shoot and root apices. Vascularization: Primary shoots of monocotyledons and dicotyledons. Formation of internodes, branching pattern, monopodial and sympodial-growth. Root-stem transition, Cambium and its function; formation of secondary xylem, characteristics of growth ring, sapwood and heartwood. Secondary phloem, stomata and their types. Anomalous secondary growth in *Bauhinia*, *Bougainvillea* and *Nyctanthus*. Marks: 20
- Unit V : Plant Embryology and Palynology:
 Plant Embryology. Microsporangium and types of pollen tetrad. Megasporangium and types of megasporogenesis. Pollen-pistil interaction, compatibility and incompatibility, syngamy and triple fusion. Development, structure and function of endosperm. Types of haustoria, Embryogeny- types. Development of monocot and dicot embryos. Suspensor, synergid, polyembryony, apomixes and their role. Pollen production and dispersion in space and time. Role of pollen in taxonomy. Application of palaeopalynology, melisso-palynology and forensic palaeopalynology. Marks: 20

Recommended Books

1. Economic Botany : Albert F. Hill
Tata McGraw-Hill Publ. Co., New Delhi
2. The Embryology of Angiosperms : S.S. Bhojwani & S.P. Bhatnagar
Vikas Publ. House Pvt. Ltd., New Delhi
3. Palynology : M.R. Saxena
Oxford & IBH Publ. Co. Ltd., New Delhi
4. Morphology of Gymnosperms : J.M. Coulter & C.J. Chamberlain
Central Book Depot, Allahabad
5. Taxonomy of Vascular Plants : G.H.M. Lawrence
Oxford & IBH Publ. Co., New Delhi

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| 6. | A Handbook of Field and Herbarium Methods | : S.K. Jain & R.R. Rao
Today & Tomorrows Prin. & Publ., New Delhi |
| 7. | A Manual of Ethnobotany | : S.K. Jain
Scientific Publications, Jodhpur. |
| 8. | Plant Anatomy | : K. Esau
John Wiley & Sons Inc., New York. |
| 9. | An Introduction to Palaeobotany | : C.A. Arnold
Tata McGraw-Hill Book Co., New Delhi |
| 10. | The Morphology of Gymnosperms | : K.R. Sporne
B.I. Publications, Delhi |
| 11. | An Introduction to the Embryology of Angiosperms | : P. Maheshwari
Tata McGraw-Hill Publ. Co., New Delhi |
| 12. | The Morphology of Angiosperm | : K.R. Sporne
B.I. Publications, New Delhi |
| 13. | The Classification of flowering Plants Volumes I & II | : A.B. Rendle
Vikas Publ. House Pvt, Ltd., New Delhi |
| 14. | Plant Systematic: Theory and Practical | : Gurucharan Singh
Oxford & IBH Publ. Co., New Delhi |
| 15. | Plant Systematics: An Integrated Approach | : Gurucharan Singh
Sciences Publ. Inc., USA |

BOT-507(P)/BOTANY - VII PRACTICAL (Based on theory paper BOT-505 and BOT-506)

Marks: 100

1. Preparation of culture media for bacteria and fungi (nutrient agar and PDA).
2. Isolation of microorganisms (bacteria and fungi) from soil/water/air.
3. Pure culture maintenance of bacteria and fungi.
4. Staining of bacteria and fungi.
5. Microscopic study of *Bacillus*, *Coccus*, *Staphylococcus*, *Spirillum*, *Escherichia*, *Nostoc*, *Anabaena*, *Saccharomyces*, *Candida*, *Aspergillus*, *Trichoderma*.
6. Morphological and anatomical studies of different types of root nodules (pea, broad bean, *Mimosa*, *Sesbania*).
7. Demonstration of Koch's postulates.
8. Symptoms, causal organisms and microscopic studies of diseased plant specimens included in theory syllabus.
9. Demonstration of commercial fungicides and equipments for field application
10. Comparative studies of thallus and reproductive structures of *Riccia*, *Anthoceros* and *Polygonum*.
11. Comparative studies of morphological and anatomical structures of *Lycopodium*, *Selaginella* and *Marsilea* in relation to stellar evolution and heterospory.
12. Gymnosperm and palaeobotany:
Ginkgo and *Taxus* – Temporary mounts of transverse sections of young and mature stems, radial section and maturation secondary wood; transverse and vertical sections of needle; whole mounts of mature microspores, young and mature embryo.
Ephedra – T.S. of node and internode of stem, whole mount of epidermal peel, L.S. of Leaf, microspores and embryos; permanent preparation of anther and ovule.
13. Examination and classification of specimen/slides of the fossil plants as per syllabus.
14. Advance plant Taxonomy: Description and classification up to genus of a representative species from each of the angiosperm families mentioned in the theory.
Magnoliaceae: *Michelia*
Brassicaceae: *Brassica/Cardamine*
Rutaceae: *Citrus*
Fabaceae: *Crotalaria/Vigna/Cassia/Caesalpinia/Mimosa/Acacia*

Myrtaceae: *Callistemon/Eucalyptus*,
 Anacardaceae: *Mangifera*
 Cucurbitaceae: *Luffa*
 Rubiaceae: *Mussaenda*
 Apocynaceae: *Vinca*
 Asclepiadaceae: *Calotropis/Asclepias*
 Acanthaceae: *Justicia/Adhatoda*
 Verbinaceae: *Duranta/Lantana*
 Polygonaceae: *Polygonum*
 Orchidaceae: *Vanda/Dendrobium*
 Scitamineae: *Musa/Canna/Maranta/Zingiber*
 Arecaceae: *Phoenix*
 Cyperaceae: *Cyperus*

15. Utilization of plants and Ethnobotany: Collection and identification of five plants each used as a source of carbohydrate, Protein, wood, oil-seed, spice and condiment and drug. Preparation of charts containing the percentage of carbohydrate contain, protein contain, oil contain, from five different species each from internet data.
16. Anatomy: Preparation of permanent/semipermanent slides for the study of anomalous secondary growth in plants included in the theory paper (Double Staining).
17. Embryology and Palynology: Examination of cleared and dissected whole mount permanent preparation of various structures mentioned in theory paper. Preparation of stained slides of endosperm and embryo. To study the germination percentage of pollen grains. Preparation of pollen slides by acetolysis method. Description and illustration of six selected pollen/spore types.
18. Identification and preparation of field notes of 50 plant species in the field.
19. An external field study tour to nationally important botanical gardens/herbaria/sanctuaries/research laboratories, etc. and submission of the study report is compulsory.

SEMESTER VI

BOT-608/BOTANY – VIII (Ecology, Plant Physiology and Molecular Biology) Marks: 100

- Unit I : Vegetation and Natural resources: Detailed study of the vegetation and floristic regions of India-evergreen, deciduous, mangrove forest. Natural resources-forest resources, conservation, afforestation, social forestry, agro forestry-timber extraction, dams and their effects – Mineral resources-water resources-floods, drought, Energy resources-renewable and non-renewable resources. Marks: 20
- Unit II : Ecosystems and Pollution: Physical environment; biotic environment; biotic and a biotic interaction, concept of habitat and niche. Ecosystem-basic component of ecosystem. Energy flow in ecosystem, trophic levels, Environmental pollution-Major pollutants-air and water and solid, pollution-control measure; Climate change and Global warming-environmental revolution. Biodiversity- concept of biodiversity. Marks: 20
- Unit III : Plant physiology: Absorption of water, Absorption of mineral elements-roots as absorbing surfaces-passive and active absorption. Physiological role of micro and macro elements-their deficiency symptoms. Phases of Growth-growth curve, Plant hormones (Auxins, Gibberellins, Cytokinins, Ethylene, Abscissic acid)– physiological functions, senescences, photoperiodism, physiology of flowering-Photomorphogenesis: phytochromes, physiological role. Marks: 20
- Photosynthesis – Significance-light reactions, Calvin cycle, photorespiration, Laws of limiting factors, chemosynthesis-a brief account. Pentose Phosphate Pathway, Biological Nitrogen fixation-mechanism, elementary knowledge of *Nif*, *Nod*, *Hup*

Genes and leghaemoglobin Stress plant physiology (Principles and application).

Marks: 20

Unit IV : Biochemistry: Water as universal solvent, weak interactions in aqueous system, Principles of biophysical chemistry (pH, buffer; reaction kinetics, thermodynamics and colligative properties), Bioenergetics, Enzymes and enzyme Kinetics, enzyme regulation, Isozymes; Respiration-glycolysis, Kreb's cycle, Fermentation, Oxidative phosphorylation, ATP synthesis. Biosynthesis of Nucleic acids and Protein synthesis.

Marks 20

Unit V : Molecular Biology: Gene structures, expression and regulation: Gene organisation in prokaryote and eukaryotes, Operon concept; gene regulation in prokaryotes and eukaryote, positive and negative gene regulation; interrupted genes in eukaryotes; RNA splicing; mRNA stability.

Recombinant DNA technology; Restriction endonucleases prokaryotic and eukaryotic clone vectors; genomic and DNA libraries; various techniques of gene mapping and concept of DNA fingerprinting; polymerase chain reaction; DNA sequencing.

Nucleic Acid: Composition of nucleic Acids; DNA structure; A, B and Z forms of DNA; denaturation and renaturation of DNA; Chromatin structure; DNA replication and recombinations; DNA polymerases; different forms of RNA.

Marks: 20

Recommended books

1. Fundamentals of Ecology : Odum E.P.
Prentice Hall of India, New Delhi
2. Concepts of Ecology : Kormondy, E.
Prentice Hall of India, New Delhi
3. Environmental studies : Chary, S.N.
Mc. Millan India Ltd.
4. Applied Ecology : Newman, E.I.
Blackwell Scientific Publ., London
6. Plant Physiology : Ting I.P.
Addison Wesley Publ. Co., Phillippines
7. Plant Physiology : Taiz L. & Zeige E.
Sinauer Associates Inc., Massachusetts
8. Plant Biochemistry : Goodwin TW & Mercer E.I.
Pergamon Press, Oxford
9. Principles of Biochemistry : Lehninger A.K., Nelson D.K. & Cox MM
CBS publ. & Dist., New Delhi
10. Biochemistry : Lupert. Stryer
Freeman International Edn., USA
11. Fundamentals of Biochemistry : Jain J.L.
S. Chand & Co., New Delhi
12. Cell and Molecular Biology : De Robertis EMF & EDP De Pobertis
BI Waverly Pvt. Ltd.

BOT-609/BOTANY – IX (Cell Biology; Genetics; Plant breeding, Biotechnology and Computer Application)

Marks: 100

Unit I : Cell Biology:

The Cell: Historical back ground; Cell theory. Kingdom-wise cell size and cell structure; Comparative account of prokaryotic and eukaryotic cell; Characteristics of archaebacteria and mycoplasma.

Nucleus and ribosomes: Ultrastructure; nuclear envelope and nuclear pore complex, nuclear matrix and nucleoplasm; DNA and Histones; nucleosome and higher level of organisation; centromere and telomere. Ribosome structure; prokaryotic, eukaryotic, organelle ribosomes and their functional significance
Mitochondrion and chloroplast: origin, structure and biogenesis; Organelle membrane and organisation of macromolecular complexes; variation in size, shape and number; types of plastids; organelle nuclear interactions; organelle gene organisation.
Structure and function of Golgi Complex; endoplasmic reticulum; lysosomes; microbodies peroxysome and glyoxysomes; Cytoskeleton
Cell membrane: Origin, ultrastructure; Chemical constituents and models of cell membrane organisation; roles of various membrane proteins, lipids and carbohydrates; role of ion channels and pumps in cellular transport and signaling.
Marks: 20

Unit II : Genetics:
Mendels' experiments and principles of inheritance; Back Cross and test Cross; Gene interactions and modified dihybrid ratios- Complementary, Supplementary, epistatic and duplicate factors.
Multiple allelism: Multiple alleles in *Drosophila* (eye colour), man (blood groups), Plants (self-incompatibility)
Quantitative genetics: Quantitative traits and quantitative genetics; the multiple factor hypothesis.
Marks: 20

Unit III : Plant Breeding:
Types of plant reproduction: Vegetative, sexual and apomixis; their effect on generating and fixing genotypic variation.
Methods of plant improvement: Pure line and mass selection; hybridization in self-and cross, pollinated Crops; introduction and acclimatization Hybrid-vigour.
Mutation and Polyploidy as methods of Plant improvement.
Marks: 20

Unit IV : Biotechnology:
History, definition and scope; Cellular differentiation and totipotency; Organogenesis and embryogenesis; protoplast isolation and culture; Somatic hybridization; clonal propagation; Genetic engineering of plants; Vectors for gene delivery; selectable markers and reporter genes; methods of gene delivery; *Agrobacterium* – the natural genetic engineer; salient achievements in crop biotechnology (with suitable examples) and prospects.
Marks: 20

Unit V : Computer application and Bioinformatics
Computer organisation programming principles; programming language; Internet and its applications; communication tools – word processing, spread sheet and presentation of software; Concept of database, Applications of Computer in Biological Sciences; introduction to biostatistical analysis of data; Application software for Botany.
Bioinformatics – introduction and asses of bioinformatics tools.
Marks: 20

Recommended Books

1. Molecular Biology of Cell : Albers, G.B., Bray, D., Lewis, J., Raf, M., Roberts, K. & Naten, L.D.
Garland Publishing Co., New York
2. Molecular Cell Biology : Lodish, H., Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. & Darnel, J.
W.H. Freeman & Co., New York
3. Principles of Genetics : Gardner E.J., Snustad, D.P. & Simmons S.M.J.
John Wiley & Sons, USA

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| 1. Molecular Cell Biology | : Nolf, S. H.
Wadsworth Publ. Co., California |
| 5. Plant Tissue Culture: Applications & Limitations | : Bhojwani S.S.
Elsevier Science Publishing, New York |
| 6. Breeding Field Crops | : Pachlmann, J.M. & Sleeper, D.R.
Longman, London & New York |
| 7. Principles & Practice of Plant Breeding | : Sharma, J.R.
Tata McGraw-Hill Publ. Co., New Delhi |
| 8. Ecology Work Book | : Misra, R.
Oxford University Press, Calcutta |
| 9. Plant Microtechnique | : Johansen, D.A.
McGraw-Hill Co. Inc., New York |
| 10. Chromosome Technique (Theory & Practical) | : Sharma, A. & Sharma, A.
Butterworths, London |
| 11. Bioinformatics: Sequence and Structure Analysis | : David Mount |
| 12. Introduction to Bioinformatics | : Attwood, T.K. & Parry Smith, D.J.
Pearson Education Asia |
| 13. Bioinformatics in Biological Science and Medicine | : Rashidi, H.H. & Buchler, L.K.
CRC Press, London. |

BOT-610(P)/BOTANY - X PRACTICAL (Based on theory papers BOT-608 and BOT-609)

Marks: 100

1. Field observation of local vegetation
2. Study of structure of a plant community by random & belt transect methods
3. Determination of density and abundance of vegetation in a community by using minimum size of quadrat
4. Determination of physical characteristics of soil like pH, Temperature and moisture content
5. Water analysis (determination of chlorine, dissolved CO₂ and O₂ in water and measurement of pH)
6. Determination of dissolved oxygen and biochemical oxygen demand (BOD) in unpolluted and polluted water.
7. Determination of stomatal frequency using leaf epidermal peeling/impression
8. Separation of plant pigment by paper chromatography technique and chemical method
9. Isolation of chloroplast and demonstration of Hill's activity.
10. Estimation of starch in photosynthesizing leaves
11. Estimation of protein by Bradford method
12. Paper chromatography separation of amino acids
13. Measurement of pH of beet, carrot, potato, tuber, *Amaranthus* leaves and sap of water hyacinth.
14. Study of Cell structure from onion leaf peels; demonstration of staining and mounting methods
15. Comparative study of cell structure in Onion cells, *Hydrilla* and *Spirogyra*. Study of cyclosis in *Tradescantia* stamens/cells hairs.
16. Study of plastids to examine pigment distribution in plants (e.g. *Cassia*, *Lycopersicum*, *Capsicum*)
17. Examination of electron micrographs of eukaryotic cells with special reference to organelles
18. Study of various stage of mitosis and meiosis using appropriate plant material (e.g. root tips, flower buds of onion/pea/broad bean).
19. Determination of chromosome counts from dividing pollen mother cells, root tips and pollen grains.

20. Preparation of karyotypes from dividing root tip cells and pollen grains
21. Detection of abnormalities in chromosome pairing and disjunction caused by mutant genes and structural alterations of Chromosome.
22. Preparation of chromosome maps from 3-point test cross data.
23. Correlation of floral structure with pollination system (e.g. *Salvia*, *Sesamum*, *Pisum*, *Lathyrus*, *Triticum*, *Oriza*, *Ricinus*).
24. Field exploration for detection of male sterile plants and estimation of their pollen fertility in locally grown crop plants e.g. tomato, *lens* etc.
25. Estimation of pollen ovule ratios and its bearing on pollination system.
26. Emasculation and bagging of flowers of Brassicaceae, Poaceae, Papilionaceae, Malvaceae etc. pollinating them manually and estimating fruits and seed set.
27. Preparation of tissue culture media, sterilization and inoculation of plant materials
28. Demonstration of techniques of *in vitro* culture of various explants.
29. Isolation of plant protoplasts (e.g. tobacco, petunia) using enzymes available commercially and estimation of their yield
30. Isolation, purification of DNA from plant materials
31. Separation of DNA fragments through gel electrophoresis
32. Isolation of plasmids for *Bacillus/Pseudomonas*
33. Hybridization experiments – F_1 and available F_2 material analysis for specific character.
34. Determination of mean, standard deviation, using MS Excel/SPSS
35. Preparation of presentation of cell organelles, using MS powerpoint or similar packages
36. Retrieving the botanical articles from internet

MANIPUR UNIVERSITY
SYLLABUS
FOR UNTER GRADUATE COURSE : B.Sc. (General)
(Semester V & VI)

Subject : BOTANY

Semester	Paper No.	Title of the paper	Marks allotted Theory/Practical
V	BOT – 505(G) (ELECTIVE)	Botany – V (G) (Microbiology, Plant Pathology, Archegoniate, Taxonomy, Developmental Biology and Plant Resources	75
		I. Microbiology & Plant Pathology	15
		II. Archegoniate and Primitive seed plants	15
		III. Advanced Plant Taxonomy	15
		IV. Developmental Biology	15
		V. Plant Resources	15
	BOT – 505(P)	Practical	25
VI	BOT – 606 (G) (ELECTIVE)	Botany – VI (G) (Plant Physiology, Molecular Biology, Genetics, Plant Breeding, Ecology and Bioinformatics)	75
		I. Plant Physiology & Biochemistry	15
		II. Cell & Molecular Biology	15
		III. Genetics, Plant Breeding & Biotechnology	15
		IV. Ecology & Environment	15
		V. Computer Application & Bioinformatics	15
	BOT – 506(P)	Practical	25

MANIPUR UNIVERSITY
SYLLABUS
FOR UNDER GRADUATE COURSE : B.Sc. (General)
(Semester V & VI)

Subject : **BOTANY**

SEMESTER – V

BOT – 505(G) (ELECTIVE) / BOTANY – V

Marks : 75

(Microbiology, Plant Pathology, Archegoniate, Taxonomy, Developmental Biology and Plant Resources)

Unit-I Microbiology and Plant Pathology :

History of microbiology, Archaeobacteria, Bacteria, Eukaryotes, Microbiology of air, soil and water, Microbes in human welfare (industry, agriculture, medicine and food),

History of Plant Pathology, Koch's postulates, Studies on symptoms, disease cycle and disease management of white rust of crucifers, powdery mildew of pea, stem rust of wheat, citrus canker, rice blast. Concept of integrated disease management (IDP).

Marks : 15

Unit-II Archegoniate & Primitive seed plants :

Bryophytes as primitive land plants, evolution and economic importance of Bryophytes, Stellar evolution in Pteridophytes, heterospony, seed habits. Economic importance of Pteridophytes. Distribution of Gymnosperms in India. Salient features and life cycle of *Ginkgo* and *Ephedra*. Primitive land plants – *Rhynia*, *Lepidodendron*, *Sphenophyllum*. Fossil gymnosperms order – Cycadofilicals.

Marks : 15

Unit-III Advanced Plant Taxonomy

Aims and objectives of Plant taxonomy, methods and techniques of herbarium preparation, Concept of chemotaxonomy, numerical taxonomy, molecular taxonomy, Role of Botanical Survey of India and Botanical gardens. Taxonomic studies & economic importance of the families – Magnoliaceae, Myrtaceae, Rutaceae, Asteraceae, Apocynaceae, Acanthaceae, Musaceae, Zingiberaceae, Orchidaceae.

Marks : 15

Unit-IV Developmental Biology :

Apical meristems & theories of shoot and root apices, vascularization, primary shoots of monocotyledonous & dicotyledonous plants, Cambium and its function, formation of secondary xylem (wood), sapwood and heart wood. Developmental biology of male and female gametophytes, pollen pistil interaction, compability & incompatibility, syngamy & triple fusion, Delopment of monocot and dicot embryo, Application of palynology – role of taxonomy and melittopalynology.

Marks : 15

Unit-V Plant Resources :

Classification of economic plants based on their uses. Origin, cultivation & improvement of maize, mustard, pea, timber yielding plants - *Dipterocarpus*, *Phoebe*, medicinal plants - *Aloe-vera* & *Vinca*, Cyanobacteria - *Spirulina* as single cell protein. Importance of ethnobotany in gene pool & germplasm conservation, Forest resources and their conservation, Agroforestry and social forestry.

Marks : 15

BOT – 505 (P) / BOTANY PRACTICAL-V (ELECTIVE)

1. Preparation of culture media for bacteria and fungi (nutrient agar media and PDA).
2. Isolation of microorganisms (bacteria and fungi) from soil / water / air.
3. Staining of bacteria and fungi.
4. Microscopic study of *Rhizobium*, *Bacillus*, *Nostoc*, *Anabaena*, *Candida*, *Aspergillus*, *Trichoderma*, *Saccharomyces*.
5. Symptoms, causal organisms and microscopic studies of diseased plant specimens included in theory syllabus.
6. Studies of fossil slides included in the theory syllabus.
7. Description and classification upto genus of a representative species from each of the angiospermic families mentioned in the theory
Rutnua : *Citrus*
Magnoliaceae : *Michelia champaca*
Myrtaceae : *Callistamon*
Asteraceae : *Eclipta* / *Gynura*
Apocynaceae : *Vinca*
Acanthaceae : *Justicia* / *Adhatoda*
Musaceae : *Musa* / *Canna*
Zingiberaceae : *Zingiber*
Orchidaceae : *Dendrobium* / *Vanda*
8. Collection and identification of three plant species used as sources of carbohydrate, timber, drug and medicine.
9. Study of different types of ovary.
10. Study of four pollen types.

Recommended books :

1. Plant Diseases R.P. Singh, Oxford & IBH Pub. Co., New Delhi.
2. Introduction to Principles of - do -

- | | |
|--|--|
| 3. Plant Pathology | R.S. Mehrotra, Tata McGraw-Hill Pub. Co., New Delhi, |
| 4. Text Book of Microbiology | R. Ananthanarayanan & C.K.J. Paniker, Orient Longman, Bombay. |
| 5. An Introduction to Embryophyta (Bryophyta) | N.S. Prihar, Kitab Mahal, Allahabad. |
| 6. An Introduction to Embryophyta (Pteridophyta) | N.S. Prihar, Kitab Mahal, Allahabad. |
| 7. The Embryology of Angiosperms | S.S. Bhojwani & S.P. Bhatnagar, Vikas Pub. House Pvt. Ltd., New Delhi. |
| 8. Taxonomy of Vascular Plants | G.H.M. Lawrence, Oxford & IBH Pub. Co., New Delhi. |
| 9. A Manual of Ethnobotany | S.K. Jain, Scientific Pub., Jodhpur. |
| 10. Plant Anatomy | K. Easwari, John Wiley & Sons Inc., New York. |
| 11. An Introduction to Paleobotany | C.A. Arnold, Tata McGraw-Hill Book Co., New Delhi. |
| 12. Plant Systematic : An Integrated Approach | Gurucharan Singh, Sciences Pub., Inc., USA. |

SEMESTER-VI

BOT – 606(G) (ELECTIVE) / BOTANY – VI

(Plant Physiology, Molecular Biology, Genetics, Plant Breeding, Ecology and Bioinformatics)

Marks : 75

Unit-I Plant Physiology and Biochemistry :

Availability and importance of essential elements, physiological roles of essential elements & their deficiency symptoms. Growth, phytohormones (auxin, gibberellins & cytokines), Photosynthesis (Light and Dark reactions), Comparative Studies of C₃, C₄ & CAM cycles. Biological nitrogen fixation.

Water as universal solvent, weak interaction in aqueous system, basic thermodynamic concept (bioenergetics), Enzyme kinetics, Respiration, glycolysis, Krebs's cycle, Fermentation, Oxidative phosphorylation, ATP synthesis.

Marks : 15

Unit-II Cell Biology and Molecular biology :

The cell-historical background, cell theory, comparative account of eukaryotic and prokaryotic cells. Mitochondrion & chloroplast-ultrastructure, origin and function. Nucleus, ribosome and chromosome- ultrastructure and function.

**B.SC. (HONS.) GEOLOGY SYLLABUS
MANIPUR UNIVERSITY**

B.SC. (Hons) GEOLOGY SYLLABUS, SEMESTER SYSTEM

The B.Sc. (Hons.) Geology shall be imparted to the students for three academic sessions consisting of six semesters. Candidates will be examined and evaluated on grade point basis at the end of each semester in the different courses of theory and practical as per marks/credits given against each course. The B.Sc. (Hons.) Geology will consist of (a) Core Courses and (b) Geological Field Work.

- a) The core courses will be compulsory for all the students. There will be eleven theories and six practical papers in the core courses. Papers carrying 100 marks will be of 4 credits, 75 marks 3 credits and 25 marks 1 credit covering major branches of Geology. There will be total 1000 marks distributed in 40 credits.
- b) Geological field work will be compulsory at the end of I, III, IV, and VI semesters. The students who fail to attend the geological field works, their results will be withheld. The geological field work will be conducted inside or outside the state depending upon the purpose. The semester breaks can also be utilized for

The scheme of papers shall be as follows:

FIRST SEMESTER

THEORY

Paper Code	Title	Marks
GL-101 (Theory)	General Geology, Structural Geology & Geomorphology	75
	General Geology	25
	Structural Geology	25
	Geomorphology	25

PRACTICAL:

Geomorphology Structural Geology & Field Work	25
Geomorphology	8
Structural Geology	10
Field Work (for 3 days)	4
Viva Voce	3

SECOND SEMESTER

THEORY

Paper Code	Title	Marks
GL-202 (Theory)	Descriptive & Optical Mineralogy, Crystallography and Geochemistry	75
	Descriptive Mineralogy	8
	Optical Mineralogy	8
	Crystallography	6
	Viva voce	3

THIRD SEMESTER

THEORY

Paper Code	Title	Marks
GL-303 (Theory)	Petrology	75
	Igneous Petrology	25
	Metamorphic Petrology	25
	Sedimentary Petrology	25

PRACTICAL

	Petrology and Field Work	25
	Igneous Petrology	6
	Metamorphic Petrology	6
	Sedimentary Petrology	6
	Field Work (for 3 days)	4
	Viva voce	3

FOURTH SEMESTER

THEORY

Paper Code	Title	Marks
GL-404 (Theory)	Palaeontology and Stratigraphy	75
	Palaeontology	35
	Stratigraphy	40
<u>PRACTICAL</u>		
	Palaeontology, Stratigraphy and Field Work	25
	Palaeontology	12
	Stratigraphy	6
	Field Work (for 3 days)	4
	Viva voce	3

FIFTH SEMESTER

THEORY

Paper Code	Title	Marks
GL-(H) 505 (Theory)	Structural Geology, Tectonics and Petrology	100
	Structural Geology and Tectonics	25
	Igneous Petrology	25
	Sedimentary Petrology	25
	Metamorphic Petrology	25
GL-(H) 506 (Theory)	Economic and Fuel Geology, Mineral Economics and Mining Geology	100
	Economic Geology	30
	Mineral Economics	20
	Fuel Geology	30
	Mining Geology	20
<u>PRACTICAL</u>		
GL-(H) 507 (Practical)	Structural and Economic Geology, Petrology and Field Work	100
	Structural Geology	25
	Petrology	30
	Economic Geology	15
	Field Survey	10
	Field Work (to visit mines etc. for 1 week)	15
	Viva voce	5

SIXTH SEMESTER

THEORY

Paper Code	Title	Marks
GL-(H) 608	Geophysics, Engineering Geology and Hydrogeology	100
	Geophysics	30
	Engineering Geology	40
	Hydrogeology	30
GL-(H) 609	Environment & Quaternary Geology, Photogeology, Remote Sensing and Computer Application	100
	Environmental Geology	25
	Quaternary Geology	25
	Photogeology, Remote Sensing	25
	Computer Application	25

PRACTICAL

GL-(H) 610	Geophysics, Hydrogeology, Photogeology, Remote Sensing, GIS, Seminar and Field Work	100
(Practical)		
	Geophysics	20
	Hydrogeology	25
	Photogeology, Remote Sensing, GIS	25
	Seminar	15
	Field Work (for 3 days)	10
	Viva voce	5

SEMESTER-I

GL-101: GENERAL GEOLOGY, STRUCTURAL GEOLOGY AND GEOMORPHOLOGY

75

Unit-1 General Geology

25

Introduction to Geology, scope, sub-disciplines and relationship with other branches of science. Earth in the solar system, its origin, size, shape, mass and density, Internal constitutions of the Earth. Convections in the Earth's core and production of magnetic field; Composition of Earth in comparison to other bodies in the solar system; Origin of hydrosphere and atmosphere, biosphere; Origin of oceans, continents and mountains; Age of the earth; Radioactivity and its application in determining the age of the earth; Earthquakes - causes, geological effects and their measurement, distribution of earthquake belts; Volcanoes - types, causes and geological effects, distribution of volcanic belts; Relationship of earthquakes with volcanic belts; Weathering erosion; Soil - formation, profile and types; Geological time scale; Major events in the earth's history.

Unit-2 Structural Geology

25

Introduction, scope and objectives of structural geology. Primary (non-diastrophic) structures of sedimentary and igneous rocks and their uses. Concept of dip and strike, contour and stratum contour maps. Concept of lamination, stratification and bedding. Different types of bedding. Overlap and offlap. Topography and its representation; Outcrop, effects of topography on outcrop. Folds- definition and description Concept of pitch and plunge. Classification of folds with special reference to morphological/geometric/genetic classification. Faults - definition and description; types and classification of faults. Joints - definition, description, classification, genesis and uses. Unconformity - definition, types, recognition and utilities. Offlap and Overlap; Outlier and inlier.

Unit-3 Geomorphology

25

Basic concepts of geomorphology. Exogenic and endogenic geomorphic processes; Evolution of landscape; A detailed account of the geological work of natural agencies – groundwater and springs, rivers, glaciers, lakes, oceans and wind, and landforms associated with them. Geomorphic cycles, soil and soil forming processes. Geomorphic sub-divisions of India and their salient features. Origin and classification of mountains; Concept and theories of isostasy; continental drift theory, sea floor spreading and brief idea about plate tectonics and distribution of plates; various structures associated with different plate boundaries. Origin and significance of mid oceanic ridges, trenches and island arc; expanding and contracting earth. Mitigation of environment hazards – earthquakes, landslides, floods.

PRACTICALS

25

Geomorphology

8

Study of important geomorphological models. Identification and interpretation of geomorphic features from the topographical map. Identification of different drainage patterns. Reading topographical maps of the Survey India. Concept of contour, scale and other topographic features. Preparation of slope maps. Preparation of longitudinal and cross-valley and superimposed profiles. Recognition of regional erosion surfaces.

Structural Geology

10

Study of clinometer and Brunton compass. Concept of stratum/structural contour maps. Completion of geological outcrop maps. Study and interpretation of geological maps-geological cross-section containing folds, faults, unconformities, dykes and sills. Determination of heave and throw of faults.

Field Work

4

Pertaining to study on primary sedimentary structures, secondary structures like folds, faults, unconformity, joints, etc. Measurement of strikes direction, dip direction and amount of dip of planar rock surfaces.

Viva voce

3

Books Recommended

- Billings, M.P. (1972): Structural Geology, Prentice Hall.
- Bhatta, B., (2008). Remote Sensing and GIS. Oxford, New Delhi.
- Bloom, A.L. (1998). Geomorphology: A systematic Analysis of Late Cenozoic Landforms (3rd Edition), Pearson Education, Inc.
- Davis, GR. (1984). Structural Geology of Rocks and Region, Ohn Wiley
- Dennis, J. G. (1972): Structural Geology, Ronald Press Company, New York.
- Ghosh, SK. (1993). Structural geology: fundamentals and modern developments. Pergamon Press, London
- Gupta, R.P. (2003). Remote Sensing Geology. 2nd Ed., Springer-Verlag, Heidelberg, Germany.
- Hills, E.S. (1963) Elements of Structural Geology, Farrold and Sons, London.
- Holmes, Arthur (1992): Principles of Physical Geology, Vol. 1, Chapman and Hall, London.
- Kale, VS. and Gupta, A. (2001). Introduction to Geomorphology. Orient Longman Ltd.
- Leet, L.D. and Judson, S. (1969): Physical Geology, Prentice Hall.
- Ramsay, J.G. and Huber, M.I. (2000): Techniques of Modern Structural Geology, Vol. III, Academic Press.
- Ritter, Dale F. (1986): Processes of Geomorphology. Wm C. Brown Publ.
- Singh, S (2001): Geomorphology, Prayag Pustak Bhandar, Allahabad
- Ruhe, R. V. (1975): Geomorphology, Houghton Mifflin Co., Boston
- Singh, R. P. (1995): Structural Geology, A Practical Approach, Ganga Kaveri Publ., Varanasi.
- Sparks (1960): Geomorphology, Longmans, London

SEMESTER-II

GL-202: DESCRIPTIVE MINERALOGY, OPTICAL MINERALOGY CRYSTALLOGRAPHY AND GEOCHEMISTRY

75

Unit-I Descriptive Mineralogy

25

Minerals, definition and classification: Common physical properties of minerals. Classification of Minerals and silicates. Mode of occurrence and genesis. Study of physical, chemical and optical properties of the following minerals (group/species)-silica, feldspars, feldspathoids, micas, amphiboles, pyroxenes, olivine, garnet, beryl, topaz, tourmaline, zircon, apatite, fluorite, calcite, dolomite, gypsum, zeolite, corundum, spinel, etc.

Unit-2 Optical Mineralogy

25

Nature of light wave: wave surface in isotropic and anisotropic minerals. electro-Magnetic spectrum, simple harmonic motion. Reflection, refraction, total internal reflection. Becke's effect. Double refraction, Nicol prism, Petrographic microscope and its handling. Polarization of light - ordinary and polarized lights. Absorption, dispersion, pleochroism. quartz-wedge, Mica plate and gypsum plate compensation. Optical properties of some common rock forming minerals (quartz, orthoclase, microcline, plagioclase, garnet, biotite, muscovite, augite, hypersthene, hornblende, olivine and calcite). Uniaxial and biaxial interference figures.

Unit-3 Crystallography & Geochemistry

25

Crystallography

15

Definition of a crystal. Crystalline and non-crystalline forms and their formation. Crystal growth theory. Bravais (Space) lattices and internal structure of the crystals. External forms and symmetry. Crystallographic axes, axial ratio, crystal indices/ parameters, Miller Indices. Crystal forms and crystal habit. Zoned crystals and twinned crystals. Laws of twinning. Composite crystals. The seven crystal systems and study of 32 classes.

Geochemistry

10

Definition and scope of the subject, composition of earth and cosmos, periodic table, crystal bonding. co-ordination principle, radius ratio, polymorphism, pseudomorphism, solid solution and isomorphism, geo-chemical classification of elements. chemical and mineralogical phase rule.

PRACTICALS

25

Descriptive Mineralogy

8

Study of physical properties and identification of minerals in hand specimen. Determination of specific gravity of common minerals.

Optical Mineralogy

8

Use of polarizing microscope. Study of optical properties of important rock forming minerals

Crystallography

6

Study of elements of symmetry of representative crystals from each system. Determination of interfacial angles.

Viva voce

3

Books Recommended

Berry, L.G. Mason. B. and Dietrich. R. V. (1982): Mineralogy. CBS Publ.
Dana. E.S. and Ford. W.E. (2002): A textbook of Mineralogy (Reprints)
Deer. W. A. Howie. R. A. and Zussman. J: An introduction to the rock forming minerals. ELBS publication. 1962-1963.
Kerr. P. F. (1977): Optical Mineralogy. McGraw Hill.
Moorhouse. W.W. (1915): Optical Mineralogy, Harper and Row Publ.
Nesse. D. W. (1986): Optical Mineralogy, McGraw Hill.
Phillips. F.C (1971): Introduction to Crystallography, Longman Group Publ.
Read, H.H. (1968): Rutley's Element of Mineralogy (Rev. Ed.), Thomas Murby and Co.
Verma, P.K., Optical mineralogy, CRC press 2009

SEMESTER-III

GL-303: PETROLOGY

75

Unit-I Igneous Petrology

25

Introduction and scope of the subject. Forms, structures and textures of igneous rocks. Composition and constitution of Magma. Formation and classification of igneous rocks. Phase rule and its application to H₂O system. Crystallization of Uni-component and Bi-component magma system. Bowen's Reaction Principles. Magmatic differentiation and assimilation: Brief petrographic description and petrogenesis of common igneous rocks - granite, granodiorite, diorite, syenite, rhyolite, trachyte, gabbro, dolerite, basalt, pyroxenite and peridotite.

Unit-2 Sedimentary Petrology

25

Introduction and scope of the subject. Sedimentary processes: origin, transportation and deposition of sediments and brief study on environment of deposition. Lithification and diagenesis of sediments. Composition, texture and primary structures of sedimentary rocks. Classification of sedimentary rocks. Study on important clastic and non-clastic sedimentary rocks. Concept of shape, size, roundness and sphericity of sedimentary particles.

Unit-3 Metamorphic Petrology

25

Introduction and scope of the subject. Definition of Metamorphism, Agents and types of metamorphism. Concept of depth zone and grade of metamorphism. Classification of metamorphic rocks. Texture, structure and nomenclature of metamorphic rocks. Common metamorphic rocks and their protoliths such as slate, phyllite, schist, gneiss, hornfels, marble, quartzite with some important Indian type rock. Stress and anti-stress minerals. Thermal and regional metamorphism of argillaceous, calcareous sediments and basic and ultrabasic rocks.

Igneous Petrology

6

Study or petrological microscope. Megascopic and microscopic study or the following rock types: Granite, syenite, diorite, gabbro peridotite, rhyolite, trachyte, dolerite, basalt, dunite, serpentinite. etc.

Metamorphic Petrology

6

Megascopic and Microscopic study of the following rock types: Slate, phyllite. schists gneiss quartzite, Marble.

Sedimentary Petrology

6

Study of sedimentary structures from hand specimens, photographs and drawings. Megascopic and microscopic study of the following rock types: Sandstone, shale, siltstone, limestone, conglomerate and breccia.

Field Work

4

Pertaining to study on identification of different kinds of rocks in the field, collection of rock samples.

Viva voce

3

Books Recommended

Best, Myron G. (2002): Igneous and Metamorphic Petrology, Blackwell Science.

Blatt, H. and Tracy, R.J. (1996): Petrology (Igneous, Sedimentary, Metamorphic), W.H. Freeman and Co., New York

Bose M.K. 1997. Igneous Petrology. World Press

Bucher K. and Martin F. 2002. Petrogenesis of Metamorphic rocks. Springer-Verlag Publication

Ehlers, E.G. & Blatt, H (1982): Igneous, Sedimentary and Metamorphic Petrology, CBS Publ.

Huang: (1962): Petrology, McGraw Hill Book Co.

Lindholm, R.C., 1987, A practical approach to sedimentology, Allen and Unwin, London

Nockold, Knox and Chinner (1978): Petrology for students, Cambridge Univ. Press.

Pettijohn, F. J. 1975, Sedimentary Rocks, 3rd edn. CBS Publ. New Delhi.

Winkler, H. G.F. (1967): Petrogenesis of Metamorphic Rocks, Springer—Verlag

SEMESTER-IV

GL-404: PALEONTOLOGY AND STRATIGRAPHY

75

Unit-I Principles of Palaeontology & Stratigraphy

25

Definition, sub-divisions and scope of Palaeontology, its relationship with other sub-disciplines of geology; Fossils, definition, kinds (body and trace fossils); various modes of preservation of fossils - their collection, preparation and preservation. Index fossils and its significance. Principles of stratigraphy; modern stratigraphic classification. Geological time scale; Elements of stratigraphic classification; Rock units, time units and time rock units. Brief outline of the standard geologic column of the Indian Stratigraphic sequences. Indian stratigraphic code and nomenclature. Methods of collecting stratigraphic data; Identification of stratigraphic contact.

Unit-2 Palaeontology

25

A detailed study of the morphology and geological distribution of the following phylum/classes/orders - Brachiopoda, Mollusca (class - Pelecypoda and Gastropoda); Arthropoda (class —Trilobita). General Morphology, classification and significance of foraminifera. Concept of micro-palaeontology. A brief account of vertebrate life through ages. Vertebrate records of India and study Of the evolution of horse, man and elephants. Concept of palaeobotany. Classification of plant kingdom. Systematic position, description and stratigraphic significance of the following plant fossils -*Glossopteris*, *Gangamopteris*, *Ptylophyllum* *Vertebraria*, *Schizoneura*, *Stigmara*, and *Nilsson*. Morphology and palaeo-environmental significance of important trace fossils of *Skolithos*, *Cruziana* and *Nereites* ichnospecies. Application of palaeontology with special reference to sequence stratigraphy, correlation, palaeo-ecology and palaeo-biogeographic reconstructions.

Unit-3 Indian Stratigraphy

25

Connotation of the terms Archean, Dharwar, Cuddapah, Vindhyan. Gondwana. Study of the following supergroups of Indian Precambrian rocks with special reference to lithology, tectonics and economic significance - Dharwar of Karnataka, Cuddapah of Andhra Pradesh and Vindhyan of Son valley, Singhbhum, Assam plateau. Gondwana Supergroup and Tertiary of Manipur. Elements of facies concept in stratigraphy.

PRACTICALS

25

Paleontology

12

Study of morphological characters of about 30 genera pertaining to Trilobita, Graptoloidea. Echinoidea, Anthozoa, Bivalves, Gastropods, Cephalopods, Brachiopods, Mega foraminifers. Morphological study and identification of the following plant fossils — *Glossopteris*, *Gangamopteris*; *Vertebraria*, *Nilsson*, etc.; and trace fossils — *Skolithos verticalis*, *Thalassinoides paradoxicus*, *Ophiomorpha nodosa*, etc.

Stratigraphy

5

Preparation of lithostratigraphic maps of India showing distribution of the following- Dharwar Supergroup, Cuddapah Supergroup, Vindhyan Supergroup, Gondwana, Tertiaries. Sequence stratigraphic interpretation of measured lithocolumn of selected sections in Manipur.

Field Work	5
Pertaining to study on collection and identification of fossils; preparing lithocolumn for sequence stratigraphic interpretations.	
Viva voce	3

Books Recommended

Black, R.M. (1988): The Elements of Palaeontology, Cambridge Univ.
 Boggs, S. (2001): Principles of Sedimentology and Stratigraphy, Prentice Hall.
 Clarkson, E.N.K. (1986): Invertebrate Palaeontology and Evolution, Allen and Unwin Publ.
 Dunbar, C.O. and Rodgers, J. (1957): Principles of Stratigraphy, John Wiley and Sons.
 Jain, P.C. and Anantharaman, M.S. (1983): Palaeontology: Evolution and Animal Distribution. Vishal Publ.
 Krishnan, M.S. (1968): Geology of India and Burma, Higgibothon, Madras.
 Kumar, R. (1985): Historical Geology and Stratigraphy of India, Wiley Eastern Ltd.
 Moore, R.C., Lalicker, C.G. and Fischer, A.G. (1997): Invertebrate Fossils. CBS Publ.
 Nield. E.W. and Tucker, V.C.T. (1985): Palaeontology: An Introduction. Pergmon Press.

SEMESTER - V

GL-(H) 505: STRUCTURAL GEOLOGY, TECTONICS AND PETROLOGY 100

Unit-I Structural Geology & Tectonics 25

Minor structures associated with folds and recognition of folds in the field. Simple mechanics of folding. Rock deformation. Recognition of faults in the field. Simple mechanics of faulting. Minor structures associated with faults. Differentiation of faults and unconformities in the field. Association of joints with major structures. Genesis and utilization of cleavage/foliation. Basic concepts of stress and strain and their uses in structural geology. Effects of faulting on the outcrops; Geometric and genetic classification of joints; Foliation, descriptive terminology, origin and relation to major structures; Stereographic projection and its use in structural analysis.

Concept of tectonics/geo-tectonics. Brief studies on isostasy, geosynclines, continental drift theory. expanding and contracting earth, island arc, sea floor spreading, paleo-climate. Concept of plate tectonics and various structures associated with different plate boundaries. Brief idea about tectonic framework of the Himalayas and the Indo-Myanmar Ranges.

Unit-2 Igneous Petrology 25

Physical properties, genesis, evolution and types of magma, igneous cumulates, liquid immiscibility, pneumatolitic action, magmatic assimilation and mixing of magmas Concepts of rock series and rock association; Phase equilibrium in one (SiO₂), two (Di-An, Fo-Silica, Ab-An) and three (Di-Ab-An and Di-Fo-An) component silicate systems. Elements of thermodynamics in magmatic crystallization. IUGS mineralogical (QAPF) and chemical (total alkali-silica diagram) classification schemes; Common igneous textures; Detailed petrographic description of granite, granodiorite, diorite, syenite, phonolite, gabbro, norite, dolerite, basalt, andesite, dunite, pyroxenite, peridotite, komatite, trachyte, rhyolite and dacite.

Unit-3 Metamorphic Petrology

25

Phase rule and Goldschmidt's mineralogical phase rule; Chemical equilibrium in metamorphism. Principles of metamorphic reactions, metamorphic facies and metamorphic facies series; Graphical representation of mineral assemblages in ACE AKF, AFM diagrams; Prograde, retrograde and polymetamorphism. Metamorphic differentiation and concept of Metasomatism. Metamorphism and melting, origin of migmatites. Progressive metamorphism of (a) Pelitic rocks in $K_2O - FeO - MgO - Al_2O_3 - SiO_2$ system, (b) Basic rocks in $CaO - FeO - MgO - Al_2O_3 - SiO_2$ system, (c) Calcareous rocks in $CaO - MgO - SiO_2 - CO_2 - H_2O$ system, (d) Ultramafic rocks in $MgO - Al_2O_3 - SiO_2 - H_2O$ system.

Unit-4 Sedimentary Petrology

25

Processes or formation of sedimentary rocks. Classification of rudaceous, arenaceous, argillaceous and calcareous rocks. Sedimentary Structures and Paleocurrent analysis. Mineralogical characteristics, textures, and diagenesis of sedimentary rocks, Heavy minerals and provenance interpretations. Techniques of grain size analysis and graphical representations. Petrographic details of important siliciclastic and carbonate rocks such as - conglomerate, breccia, quartz-arenite, arkose, lithic arenite, quartzwacke, felspathicwacke, lithicwacke, mudrocks / shale, limestones, crystalline, micritic and sparitic.

**GL-(H) 506: ECONOMIC GEOLOGY, MINERAL ECONOMICS, FUELS
GEOLOGY, MINING AND EXPLORATION GEOLOGY**

100

Unit-I Economic Geology

25

Scope of the subject. Definition of ore, ore mineral and gangue. Tenor of ore. Classification of ore deposits. Mineralization and mineral deposits. Concept of syngenetic and epigenetic deposits. Forms and structures of mineral deposits. Brief idea about ore forming processes - magmatic, metasomatic, metamorphic, hydrothermal, placer, residual deposits and oxidation and supergene sulphide enrichment. Concepts of metallogenic epoch and province. Paragenesis, paragenetic sequence and zoning in metallic ore deposits.

Study of Indian deposits of the following ores and minerals with reference in their geology, mode of occurrence, distribution, uses of - magnetite, hematite, chromite, psilomalane, pyrolusite, chalcopryrite, galena, sphalerite, native gold, magnesite, bauxite, pyrite, diamond, muscovite, beryl, fluorite, gypsum, barite, halite, phosphorite, talc, kyanite, graphite, asbestos, monazite and corundum: Precious and Semi-precious minerals.

Unit-2 Mineral Economics

25

Study of important industrial minerals of India with particular reference to the industries cement, glass and ceramics, refractory, fertilizer and building stones, chemicals and gemstones. Significance of minerals in national economy. Demands, supply and substitute of minerals. Resources and reserves, their classification.

Unit-3 Fuel Geology

25

Fundamentals of coal petrology, origin of Coal. Stratigraphy of Coal Measures. Overview of Indian coal deposits. Origin of petroleum and natural gas, surface indicators of oil shows, migration of oil, petroleum reservoirs and various types of oil traps. Onshore and off-shore distribution of petroliferous basins in India. A brief study of atomic fuels.

Unit-4 Mining and Exploration Geology

25

Relationship between geology and mining. Different terms used in mining. Concept of Mining methods - surface mining and alluvial mining, mineral sand. open pit and open cast mining and underground mining. Fundamentals of geological, geochemical and geophysical techniques employed in exploration of mineral deposits.

GL-(H) 507(P) PRACTICALS**100****Structural Geology**

20

Exercises on structural geology problems: Graphic solutions of dip and strike problems. Three and four points problems of thickness determination. Stereographic projection of structural data. Plotting of fold limbs, faults, joints/fractures. Evaluation of pitch and plunge from stereographic map. Concept of α and β diagrams.

Igneous Petrology

10

Calculation of C.I.P.W. norm of oversaturated rocks. Calculation of Niggli value of rocks.

Metamorphic Petrology

10

Megascopic and microscopic study of metamorphic rocks - slate, phyllite, schist. gneiss, marble, quartzite, charnockite, hornfels, khondalite.

Sedimentary Petrology

10

Grain size analysis and preparation of histogram, frequency curves on the basis of grain size data. Presentation of palaeocurrent data. Examination of some common heavy minerals in grain mounts.

Economic Geology

20

Study of ore and economic minerals in hand specimens as detailed in the theory syllabus; Preparation of maps showing distribution of important metallic and non-metallic deposits and important coal and oil fields of India.

Surveying

10

Using Plane Table, Prismatic Compass and Dumpy Level.

Field Work

15

Visit to mine

Viva voce

5

Books Recommended

- Arogyaswami, R.P.N. 1996 Courses in Mining Geology. 4th Ed. Oxford-IBH.
- Billings, M.P. (1972): Structural Geology, Bjorlykke, Sedimentary and Petroleum Geology.
- Brown, C. and Dey, A.K. (1955): Indian Mineral Wealth, Oxford Univ.
- Clark, G.B. 1967. Elements of Mining. 3rd Ed. John Wiley & Sons
- Ghosh, S.K. (1993): Structural Geology, Pergamon Press, New York.
- Gokhale, K.V.G.K. and Rao, T.C. (1983): Ore Deposits of India, East West Press Pvt. Ltd.
- Jensen, M.L., Bateman, Bateman, and A.M. (1981): Economic Mineral Deposits, John Wiley and Sons.
- Krishnaswamy, S. (1979): India's Minerals Resources, Oxford and IBM Publ.
- Leet, L.D. and Judson, S. (1969): Physical Geology, Prentice Hall.
- Mallory, B.F and Cargo, D.N. (1979): Physical Geology, McGraw Hill.
- Monrow, James S. (1986): Physical Geology: Exploring the Earth, Booke Cole, Australia.
- McKinstry, I-I.E. 1962. Mining Geology (2nd Ed.) Asia Publishing House.
- Mookherjee, A. (2000): Ore Genesis-A Holistic Approach, Allied Publisher.
- Ranisay, J.G. and Huber, M.I. (2000): Techniques of Modern Structural Geology, Vol. III. Academic Press.
- Sharma. N.L. and Ram, K.V.S. (1972): Introduction to India's Economic Minerals, Dhanbad Publ.
- Sitter, L. U. De (1959): Structural Geology, Mc Graw Hill Publ.

SEMESTER-VI

GL-(H) 608: GEOPHYSICS, ENGINEERING GEOLOGY AND HYDROGEOLOGY 100

Unit-I Geophysics

25

Interrelationship between geology and geophysics. Role of geological and geophysical data in explaining geodynamical features of the earth. General and Exploration Geophysics- Different types of Geophysical methods like: Gravity, Magnetic, Electrical and Seismic, their principles and applications. Physical properties of rocks and minerals giving anomalies leading to the idea of geophysical properties. Application of geophysical methods in oil, gas, minerals and groundwater explorations.

Unit-2 Engineering Geology

25

Geology vs Engineering. Role of Engineering geologists in planning, design and construction of major man-made structural features. Elementary concepts of rock mechanics and rock engineering. Soil mechanics. Site investigation, characterization and problems related to civil engineering projects: foundation treatment, geological and geotechnical investigations for dams, reservoirs and spillways, tunnels, underground caverns, bridges, highways, shorelines.

Unit-3 Engineering Geology

25

Environmental considerations related to civil engineering projects. Construction materials. Geological hazards (landslides and earthquakes) their significance, causes and preventive/remedial measures. Slope stability studies and Earth-quake Zonation and aseismic design of structures. Recent trends in geotechnical engineering. Case histories studies with Indian examples.

Unit-4 Hydrogeology

25

Definition of hydrogeology, geohydrology and hydrology; Hydrological cycle and groundwater in the hydrological cycle; Hydrological parameters - Precipitation, evaporation, transpiration and infiltration: Origin and age of groundwater; Vertical distribution of groundwater; Types of aquifers: Water bearing properties of rocks - Porosity and Permeability; springs and their formations; Darcy's law and its validity; Dissolved constituent of groundwater; Salinization of groundwater. Groundwater provinces of India.

GL-(H) 609: ENVIRONMENTAL GEOLOGY, QUATERNARY GEOLOGY, PHOTO GEOLOGY, REMOTE SENSING AND COMPUTER 100

Unit-I Environmental Geology

25

Fundamental concept of Environmental Geology. Environmental hazards caused by earth processes viz., River, Landslide, Volcanoes, Cyclone. Pollution - sediments, ground water, solid waste disposal, radioactive waste, water management. Mineral resources and environment. Environmental impact of mineral development, recycling of resources, land-use planning in relation to engineering projects.

Unit-2 Quaternary Geology

25

Definition of Quaternary, the Character of Quaternary. duration of the Quaternary and development of Quaternary studies. Quaternary stratigraphy- Oxygen isotope stratigraphy, biostratigraphy and magnetostratigraphy. Response of geomorphic, neotectonics, active tectonics and their application to natural hazard assessment. Quaternary dating methods: Radiocarbon, Uranium series Luminescence, Amino Acid, Relative dating methods. Application of pollen, spores and phytoliths in Quaternary stratigraphy.

Unit-3 Photogeology & Remote Sensing

25

Types and acquisition of aerial photograph. Scale and resolution. Black and white, colour and infrared film. Photomosaics. Principles of stereoscopy, lens and mirror stereoscopes, image parallax, relief displacement, vertical exaggeration, distortion. Elements of airphoto interpretation. Identification of sedimentary, igneous and metamorphic rocks. Aeolian, glacial, fluvial and marine landforms. Physical principles of remote sensing. Early history of space imaging. Earth Resources Satellites: Characteristics and applications of imageries of LANDSAT 1 to 7, SPOT missions, Indian Remote Sensing Satellite mission. Basic idea of Radar

Unit-4 Computer Application

25

Fundamentals of computer operating systems: MS Office (Microsoft Office Word, Microsoft Office Excel, Microsoft Office Power Point etc.). Application of computer softwares in geological sciences GeoOrient, ROCKPACK III and Software Norm Calculations. Use of MapInfo 8 and ArcGIS 9.2 for preparation of geological maps and lithologs.

GL-(II) 610 (P): PRACTICALS

100

Geophysics

20

Preparation and interpretation of gravity, magnetic and electrical anomaly profiles and contour maps.

Hydrogeology

20

Preparation and interpretation of water table maps. Plotting of groundwater provinces of India on a map of India.

Photogeology, Remote Sensing and GIS

30

Study of aerial photo-pairs using lens and mirror stereoscopes delineating geomorphic features (aeolian, fluvial, glacial and coastal), rock types (igneous, sedimentary and metamorphic and unconsolidated sediments) and structural features (fold, faults, joints, caverns, lineaments). Recognition of various topographic features from satellite imageries. Calculation of scale from aerial photographs. Preparation of geological drainage maps from photographs.

Field Work

15

Pertaining to observation of Quaternary deposits, river terraces, neotectonics and active tectonic evidences.

Seminar

10

Viva voce

5

Books Recommended

- Arogyaswami, R.P.N., 1996: Courses in Mining Geology. 4th Ed. Oxford-IBH.
- Brown, C. and Dey, A.K., 1955: Indian Mineral Wealth, Oxford Univ.
- Clark, G.B., 1967: Elements of Mining. 3rd Ed. John Wiley & Sons.
- Evans, A.M., 1993: Ore Geology and Industrial Minerals. Blackwell.
- Gokhale, K.V.G.K. and Rao, T.C., 1983: Ore Deposits of India, East West Press Pvt. Ltd.
- Jensen, M.L., Bateman, and A.M., 1981: Economic Mineral Deposits, John Wiley and Sons.
- Krishnaswamy, S., 1979: India's Minerals Resources, Oxford and IBH Publ.
- McKinstry, H.E., 1962: Mining Geology (2nd Ed.) Asia Publishing House.
- Mookherjee, A., 2000: Ore Genesis-A Holistic Approach, Allied Publisher.
- Sharma, N.L. and Ram, K.V.S., 1972: Introduction to India's Economic Minerals, Dhanbad Publ.
- Smirnov, V.I., 1978: Geology of Ore Deposits, MIR Publications, Moscow

Syllabus

BACHELOR OF SCIENCE in CHEMISTRY (HONS)

SEMESTER - I

CH -101

Section A : INORGANIC CHEMISTRY

25 marks; 30 Hours

Unit 1 Atomic Structure 6 Marks

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, quantum numbers, radial and angular wave functions, and probability distribution curves, shapes of s, p, d, orbitals, Aufbau and Pauli exclusion principles, Hund's multiplicity rule, Electronic configurations of the elements, effective nuclear charge.

Unit 2 Periodic Classification of Elements 6 Marks

Electronic configurations of the elements, atomic and ionic radii, ionization energy, electron affinity, and electronegativity – definition methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

Unit 3 Chemical Bonding 8 Marks

Covalent bond – Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion theory (VSEPR) to NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2 , Molecular orbital theory, homonuclear and heteronuclear diatomic molecules multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Unit 4 Theory of quantitative and qualitative analysis 5 Marks

Strength of acids and bases, pH, common ion effect, solubility of precipitates, solubility product.

Principles of oxidimetry and reductimetry, iodimetry and iodometry.

Gravimetric analysis – its principles, precipitation, coprecipitation, postprecipitation, theory of washing.

Error in quantitative analysis

SECTION - B : ORGANIC CHEMISTRY

25 Marks ; 30 Hours

Unit 1 Structure and Bonding

5 Marks

Hybridization (sp , sp^2 and sp^3) bond lengths and bond angles, bond energy, localized and delocalized chemical bond, van der Waals interactions, inclusion compounds, clathrates, charge transfer complexes, resonance, hyperconjugation, inductive and field effects, hydrogen bonding.

Unit 2 Mechanism of organic reactions

6 Marks

Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents- electrophiles and nucleophiles. Types of organic reactions. Energy considerations. Reactive intermediates - carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species.

Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetically controlled and thermodynamically controlled reactions and stereochemical studies).

Unit 3 Cycloalkanes

5 Marks

Nomenclature: monocyclic, bicyclic, tricyclic, cycloalkanes. Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds.

Unit 4 Alkenes Cycloalkenes, Dienes and Alkynes

9 Marks

Methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes.

Chemical reactions of alkenes - mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration - oxidation, oxymercuration - reduction, Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$ Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes.

Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions 1,2- and 1,4- additions, Diels - Alder reaction.

Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration - oxidation, metal - ammonia reductions, oxidation and polymerization.

Section C : PHYSICAL CHEMISTRY

25 Marks; 30 hours

Unit 1 Gaseous state - I *Jay* 6 Marks

Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path, including their temperature and pressure dependence. Barometric distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy.

Unit 2 Gaseous state - II *Muma* 6 Marks

Deviations from ideal gas behaviour, compressibility factor, Z , and its variation with pressure for different gases. Causes of deviation from ideal behavior, van der Waals equation of state, its derivation and application in explaining real gas behaviour, mention of other equations of state (Berthelot, Dieterici); Boyle temperature. Continuity of states, critical state, relation between critical constants and van der Waals constants, law of corresponding states.

Unit 3 Liquid state *Pencer* 5 Marks

Nature of liquid state, intermolecular forces, Qualitative treatment of the structure of the liquid state; physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Temperature variation of viscosity and surface tension of liquids.

Unit 4 Solid state *Jai* 8 Marks

Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method.

CH -101P: INORGANIC CHEMISTRY PRACTICAL

25 Marks; 45 Hours

I. Semimicro analysis (4 radicals)

Semimicro analyses of inorganic mixtures containing four radicals/ions from the following list: Silver, lead, mercury, bismuth, copper, cadmium, arsenic, manganese, cobalt, aluminium, iron, nickel, calcium, strontium, barium, magnesium, sodium, potassium, ammonium, chloride, bromide, iodide, fluoride, sulphate, sulphite, thiosulphate, chromate, phosphate, nitrate, nitrite, borate, arsenite, and arsenate.

II Quantitative analysis

Volumetric Estimation (one metal)

Iodometry, dichromatometry

SEMESTER- II

CH -202

Section A: INORGANIC CHEMISTRY

25 marks; 30 Hours

Unit 1 Acids and Bases

6 Marks

Arrhenius concept, Bronsted-Lowry theory, electronic theory, Lux- flood theory, solvent system theory, Lewis theory of acids and bases.

Unit 2 Oxidation and Reduction

6 Marks

Electronic concept of oxidation number, concept of oxidation-reduction, oxidation-reduction potentials, factors influencing redox potential.

Unit 3 Non-aqueous solvents

6 Marks

Classification of solvents (protic, aprotic, amphiprotic), qualities of ionizing solvents, study of reactions in liquid ammonia, liquid hydrogen fluoride and liquid sulphur dioxide.

Unit 4 Chemistry of s-block elements

7 Marks

Comparative studies, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems.

Section B : ORGANIC CHEMISTRY

25 Marks; 30 Hours

Unit 1 Stereochemistry of organic compounds

10 Marks

Concept of isomerism - elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo- and erythro- diastereomers, meso- compounds.

Relative and absolute configuration, sequence rules, D and L and R and S systems of nomenclature. Geometrical isomerism, E and Z system of nomenclature, geometrical isomerism in oximes and alicyclic compounds.

Conformational isomerism - conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of monosubstituted cyclohexane derivatives. Newman projection and Sawhorse formulae, Fischer and flying wedge formulae.

Difference between configuration and conformation.

Unit 2 Arenes and aromaticity

7 Marks

Structure of benzene : molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture.

Aromaticity : the Huckel rule, aromatic ions.

Aromatic electrophilic substitution - general pattern of the mechanism, role of σ - and π -complexes and energy profile diagram. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel - Crafts reaction. Activating and deactivating substituents, orientation and ortho/para ratio.

Unit 3 Alkyl halides and aryl halides

4 Marks

Mechanisms of nucleophilic substitution reactions of alkyl halides. S_N2 and S_N1 reactions with energy profile diagrams.

Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions.

Unit 4 Alcohols

4 Marks

Synthesis from carbonyl compounds, dihydric alcohols - nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HIO_4].

Trihydric alcohols- nomenclature, chemical reactions, nitration, reaction with $KHSO_4$.

Section C: PHYSICAL CHEMISTRY

25 Marks; 30 Hours

Unit 1 Solutions

6 Marks

Solutions and mixtures, miscible and immiscible liquids, types of solutions, Raoult's law and Henry's laws, ideal and nonideal solutions, deviations from ideal behavior, vapour pressure of liquids and liquid mixtures, separation of completely miscible binary liquid solutions by distillation, azeotropic mixtures, solubility of partially miscible liquids (phenol-water, TEA-water and nicotine-water systems), critical solution temperature, Nerst's distribution law and its limitations.

Unit 2 Dilute Solutions

6 Marks

Dilute solutions; Colligative properties - lowering of vapour pressure. Clapeyron - Clausius equation, Thermodynamic derivation using chemical potential to derive relations between the four colligative properties [(i) relative lowering of vapour pressure, (ii) elevation of boiling point, (iii) Depression of freezing point, (iv) osmotic pressure and amount of solute. Applications in calculating molar masses of normal, dissociated and associated solutes in solution.

6 Marks

Unit 3 Colloids and Surface Chemistry

Colloidal state and colloidal systems, characteristics of true solutions, colloidal solutions and suspensions. Classification, preparation and purification of colloidal solutions, properties of colloidal solutions: Tyndal effect, Brownian motion. Adsorption - Physisorption and chemisorption - Freundlich adsorption isotherm - Langmuir adsorption isotherm.

7 Marks

Unit 4 Thermodynamics-I

Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics. First law: Concept of heat, q , work, w , internal energy U and statement of first law; enthalpy, H , relation between heat capacities, calculations of q , w , U and H for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions. Joule-Thomson effect and relation between Joule-Thomson coefficient and other thermodynamic parameters; inversion temperature.

CH -202P

ORGANIC CHEMISTRY PRACTICAL

Marks 25; 45 Hours

1. Determination of melting point:

Naphthalene 80-82°C, Benzoic acid 121.5-122°C, Urea 133.5-135°C, Succinic acid 184.5-185°C, *trans*-Cinnamic acid 133.5-135°C, *cis*-Cinnamic acid 58°C, Salicylic acid 157.5-158°C, Acetanilide 113.5-114°C, *m*-Dinitrobenzene 90°C, *p*-Dichlorobenzene 52°C, Aspirin 135°C.

2. Determination of boiling point: Ethanol 78°C, Cyclohexane 81.4°C, Toluene 110.6°C, Benzene 80°C.

3. Mixed melting point determination: Urea-Cinnamic acid mixture using of various compositions (1:4, 1:1, 4:1).

4. Distillation: Simple distillation of ethanol-water mixture using water condenser. Distillation of nitrobenzene and aniline using air condenser.

5. Crystallisation: Concept of induction of crystallisation, Benzoic acid from water.

6. Decolourisation and crystallisation using charcoal: Decolourisation of brown sugar(sucrose) with animal charcoal using gravity filtration.

SEMESTER - III

CH -303

Section A: INORGANIC CHEMISTRY

25 marks; 30 Hours

Unit 1 Metallurgy

6 Marks

Minerals and ores, general principles of metallurgy, extraction of Li, K, Be, Sn, Sb, Bi, Cr and Mn.

Unit 2 Chemistry of p-block elements

6 Marks

Comparative studies, diagonal relationships, salient features of hydrides, oxides, oxyacids and halides, basic properties of halogens, interhalogens and polyhalogens. Applications of p-block elements (Si, Ge, Se)

jaw
Unit 3 General properties of d-block elements

6 Marks

Definition, position in periodic table, Characteristic properties of d-block elements, occurrence and abundance, variable oxidation states.

Unit 4 Coordination Chemistry

7 Marks

Werner's coordination theory and its experimental verification, types of ligands, nomenclature of coordination compounds (IUPAC), coordination number and stereochemistry of coordination compounds, isomerism of coordination compounds.

SECTION - B : ORGANIC CHEMISTRY

25 Marks; 30 Hours

Unit 1 Phenols *Reena*

5 Marks

Acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols - electrophilic aromatic substitution, acylation and carboxylation, Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben - Hoesch reaction and Reimer - Tiemann reaction.

Unit 2 Ethers and epoxides *Tij*

5 Marks

Ethers: Methods of their formation, physical properties. Chemical reactions - cleavage and autoxidation, Ziesel's method.

Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.

Unit 3 Aldehydes and ketones *SSS*

8 Marks

Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1, 3 - dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties.

Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations, Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction.

Oxidation of aldehydes, Baeyer - Villiger oxidation of ketones. Cannizzaro reaction, MPV reaction, Clemmensen reduction, Wolff - Kishner reduction, LiAlH_4 and NaBH_4 reductions. Halogenation of enolizable ketones.

An introduction to α , β -unsaturated aldehydes and ketones.

Unit 4 Organic compounds of nitrogen

7 Marks

Preparation of nitroalkanes and nitroarenes, Chemical reactions of nitroalkanes, Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media, Picric acid.

Structure and nomenclature of amines, physical properties, Stereochemistry of amines, Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction.

Section C : PHYSICAL CHEMISTRY

25 Marks; 30 Hours

Unit 1 Thermochemistry

6 Marks

Heats of reactions: standard states; enthalpy of formation of molecules, and ions and enthalpy of combustion and its applications; calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, effect of temperature (Kirchoff's equations)

Unit 2 Thermodynamics – II

6 Marks

Carnot cycle and its efficiency, concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics; Calculation of entropy change for reversible and irreversible processes. Free Energy Functions and Gibbs and Helmholtz equation.

Unit 3 Chemical equilibrium

7 Marks

Criteria of thermodynamic equilibrium, chemical equilibria in ideal gases, concept of fugacity. Thermodynamic derivation of relation between Gibbs free energy of reaction. Equilibrium constants and their quantitative dependence on temperature, pressure and concentration. Free energy of mixing and spontaneity; thermodynamic derivation of relations between the various equilibrium constants K_p , K_c and K_x . Le Chatelier principle.

Unit 4 Chemical Kinetics – I

6 Marks

Order and molecularity of a reaction, rate laws in terms of the advancement of a reaction, differential and integrated form of rate expressions up to second order reactions, Zero order reactions and examples - half life period with examples, effect of temperature on the rate of reactions - Arrhenius equation and concept of energy of activation. Experimental methods of the determination of rate laws.

CH-303P

PHYSICAL CHEMISTRY PRACTICAL

25 Marks; 45 Hours

1. Surface tension measurements (use of organic solvents excluded).

Determine the surface tension by (i) drop number (ii) drop weight method.

2. Viscosity measurement:

(a) Viscosity measurement of given liquids using Ostwald's viscometer (at room temperature)

(b) Study the effect of variation of viscosity of an aqueous solution with the concentration of solute.

3. pH measurements

a) Measurement of pH of different solutions using pH-meter.

b) Preparation of buffer solutions

(i) Sodium acetate-acetic acid

(ii) Ammonium chloride-ammonium hydroxide

Measurement of the pH of buffer solutions and comparison of the values with theoretical values.

c) pH metric titrations of

(i) strong acid and strong base

(ii) weak acid and strong base

Any other experiment carried out in the class.

SEMESTER - IV

CH -404

Section A: INORGANIC CHEMISTRY

25marks; 30 Hours

Jai
Unit 1 Chemistry of Lanthanides 6 Marks
Position of lanthanides in the periodic table, general properties of lanthanides, electronic structure, oxidation states, ionic radii and lanthanide contraction, consequences of lanthanide contraction, complex formation, uses of lanthanides and their compounds.

Sai
Unit 2 Chemistry of Actinides 6 Marks
Position of actinides in the periodic table, general properties of actinides, identification and nuclear synthesis of trans-uranium elements, separation of Np, Pu and Am from U, similarities between the later actinides and later lanthanides.

mu
Unit 3 Chemistry of noble gases 6 Marks
Position in the periodic table, principles of isolation, chemical properties, bonding and stereochemistry of xenon compounds, uses of noble gases.

mu
Unit 4 Hard and soft acids and bases 7 Marks
Classification of acids and bases as hard and soft, Pearson's concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

Section B: ORGANIC CHEMISTRY

25 Marks; 30 Hours

S. Sai
Unit 1 Carboxylic acids 6 Marks
Acidity of carboxylic acids, effects of substituents on acid strength. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation.
Hydroxy acids: malic, tartaric and citric acids.

Tyge
Unit 2 Carboxylic acid derivatives 6 Marks
Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.
Preparation of carboxylic acid derivatives, chemical reactions. Mechanisms of esterification and hydrolysis (acidic and basic).

Purna
Unit 3 Organometallic compounds 6 Marks
Organomagnesium compounds: the Grignard reagents - formation, structure and chemical reactions.
Organozinc compounds: formation and chemical reactions.
Organolithium compounds: formation and chemical reactions.

Unit 4 Polymers

7 Marks

Natural and synthetic, mechanism of polymerization, condensation and addition polymers, Synthetic plastics, thermosetting and thermoplastic. Urea-formaldehyde, phenol-formaldehyde plastics. Teflon, polystyrene and polyurethanes, natural and synthetic rubbers, synthetic fibres, acrylics, nylon-6 and nylon - 66 terylene, elementary of fibremaking, blended fibres.

Section C : PHYSICAL CHEMISTRY

25 Marks; 30 Hours

Unit 1 Catalysis *Suchi*

6 Marks

Types of catalyst, specificity and selectivity, mechanisms of catalyzed reactions at solid surfaces; effect of particle size and efficiency of the catalysts. Enzyme catalysis, Michaelis-Menten mechanism, acid-base catalysis. Theory of catalysis – adsorption and intermediate compound formation.

Unit 2 Ionic equilibria – I

7 Marks

Electrolytes and non-electrolytes, strong, moderate and weak electrolytes, ionization and ionization constant, factors affecting degree of ionization, ionic product of water. Calculation of pH of dilute solutions of weak acids and bases, common ion effect; dissociation constants of mono- and di-protic acids. Salt hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action and applications of buffers in analytical chemistry and biochemical processes in the human body.

Unit 3 Ionic equilibria – II *Muna*

6 Marks

Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. Qualitative treatment of acid – base titration curves. Theory of acid – base indicators; selection of indicators and their limitations.

Unit 4 Phase equilibria I *Arjuna*

6 Marks

Phases, components and degrees of freedom, Gibbs Phase Rule (no derivation) for non-reactive and reactive systems; - Application to one component systems – water, carbon dioxide and sulphur with applications.

CH- 404P ANALYTICAL CHEMISTRY PRACTICAL

25 marks; 45 Hours

1. To determine Hardness of water using EDTA
2. To estimate nickel using DMG
3. To estimate calcium content in chalk as calcium oxalate by permanganometry
4. To estimate reducing sugar by titration with standard Fehlings solution /Benidict's solution.
5. To determine the equivalent weight of the given acid sample by direct titration method with alkali
6. To determine the Saponification value of the given fat or oil sample.
7. To estimate protein in the given sample by Folin Lowry method/biuret method.
8. To estimate a reducing sugar by colorimetric method.
9. To determine the concentration of a given sample by using Lambert-Beer's law.
10. To determine the amount of iodine from a given sample (salt) by titration method.

SEMESTER - V

CH -505

INORGANIC CHEMISTRY

Total theory 140 + 6
67 marks; 90 Hours

Unit 1 Nuclear Chemistry and Radioactivity

7 Marks

Discovery of radioactivity, nature of radiations, separation of isotopes, binding energy, mass defect, half-life, group displacement law, artificial transmutation, artificial radioactivity. Nuclear binding energy and packing fraction. Thermonuclear reactions, radioactive tracer techniques and their applications.

Unit 2 Chemistry of compounds of non-transition elements

8 Marks

Comparative studies of s - and p - block elements. Preparation and properties of bleaching powder, Portland cement and borazole. Study of solid CO₂ and carbeneous fuel (solid, liquid and gaseous). Oxides and oxyacids of phosphorous, oxides and hydrides of halogens. Chemical reactivity of Chalcogens (halides , oxyacids and peroxyacids of sulphur).

Unit 3 Chemistry of second and third transition element series 11 Marks

General characteristics, comparative treatment with their 3d-analogues (ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry).

Vertical group and horizontal group relationship of 3d, 4d and 5d elements, oxides and halides of scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper and zinc groups. Role of transition elements in biology.

Unit 4 Alloy and intermetallic compounds 6 Marks

Effect of alloying, types of alloys, rules for the formation of alloys, intermetallic compounds.

Unit 5 UV-visible spectroscopy 9 Marks

Fundamental laws of photochemistry (Lambert-Beer's law), molar absorptivity, energy levels of electron transition of $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$, presentation of electronic spectra, application to characterization of groups like conjugated dienes, carbonyls and α , β -unsaturated carbonyl compounds, and inorganic compounds. Elementary ideas on instrumentation and sample handling.

Unit 6 Infrared Spectroscopy 9 Marks

Unit of frequency, wavelength and wavenumber, molecular vibrations – fundamental, overtone, combination tone, Fermi resonance, stretching and bending. Factors influencing vibrational frequencies (elementary treatment only), application to characterization of groups like C=N, C=O, C=C, COOR, N-H and CONH₂. Elementary ideas on instrumentation and sample handling.

Unit 7 Thermodynamic and kinetic aspects of metal complexes 5 Marks

A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.

Unit 8 Environmental Chemistry 12 Marks

Environmental segment, atmosphere, composition of atmosphere, atmospheric structure, reactions in atmosphere, oxidation of sulphur dioxide, photochemical smog, oxidation of organic compounds, radionuclides in environment.

Water pollution, nature of pollutants, treatment of water.

Toxic chemicals in environment, biochemical effects of mercury, cadmium, lead and pesticides, control and treatment of the above trace elements, solid waste pollution, treatment and disposal.

CHM: SE - 11506

F.M. = 47
P.M. = 17

CH - 506

ORGANIC CHEMISTRY

67 Marks; 90 Hours

Unit 1 Carbohydrates**11 Marks**

Classification and nomenclature, Monosaccharides, mechanism of osazone formation, constitution of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D(+)- glucose. Mechanism of mutarotation.

Structures of ribose and deoxyribose.

An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Unit 2 Amino acids, Peptides and Proteins**7 Marks**

Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α -amino acids.

Classification of proteins, Peptide structure determination, Classical Levels of protein structure. Protein denaturation/renaturation.

Unit 3 Nucleic acids**5 Marks**

Nucleic acids: Introduction. Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical structure of DNA.

Unit 4 Fats, Oils, detergents**6 Marks**

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value. Soaps, synthetic detergents, alkyl and aryl sulphonates.

Unit 5 Pericyclic reactions**9 Marks**

Definition and classification, electrocyclic reactions (thermal and photochemical) involving 4 and 6 π - electrons and corresponding cyclo reversion reaction, cycloaddition reactions, FMO approach, Diels-Alder Reaction, photochemical [2+ 2] reactions

Unit 6 Synthetic dyes**5 Marks**

Colour and constitution (electronic concept). Classification of dyes. Chemistry and synthesis of Methyl orange, Congo red, Malachite green, Crystal violet, Phenolphthalein, Fluorescein, Alizarin and Indigo.

Unit 7 Steroids**7 Marks**

Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and stereochemistry. Isolation, structure determination and synthesis of Cholesterol, Estrone. Biosynthesis of steroids.

R Unit 8 Terpenoids 5 Marks
Occurrence, isolation, classification of terpenes, chemical composition, general methods of determining structure - Isoprene rule, synthesis and structure of citral and limonene.

Answer Unit 9 Alkaloids 6 Marks
Definition, extraction and general methods of determining structure, isolation, structure and synthesis of nicotine, atrophine and cocaine.

Unit 10 Enzymes *S* 6 Marks
Enzymes as biocatalyst, chemical nature, general characteristics and nomenclature of enzyme activity, Active sites, Vitamines (B complex group) and elements in enzyme function.

CH - 507 PHYSICAL CHEMISTRY

66 Marks; 90 Hours

Unit 1 Mathematics for Chemists *Ty* 6 Marks
Uncertainty in measurement: types of uncertainties, combining uncertainties. Statistical treatment of uncertainties. Mean, standard deviation, relative error. Data reduction and the propagation of errors. Graphical and numerical data reduction, method of least squares (regression).

Unit 2 Atomic structure *SJS* 6 marks

Bohr treatment of atomic structure and spectra of hydrogen like atoms, limitations of Bohr model. Black body radiation, Planck's theory - photo electric effect - Compton effect. Dual nature of matter, de Broglie's relationship, some simple examples.

Unit 3 Quantum Chemistry - I *muma* 8 Marks
Black-body radiation, Planck's radiation law, photoelectric effect, Bohr's model of hydrogen atom (no derivation and its defects), De Broglie hypothesis, Heisenberg's uncertainty principle. Quantum mechanical operators - momentum, position, energy (Hamiltonian) operators, postulates of quantum mechanics. Expectation values of dynamical variables.

Unit 4 Photochemistry *Jai* 6Marks

Grotthus-Draper's and Lambert Beer's Laws, Stark-Einstien's laws of photochemical equivalence, Quantum yield. Photolysis of ammonia, decomposition of Hydrogeniodide and Hydrogenchlorine reactions, Photoynthesis. Phosphorescence, Fluorescence, Chemiluminescence and photosensitisation - definitions with examples.

Unit 5 Energetics

8 Marks

Ques Gibbs-Helmholtz equation; Maxwell relations; thermodynamic equation of state. Systems of variable compositions, Partial molar quantities, dependence of thermodynamic parameters on composition; Gibbs-Duhem equation, chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases. Nernst heat theorem, Third Law: Statement of third law, calculation of absolute entropy of molecules.

Unit 6 Specific heats of solids

6 Marks

Ques The law of Dulong and Petit, atomic and molar heat capacities, Kopp's law, classical derivation of heat capacity, quantum theory of specific heats- Einstein equation of heat capacity of solids, Debye's equation, Debye's T law and characteristic temperatures of solids

Unit 7 Statistical Thermodynamics – I

6 Marks

Ty Purpose of statistical thermodynamics, probability of distribution, law of multiplication of probabilities, law of addition of probabilities, Sterling approximation, concept of ensembles, canonical ensemble, microcanonical ensemble and grandcanonical ensemble.

Unit 8 Interaction of molecules with electromagnetic radiations

6 Marks

Ques Electromagnetic radiation, wave length, wave number and frequency with their units, the electromagnetic spectrum with wave lengths and frequency, absorption of electromagnetic radiation by molecules, elementary idea of different spectroscopic techniques and the information obtainable from each.

Unit 9 Macromolecules

6 Marks

Suchi Classification of polymers - natural and synthetic - rubber, cellulose, starch, wool, silk - synthetic rubber, polyalkenes, acrylics, polyamides, polyesters, PVC polyurethane starting materials and uses only. Number average molecular weight and weight average molecular weight. Special properties of polymers.

Unit 10 Conductance

8 Marks

Ty Metallic and electrolytic conductors - specific, equivalent and molar conductance - measurement of conductance - variation of Conductance with dilution for strong and weak electrolytes (qualitative explanation) - Transport number and its determination by Hittorff's and moving boundary method - effect of temperature and concentration - ionic mobility and ionic conductance - Kohlrausch's law and its applications - salt hydrolysis and pH of a salt solution, buffer action and explanation.

CH - 508P INORGANIC AND PHYSICAL CHEMISTRY PRACTICAL

100 Marks (Inorganic: 67 marks; Physical : 33 marks)
135 Hours

Inorganic Laboratory:

I. Preparation of Inorganic complexes

- Preparation of sodium tris(oxalato)ferrate(III)
- Preparation of Nickel Dimethylglyoxime, $[\text{Ni}(\text{DMG})_2]$
- Preparation of copper tetraammine complex, $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$
- Preparation of *cis* and *trans*-bis(oxalato)diaqua chromiate

II. Estimation of two constituents from a binary mixture (one volumetrically and one gravimetrically)

Estimation of the constituents from the following mixture: Iron and calcium, iron and copper, iron and manganese, copper and zinc, silver and copper, calcium and barium, calcium and lead, calcium and magnesium, copper and chloride, copper and sulphate.

III Semimicro analysis

Semimicro analyses of five radicals containing at least one rare element (V, Mo, W, etc.) Silver, lead, mercury, bismuth, copper, cadmium, arsenic, manganese, cobalt, aluminium, iron, nickel, calcium, strontium, barium, magnesium, sodium, potassium, ammonium, chloride, bromide, iodide, fluoride, sulphate, sulphite, thiosulphate, chromate, phosphate, nitrate, nitrite, borate, arsenite, and arsenate.

Physical Laboratory

(I) Study the equilibrium of the following reactions by the distribution method:

(i) I_2 in water- Kerosene/ CCl_4

(ii) $\text{I}_2(\text{aq}) + \text{I}^- \rightarrow \text{I}_3^- (\text{aq})$

(iii) $\text{Cu}^{2+}(\text{aq}) + n\text{NH}_3 \rightarrow \text{Cu}(\text{NH}_3)_n^{2+}$

(II) Perform the following potentiometric/pH-metric titrations:

(i) Strong acid with strong base (ii) weak acid with strong base and (iii) dibasic acid with strong base

(III) Potentiometric/pH-metric titration of Mohr's salt with potassium dichromate.

(IV) Determination of critical solution temperature and composition of the phenol-water system and to study the effect of impurities on it.

(V) Phase equilibria: Construction of the phase diagram of (i) simple eutectic and

(ii) congruently melting systems, using cooling curves and ignition tube methods.

Any other experiment carried out in the class.

SEMESTER - VI

CH -608

INORGANIC CHEMISTRY

67 marks; 90 Hours

mine
Unit 1 Bonding in coordination compounds 14 Marks

Theory of coordination bond, Effective atomic number rule, Valence bond theory and its limitations. Crystal field theory. Splitting of d-orbitals in different stereochemistries octahedral, tetrahedral and square planar complexes. Factors that influence complex formation, stability constants.

Jai
Unit 2 Magnetic properties of transition metal complexes 8 Marks

Types of magnetic behaviour, methods of determining magnetic susceptibility, spin only, formula, L-S coupling, and applications of magnetic moment data in 3d transition metal complexes.

Jai
Unit 3 Inorganic polymers 7 Marks

Silicates and their classifications and structures, phosphazenes as inorganic polymers, structure and bonding in triphosphazenes, zeolites and molecular sieves.

Jai
Unit 4 Thermoanalytical methods 9 Marks

Thermogravimetric (TGA) and Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) - Basic principles, Instrumentation, Factors affecting thermoanalytical techniques, Application in soils, organic and inorganic compounds, analytical chemistry.

mine
Unit 5 Organometallic Chemistry 9 Marks

Definition, nomenclature and classification of organometallic compounds. 18 electron rule, counting of electrons in compounds; bonding and structure of CO, NO and N₂ compounds.

Suchi
Unit 6 Bioinorganic Chemistry 9 Marks

Suchi
Essential and non essential trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Na⁺, K⁺ and Ca²⁺, nitrogen fixation, chlorophyll.

mine
Unit 7 Inorganic rings and cages 5 Marks

Boron hydrides, diborane and higher boranes, borazine, tetrasulphur, tetranitride, synthesis, structure and their properties.

Unit 8 Non-stoichiometric compounds

6 Marks

Radius ratio rules, classification of ionic structures, layer structures, lattice energy, Born-Harber cycle, non-stoichiometric defects and stoichiometric defects, semiconductor and transistors, photovoltaic cells.

CH - 609 ORGANIC CHEMISTRY

66 Marks ; 90 Hours

Unit 1 Organo sulphur compounds

5 Marks

Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides.

Unit 2 Elimination reactions

7 Marks

Elimination Reaction, α -elimination, β -elimination, The E2, E1 and E1cB mechanisms, orientation effects in Elimination Reactions, stereochemistry of E2 Elimination Reactions, elimination Vs substitution, factors affecting the elimination and substitution reactions.

Unit 3 Organic synthesis via enolates

7 Marks

Acidity of α -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation Keto-enol tautomerism of ethyl acetoacetate.

Alkylation of 1, 3-dithianes. Alkylation and acylation of enamines

Unit 4 Heterocyclic compounds

10 Marks

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.

Introduction to condensed five and six-membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Unit 5 Medicinal chemistry

7 Marks

Drugs and antibiotics - synthesis and structure of the following

Sulphadruugs - Sulphadiazine - sulphaguanidine

Analgesics - aspirin, phenacetin

Antimalarials - Plasmoquin, chloroquine

Antibiotics - chloramphenicol

Copy
Unit 6 Chromatography 5 Marks
Principles and application of chromatography- column, thin layer, paper, preparatory thin layer, gas chromatography, elementary ideas of instrumentation of gas chromatography.

Test
Unit 7 Mass spectroscopy 7 Marks
Basic principle, basic compounds of double focusing instruments, molecular ions, fragmentation of molecular ions, basic rules of fragmentation, fragmentation by α -bond rupture in alkane groups, α -bond rupture near functional groups, study of the nature of fragmentation and presentation of mass spectra of 2-methylpentane, cyclohexane.

Test
Unit 8 Nuclear Magnetic Resonance Spectroscopy 8 Marks
Qualitative and conceptual treatment of the nmr phenomenon, precessional frequency, energy transition, theory of resonance, chemical shift, magnetically non-equivalent protons, shielding and deshielding, spin coupling, analysis of AX type spectra like, trans-cinnamic acid, 1, 1, 2-trichloro ethane, ethyl bromide, elementary ideas on instrumentation and sample handling.

Test
Unit 9 Electron Paramagnetic Resonance Spectroscopy 5 Marks
Elementary principle of epr., g values hyperfine splitting, epr spectra of $C_6H_6(\cdot)$ and $CH_3CHOCH_2CH_3$ and their analysis.

Sample
Unit 10 Green Chemistry 5 Marks
Principles and applications of green chemistry. Introduction, advantages and disadvantages. Applications in organic synthesis, principles of ultrasound and microwave assisted organic reactions, reactions in ionic liquids.

CH - 610 PHYSICAL CHEMISTRY 67 Marks; 90 Hours

Unit 1 Computer Applications in Chemistry 6 Marks

Test
Introduction to computers and its application in chemistry: - introduction to computers - characteristics of a computer - types of computers - block diagram of a digital computer. Algorithm - Flow chart -, Applications of computer in chemistry (only selected programs) determination of molarity, normality and molality of solutions - calculation of pH.

Unit 2 Quantum Chemistry - II *Muma* 7 Marks

Schrodinger wave equation (in Cartesian co-ordinates) and its importance, wave function and its physical interpretations, Schrodinger equation for a free particle moving in one dimensional box and its solutions, probability distribution of electrons - radial probability distribution curves.

Unit 3 Spectroscopy

8 Marks

Rotational spectra of diatomic molecules :

Rigid rotor, moment of inertia, energy levels, selection rules, nature of spectrum, determination of bond length. Effect of isotopic substitution on the rotational spectra.

Vibrational spectra of diatomic molecules:

Harmonic oscillator: energy levels, selection rules, nature of spectrum, determination of force constant. Anharmonic oscillator: energy levels, selection rules, nature of spectrum, fundamental band, overtones.

Raman Spectroscopy: Raman effect, Raman scattering -Stokes lines and Anti-Stokes' lines. Raman shift.

Unit 4 Symmetry and Point groups

6 Marks

Symmetry operations - products of symmetry operations of various point groups with examples, group multiplication table (C_{2v} , C_{3v}).

Unit 5 Electrochemistry I

6 Marks

Chemical cells, reversible and irreversible cells with examples. Electromotive force of a cell and its measurement, Nernst equation; Standard electrode potential and its application to different kinds of half-cells. EMF in determination of (i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinone-hydroquinone, glass electrodes.

Unit 6 Electrochemistry II

7 Marks

Concentration cells with and without transference, liquid junction potential, decomposition potential, electrolytic polarization, overvoltage; determination of activity coefficients and transference numbers. Qualitative discussion of potentiometric titrations (acid-base, redox, precipitation),

Theory of strong electrolytes - Debye - Huckel - Onsager theory (without detailed treatment) - verification of Onsager equation -- Wien effect and Debye - Falkenhagen effect - ionic strength - activity and activity coefficients of strong electrolytes and the limiting equation.

Unit 7 Statistical Thermodynamics - II

6 Marks

Basic postulates of Maxwell-Boltzmann distribution law, derivation of Maxwell-Boltzmann distribution law, Maxwell-Boltzmann distribution law of velocities, Partition function and its physical significances, types of partition functions (derivation not included).

Unit 8 Surface Active Agents

6 Marks

Hydrophilic and hydrophobic groups, amphiphiles, classification of surfactants, surfactants in solution, micelles and micelles formation.

Organic
Unit 9 Chemical kinetics II

8 Marks

Collision theory and transition state theory of reaction rates, Lindemann mechanism, Steady state approximation and reaction mechanism, Kinetics of complex reactions: (i) Opposing reactions (ii) parallel reactions, (iii) consecutive reactions and (iv) chain reactions.

Organic
Unit 10 Phase equilibria II

7 Marks

Phase equilibria of two component system : solid -liquid equilibria, simple eutectic - Bi, Cd, Pb-Ag systems, desilverisation of lead.,
Solid solutions : compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl . H₂O), (FeCl₃-H₂O) and CuSO₄-H₂O system. Freezing mixtures, acetone dry ice.

CH - 611P ORGANIC AND PHYSICAL CHEMISTRY PRACTICAL

100 Marks (Organic : 67, Physical : 33)

Organic Laboratory:

A. Qualitative Analysis

Identification of Organic Compounds; Detection of extra elements(N,S and halogens) and functional groups – phenolic, carboxylic, carbonyl, esters, amines, nitro, anilide, alcohol, halogen derivative of hydrocarbons and hydrochloride in simple organic compounds.

Analysis should include detection of elements, functional group, preparation of a solid derivative. A completely dried sample of the derivative should be submitted to the examiner.

B. Organic Preparation:

(a) Acetylation of salicylic acid, aniline, glucose and hydroquinone. Benzoylation of aniline and phenol.

(b) Aliphatic electrophilic substitution; Preparation of iodoform from ethanol and acetone.

(c) Aromatic electrophilic substitution:

Nitration: Preparation of m-dinitrobenzene, p-nitroacetanilide.

Halogenation: Preparation of p-bromoacetanilide, 2, 4, 6-tribromophenol

(d) Diazotisation/ coupling : Preparation of methyl orange and methyl red.

(e) Oxidation: Preparation of benzene from toluene.

(f) Reduction: Preparation of aniline from nitrobenzene.

Physical Laboratory

1. To study changes in conductance in the following systems
 - (a) strong acid-strong base
 - (b) weak acid-strong base and
 - (c) mixture of strong acid and weak acid-strong base
2. Study the kinetics of the following reactions.
 - (a) Acid hydrolysis of methyl acetate with hydrochloric acid, volumetrically or conductometrically.
 - (b) Saponification of ethyl acetate:
3. Verification of Lambert-Beer's Law
4. Determination of pK (indicator) for phenolphthalein or methyl red
5. Study the formation of a complex between ferric and thiocyanate (or salicylate) ions.

Any other experiment carried out in the class.

Reference Books:

Inorganic Chemistry

1. J. D. Lee, New Concise in Inorganic Chemistry.
2. J.E. Huheey, E.A. Keiter and R.L. Keiter, Principles of Structure and Reactivity, Harper Collins College Publishers, 1993.
3. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, Academic Press, 3rd Edition, 1976.
4. A Text Book of Inorganic Chemistry - Part I, R. L. Dutta
5. A Text Book of Inorganic Chemistry, Satya Prakash
6. D.F. Shriver, P.W. Atkins and C.H. Langford, Inorganic Chemistry, Academic Press, 1991.
7. S. Sarkar, General and Inorganic Chemistry, Part II
8. G.L. Miessler and D.A. Tarr, Inorganic Chemistry, Pearson Education, Low price Edition.
9. G. Pass and H. Sutcliffe, Practical Inorganic Chemistry, Chapman & Hill, 2nd Edition. 1974.
10. J.N. Gurtu and Kapoor, Advanced Experimental Inorganic Practical Chemistry, S. Chand and Company, N. Delhi
11. J. Basset, R.C. Denney, G.H. Jeffery and J. Mendham, Vogel's Text Book of Quantitative Inorganic Analysis, ELBS.
12. J. Basset, R.C. Denney, G.H. Jeffery and J. Mendham, Vogel's Text Book of Qualitative Inorganic Analysis, ELBS.
13. H.H. Willard, L.L. Merritt and J.A. Dean, Instrumental Methods of Analysis, East-West Press, 4th Edition, 1974.
14. R.L. Dutta and A. Syamal, Elements of MagnetoChemistry, Affiliated East-West Press, 2nd Edition.
15. G. Friedlander, J.W. Kennedy and J.M. Mill, Nuclear and Radiochemistry, Wiley International, 2nd Edition.

BACHELOR OF SCIENCE
In
CHEMISTRY (General)
SEMESTER - V

CH -501
Section A : INORGANIC CHEMISTRY

25marks; 30 Hours

Unit 1 Nuclear Chemistry and Radioactivity 6 Marks

Jai Discovery of radioactivity, nature of radiations, separation of isotopes, binding energy, mass defect, half-life, group displacement law, artificial transmutation, artificial radioactivity, Nuclear binding energy and packing fraction.

Unit 2 Chemistry of compounds of non-transition elements 6 Marks

Preparation and properties of bleaching powder, Portland cement and plaster of paris. Oxides and oxyacids of phosphorous, and sulphur

muma Unit 3 Alloy and intermetallic compounds 3 Marks

Alloy and its classification, types of alloys, rules for the formation of alloys and intermetallic compounds.

Unit 4 Introduction to spectroscopy 4 Marks

Fundamental laws of photochemistry (Lambert-Beer's law), molar absorptivity, Unit of frequency, wavelength and wavenumber, molecular vibrations – fundamental, overtone, combination tone, Fermi resonance, stretching and bending.

Suchi Unit 5 Environmental Chemistry 6 Marks

Water pollution, cause, effect and treatment of water pollution. Air pollution, cause, effect and remedies to minimise of air pollution, solid waste pollution, treatment and disposal.

Section B : ORGANIC CHEMISTRY

25 Marks; 30 Hours

Unit 1 Carbohydrates *Suchi* 6 Marks

Classification and nomenclature, Monosaccharides, mechanism of osazone formation, Configuration of monosaccharides, mutarotation, Introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Unit 2 Amino acids, Peptides Proteins and Enzymes *Suchi* 6 Marks

Classification, structure Acid-base behaviour, isoelectric point and electrophoresis, Classification of proteins, Classical Levels of protein structure, Protein denaturation/renaturation.

Enzymes as biocatalyst, general characteristics and nomenclature of enzyme activity and active sites.

Unit 3 Pericyclic reactions *SJS*

7 Marks

Definition and classification, electrocyclic reactions (thermal and photochemical) involving 4 and 6 π -electrons, cycloaddition reactions, FMO approach, Diels-Alder Reaction.

Unit 4 Alkaloids

6 Marks

Definition, extraction and general methods of determining structure, isolation, structure and synthesis of nicotine, atropine and cocaine.

Section C : PHYSICAL CHEMISTRY

25Marks;30 Hours

Unit 1 Quantum Chemistry-I

6 marks

Memo Black-body radiation, Planck's radiation law, Photoelectric effect, Bohr's model of hydrogen atom, De-Broglie hypothesis, Heisenberg's uncertainty principle, Quantum mechanical operators-momentum, position, energy (Hamiltonian) operators, Postulates of quantum mechanics.

Unit 2 Photochemistry

6 marks

2m Grothuss-Draper's and Lambert Beer's Laws, Stark-Einstein's Laws of Photochemical equivalence, Quantum yield of a photochemical reaction, Primary and secondary processes in photochemical reactions, Phosphorescence, Fluorescence, Chemiluminescence, Thermoluminescence (definition with examples), Photochemical reactions of decomposition of hydrogen iodide, photochemical combination of hydrogen and bromine, reaction between hydrogen and chlorine, Photosensitised reactions, Radiation chemistry.

Unit 3 Macromolecules

6 marks

Each Classification of polymers-natural and synthetic-rubber, cellulose, starch, wool, silk, synthetic rubber, polyalkenes, acrylics, polyamides, polyesters, PVC, polyurethane (starting materials and uses only), Number average molecular weight and Weight average molecular weight.

Unit 4 Conductance

7 marks

Try Metallic and electrolytic conductors-specific, equivalent and molar conductance, measurement of conductance-variation of conductance with dilution for strong and weak electrolytes (qualitative explanation), Transport number and its determination by Hittorf and moving boundary method-effect of temperature and concentration, ionic mobility and ionic conductance-Kohlrausch's law and its applications.

CH - 501P ORGANIC AND PHYSICAL CHEMISTRY PRACTICALS

25 Marks: 6 Hours

A. Organic Experiments

6 marks

Identification of given organic compounds and detection of elements like nitrogen, sulphur, halogens

B. Physical experiments

12 marks

1. Verification of Lambert-Beer's Law and determination of the concentration of a given solution.
2. Determination of the concentration/amount of oxalic acid by conductometric titration with sodium hydroxide.
3. Determination of critical solution temperature (CST) for phenol-water system.
4. Determination of Critical Micelle Concentration (CMC) of sodium lauryl sulphate from the measurement of conductivities at different concentrations

C. Viva voce

4 marks

D. Laboratory note book

3 marks

25 marks; 30 Hours

Unit 1 Bonding in coordination compounds 5 marks

Muma Werner's coordination theory, classification of coordination compounds
Theory of coordination bond. Valence bond theory and Crystal field theory. Splitting of d- orbitals in octahedral and tetrahedral complexes.

Unit 2 Inorganic polymers 5 marks

Jai Silicates, classifications and structures, phophazenes as inorganic polymers

Unit 3 Bioinorganic Chemistry 5 marks

Suchi Essential and non essential trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and chlorophyll. Biological role of Na^+ , K^+ and Ca^{2+} .

Unit 4 Organometallic Chemistry 5 marks

Muma Definition, and classification of organometallic compounds. Elementary studies of carbonyls and nitrosyls.

Unit 5 Metallurgy 5 marks

Extraction and studies of the following metals and their important compounds
Platinum, palladium, tungsten and thorium

Section B : ORGANIC CHEMISTRY

25 Marks ; 30 Hours

Unit 1 Elimination reactions 7 marks

Reena Elimination Reaction. a-elimination, b-elimination. E2, E1 and E1 cb mechanisms. orientation effects in Elimination Reactions. stereochemistry of E2 Elimination Reactions. elimination Vs substitution reactions.

Unit 2 Organic synthesis via enolates 6 marks

Joy Acidity of α -hydrogens. alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.

Unit 3

Heterocyclic compounds

6 marks

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine.
Mechanism of electrophilic substitution reactions, nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.

Unit 4 Medicinal chemistry

6 marks

Drugs and antibiotics - synthesis and structure of the following
Sulphadruugs - Sulphadiazine - sulphaguanidine
Analgesics - aspirin, phenacetin
Antimalarials - Plasmoquin, chloroquine
Antibiotics - chloramphenicol

Section C : PHYSICAL CHEMISTRY

25 Marks; 30 Hours

Unit 1 Quantum Chemistry-II

6 marks

Schrodinger wave equation (Cartesian co-ordinates) and its importance, wave function and its physical interpretations, Schrodinger equation for a free particle moving in one dimensional box and its solutions.

Unit 2 Spectroscopy

7 marks

Rotational spectra of diatomic molecules: Rigid rotor, moment of inertia, energy levels, selection rules, nature of spectrum, determination of bond length. Effect of isotopic substitution on the rotational spectra.

Vibrational spectra of diatomic molecules: Harmonic oscillator: energy levels, selection rules, nature of spectrum, determination of force constant. Anharmonic oscillator: energy levels, selection rules, nature of spectrum, fundamental bands and overtones.

Unit 3 Surfactants

6 marks

Hydrophilic and hydrophobic groups, amphiphiles, classification of surfactants, surfactants in solution, formation of micelles and reverse micelle.

Unit 4 Symmetry and point groups

6 marks

Symmetry operations, products of symmetry operations of various point groups with examples, group multiplication table of C_{2v}

CH-601P ORGANIC AND INORGANIC CHEMISTRY PRACTICAL

25 Marks: 6 Hours

A. Organic experiments

6 marks

Preparation of organic compounds involving benzylation, bromination and nitration

B. Inorganic Experiments

12 marks

I. Preparation of Inorganic complexes

- Preparation of sodium tris(oxalato)ferrate(III)
- Preparation of Nickel Dimethylglyoxime, $[\text{Ni}(\text{DMG})_2]$
- Preparation of copper tetraammine complex, $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$
- Preparation of *cis* and *trans*-bis(oxalato)diaqua chromate

II. Oxidation-Reduction Titration (Permanganometry Titration)
Estimation of ferrous and ferric iron

4 marks

C. Viva voce

3 marks

D. Laboratory note book

MANIPUR UNIVERSITY
DEPARTMENT OF COMMERCE

Course Structure of B.Com. (Semester System)

Semester I

FC-1 MIL/

B.Com. 101

General English

BUSINESS COMMUNICATION

Objective: To develop effective business communication skills.

Unit I: The Nature of Communication: Definition of communication, Purpose of communication, Variables in communication process, Communication barriers – meaning, organization, interpersonal, individual, economic, geographical, temporal, channel, media and technological Encoding – decoding skills Communication styles .

Unit II: Non-Verbal Communication: Meaning & importance, Paralanguage, Kinesics , Proxemics, Other Categories – dress, colour, time , Combined Impact.

Unit III: Listening: Meaning and importance, Characteristics of listening, Perceptual barriers to listening, General barriers to listening, Active listening, other concepts related to listening, Keys to effective listening.

Unit IV: Business Letters: Need and functions of business letters - Planning & layout of business letter - Kinds of business letters - Essentials of effective correspondence.

Unit V: Drafting of business letters: Enquiries and replies - Placing and fulfilling orders - Complaints and follow-up - Sales letters - Circular letters - Application for employment and resume - Report writing - Notices, Agenda and Minutes of the Meetings – Memos.

REFERENCES:

1. Business Communication - K. K. Sinha - Galgotia Publishing Company, New Delhi.
2. Media and Communication Management - C. S. Rayudu - Himalaya Publishing House, Bombay.
3. Essentials of Business Communication - Rajendra Pal and J. S. Korlhalli - Sultan, Chand & Sons, New Delhi.
4. Business Communication (Principles, Methods and Techniques) Nirmal Singh - Deep & Deep Publications Pvt. Ltd., New Delhi.
5. Business Communication - Dr. S.V. Kadvekar, Prin. Dr. C. N. Rawal and Prof. Ravindra Kothavade - Diamond Publications, Pune.
6. Business Correspondence and Report Writing - R. C. Sharma, Krishna Mohan - Tata McGraw-Hill Publishing Company Limited, New Delhi.

Objectives: To equip the students with the knowledge of accounting process and preparation of final accounts and to develop the skills of recording financial transactions and preparation of reports .

Unit I: Introduction to Accounting: Definition, features, objectives, functions, scope of accounting - Book keeping and Accounting - Branches of Accounting - Advantages and limitations-basic terminology used- – Accounting concepts and conventions. Accounting Process-Accounting cycle-Accounting equation-classification of accounts-rules of double entry book keeping - Journalizing –Posting to Ledgers, Balancing of Ledger Accounts

Unit II: Subsidiary Books and Bank Reconciliation Statement: Sub Division of Journal-Preparation of Subsidiary Books including different types of cashbooks- simple cashbook, cashbook with cash and discount columns, cashbook with cash, discount and bank columns, cashbook with cash and bank columns and petty cash book. Bank Reconciliation Statement- Preparation of bank reconciliation statement.

Unit III: Trial Balance, Final Accounts: Trial Balance: meaning, objectives, methods of preparation - Final Accounts: Meaning, features, uses and preparation of Trading Account, Profit & Loss Account and Balance Sheet-Adjusting and Closing entries.

Unit IV: Consignment and Joint Ventures: Consignment - Features, Terms used Proforma invoice - Account sale, Del Credere commission -Accounting treatment in the books of the consignor and the consignee - Valuation of consignment stock - Normal and abnormal Loss - Invoice of goods at a price higher than the cost price. Joint ventures - features-difference between joint venture and consignment, Accounting Procedure – Methods of keeping records for Joint venture accounts-method of recording in co ventures books-separate set of books method.

Unit V: Depreciation - Provisions and Reserves: Meaning of Depreciation - Causes-objects of providing for depreciation -Factors affecting depreciation - Accounting Treatment- Methods of providing depreciation - Straight line method - Diminishing Balance Method, Provisions and Reserves - Reserve Fund – Different Types of Provisions and Reserves.

REFERENCES:

1. Principles and Practice of Accounting R.L. Gupta & V.K. Gupta Sulthan Chand & sons
2. Accountancy - I S.P. Jain & K.L Narang Kalyani Publishers
3. Accountancy – I Tulasian Tata Mcgraw Hill Co
4. Introduction to Accountancy T.S.Grewal S.Chand and CO
8. Advanced Accountancy-I S.N.Maheshwari & V.L.Maheswari Vikash Publishing co.

B.com.103

BUSINESS ECONOMICS AND ENVIRONMENT

Objective: To facilitate the students to learn the concepts of business economics and environment and apply them in real life situations.

Unit I: Introduction: Economics-Definitions-- micro and macro economics-method of economics-positive and normative—inductive and deductive approaches. Demand—meaning—law of demand -properties of demand curve, income effect and substitution effect-exceptions to the law of demand-Supply-law of supply, determinants of supply—market equilibrium.

Unit II: Production and Costs: Meaning, Distinction between short-run and long-run—Production with variables, law of variable proportion—production with two variable inputs-isoquants – isocosts- techniques of maximization of output, minimization of cost and maximization of profit, Cost of production-cost function—short-run total and average costs.

Unit III: Market Structure: Perfect competition-characteristics-equilibrium price—profit maximizing output in the short and long-run—Monopoly-characteristics profit maximizing output—monopolistic competition-characteristics—product differentiation—Oligopoly-characteristics-price rigidity.

Unit IV: Business Environment – concept –Environmental Influence on Business - Social and cultural Environment – Demographic Trend – Indian Social Structure – Caste and Communal Systems – Interplay of various Systems– Impact on Business– Types of social organization – social responsibilities of business.

Unit V: Political Environment – Directive Principles of State Policy – Centre – State Relations – Impact of Political Environment on Business. Economic Environment – Sectors of Economy & their Significance.

REFERENCES:

1. Francis Cherunilam – Business Environment, Himalaya Publishing House, Mumbai.
2. Amarchand – Government and Business, Emeralds Publishers, Chennai.
3. V.P. Michael – Business Policy and Environment (Himalaya Pub. House).
4. Douglas E.J. Managerial Economics: Theory, Practice and Problems, Prentice Hall Inc., New Jersey
5. Paul A Samuelson and 'William D Nordhaus, Economics, Mc.Graw Hill Book Co.
6. Sankaran S., Economics Analysis, Margam Publishing Co., Chennai
7. Varsheny R.L. and Maheshwari K.L., Managerial Economics, Sultan Chand & Sons
8. Vivek Mittal, Business Environment, Excel Books, New Delhi

SEMESTER II
20
B. Com. ~~FC-2~~ E-COMMERCE

Objectives: A student should become familiar with mechanism for conducting business transactions through electronic means.

Unit-I: Introduction to e-Commerce: Framework, Architecture, Benefits and Impact of e-Commerce, The Anatomy of e-Commerce applications, e-Commerce Consumer applications, e-Commerce Organisation Applications, e-commerce in India, Prospects of e-commerce.

Unit-II: Network Infrastructure for e-commerce: Intranet, Extranet, & Internet, Internet Backbone in India, ISP and services in India, OSI Model, Standards & Overview of TCP/IP, Internet Security, e-commerce & Internet.

Unit-III E-commerce Models: Business-to-Business-Hubs, Market Places, Business-to-Business Exchange, Business-to-Consumer, Consumer-to-consumer, Business-to-Government, Government-to-Government.

Unit-IV: Electronic Payment Systems: Introduction to Payment Systems, On-Line Payment Systems, Pre-Paid e-Payment System, Post-Paid e-Payment System, Requirements Metrics of a Payment System.

Unit-V: E-Security: Securing the Business on Internet- Security Policy, Procedures and Practices, Transaction Security, Cryptology, Digital Signatures, Security Protocols for Web Commerce.

REFERENCES:

1. Jeffrey F. Rayport & Bernard J. Jaworski: Introduction to E-commerce, TMH, ~~2003~~.
2. Kalakota & Winston: Frontiers of E-commerce, Pearson Education, Mumbai, ~~2003~~.
3. David Whiteley: E-Commerce- Strategy technologies and Applications, Tata Mac-Graw Hill, New Delhi, ~~2003~~.
4. C.S.V. Murthy: E-Commerce-Concepts, Models & Strategies, Himalaya Publishing house, Mumbai, ~~2003~~.
5. Kamallesh K. Bajaj & Debjani Nag: E-Commerce, the Cutting Edge of Business- Tata McGraw-Hill, New Delhi, ~~2003~~.
6. Bharat Bhaskar: Electronic Commerce, Tata Mc-Graw-Hill, New Delhi, ~~2003~~.
7. Perry: E-Commerce, Thomson Publications, New Delhi, ~~2003~~.
8. Elias M. Awad: Electronic Commerce, Prentice-Hall India, New Delhi, ~~2003~~.

B.Com. 201.

~~EL(202)~~ PRINCIPLES OF MANAGEMENT

Objectives: To familiarize the students with concepts and principles of Management.

Unit I: Management: Meaning, nature and characteristics of Management - Scope and functional areas of management - Management as a science or art or profession - Management & Administration - Principles of management - Social responsibility of management and Ethics.

Unit II: Planning : Nature, importance and purpose of planning - Planning process, Objectives - Types of plans , Decision making , importance & steps.

Unit III: Organising and Staffing : Nature and purpose of organisation, Principles of organisation - Types of organization - Departmentation, Committees - Centralisation Vs decentralisation of authority and responsibility - Span of Control - MBO and MBE - Nature and importance of staffing - Process of selection & recruitment.

Unit IV: Directing: Meaning and nature of directing - Leadership styles - Motivation theories (Maslow's, Herzberg, McGregors X & Y theory) .

Unit V: Controlling: Meaning and steps in controlling - Essentials of a sound control system - Methods of establishing control.

REFERENCES:

1. Robbins and Coutler, Management, Prentice Hall
2. Koontz & O'Donnel, Management, Mc.Graw Hill
3. S.A. Sherlekar, Management, Himalaya Publishing House
4. Edwin B Flippo, Personnel Management, McGraw Hill, New Delhi
5. Bhagawan Sri Sathya Sai Baba, Discourses on Man Management, Sri Sathya Sai Books and Publications Trust
6. Peter Pruzan and K P Mikkelson, Leading with Wisdom, Sage Publications, New Delhi
7. CB Gupta, General Management, Sultan Chand & Co.

B.Com - 202

F2(202) FUNDAMENTAL OF ENTREPRENEURSHIP

Objective: The purpose of this paper is to enable student to develop the importance of entrepreneurship and to understand the generation of self employment.

Unit I. Entrepreneur-entrepreneurship-and-enterprise: Meaning, conceptual framework, Entrepreneurship *versus* Intrapreneurship, Role of entrepreneurship in economic development, functions of entrepreneur in relation to new venture creation.

Unit II. Theories of Entrepreneurial Emergence: Economic, Sociological and Psychological Perspectives. Entrepreneurial competencies, motivations, performance and rewards: role in entrepreneurial manifestation and sustenance- Innovation Theory.

Unit III. Global Entrepreneurship Monitor (GEM) Project and Total Entrepreneurship Index (TEI), India's rank and the issues facing Indian Entrepreneurship: families business management.

Unit IV. Policy for entrepreneurship and small business development in India. Genesis and the evolution of the Government of India's small-scale sector policy: Industrial Policy Resolutions. - Entrepreneurial environment in India .

Unit V. Promotional Programmes: evaluation of their effectiveness-Role of financial Institutions and Govt. - vendor development cells, business incubators and venture capital, and, their interface with the entrepreneur.

REFERENCES:

1. Bhide, Amar V., "The Origin and Evolution of New Businesses", Oxford University Press, New York, ~~2000~~.
2. Desai, Vasant., "Small Scale Enterprises Vols. 1-12", Mumbai, Himalaya Publishing House. (Latest edition).
3. Desai, Vasant., "Dynamics of Entrepreneurial Development and Management," Mumbai, Himalaya Publishing House. (Latest edition).
4. Dollinger, Mare J., "Entrepreneurship: Strategies and Resources", Illinois, Irwin, ~~2000~~.
5. Holt, David H., "Entrepreneurship: New Venture Creation", Prentice-Hall of India, New Delhi, latest Edition.

B.Com. 203

E3(202) COST ACCOUNTING

Objectives: To familiarize students with the various concepts and element of cost and to create cost consciousness among the students.

Unit – I: Cost Accounting: Meaning of Cost, costing and Cost Accounting – Comparison between Financial Accounts and Cost Accounts – Application of Cost Accounting – Designing and installing a Cost Accounting system – Cost concepts and Classification of Costs – Cost Unit – Cost Center – Elements of Cost – Preparation of cost sheet – Tenders and Quotations – Problems.

Unit – II: Material Costing: Classification of materials – Material Control – Purchasing procedure – store keeping – techniques of Inventory control – Setting of stock levels – EOQ – Methods of pricing materials issues – LIFO– FIFO – Weighted Average Method – Simple Average Method – Problems.

Unit – III: Labour Costing: Control of labour cost – Labour Turn Turnover – Causes and effects of labour turnover – Meaning of Time and Motion Study, Merit Rating, Job Analysis, Time keeping and Time booking – Idle time, causes and treatment – Overtime – Methods of Wage Payment, Time rate and Piece Rate – Incentive Schemes – Halsey Premium Plan – Rowan Bonus Plan – Taylor's and Merrick's differential piece rate systems – Problems.

Unit – IV: Overhead Costing: Definition – Classification of overheads – Procedure for accounting and control of overheads – Apportionment of Service department costs to production departments – Repeated Distribution method – Simultaneous equation method – absorption of OH's – Methods of Absorption – Percentage of direct material cost – Direct Labour Cost – Prime Cost, Direct Labour hour rate and Machine Hour Rate – Problems.

Unit – V: Reconciliation Of Cost And Financial Accounts: Need for reconciliation – Reasons for difference in profits – Problems on preparation of Reconciliation statements.

REFERENCES:

1. N.K. Prasad : Cost Accounting, Book Syndicate Pvt. Ltd. Calcutta
2. Nigam & Sharma : Cost Accounting, Himalaya Publication
3. Jain & Narang : Cost Accounting, Kailani Publication, New Delhi
4. S.P. Iyengar : Cost Accounting, Sultan Chand and Sons, New Delhi
5. S.N. Maheshwari : Cost Accounting, Shree Mahvir Book Dept. New Delhi.
6. Horngren : Cost Accounting : A Managerial Emphasis, Prentice Hall of India Pvt. Ltd.
7. M. N. Arora : Cost Accounting, Vikas Publishing House Pvt. Ltd., New Delhi.
8. P.C. Tulsian, Practical Costing, Vikas Publishing House Pvt. Ltd.

B.Com.(FC-3)

SEMESTER III

~~FC-2~~ FUNDAMENTALS OF COMPUTER

Objective: To impart basic knowledge about fundamental of computer.

Unit I: Introduction to Computers: Definition of Computer; Components of Computer; Characteristics of Computers; Evolution of Computers; Generation of computers; Classification of Computers- According to Purpose, According to Technology , According to Size and Storage Capacity ; Human being VS Computer; Difference between Computer and Calculator.

Unit II: Input Devices: Mouse, Keyboard, Light pen, Track Ball, Joystick, MICR, Optical Mark reader and Optical Character Reader Scanners, Voice system, Web Camera.
Output Devices: Hard Copy Output Devices; Line Printers, Character Printers, Chain Printers, Dot-matrix Printers, Daisy Wheel Printer, Laser Printers, Ink Jet Printers; Plotters, Soft Copy device –Monitor, Sound Cards and speakers.

Unit III: Memory and Mass Storage Devices: Characteristics of Memory Systems; Memory Hierarchy; Types of Primary Memory; RAM and ROM; Secondary and Back-up; Magnetic Disks, Characteristics and classification of Magnetic Disks; Optical Disks; Magnetic Taps.

Unit IV: MS- Word: Fundamentals of MS-Word, Features of MS-Word, Menus, Formatting and Standard Toolbars, Ruler, Scroll Bar, Creating, Editing, Saving, export and import files, inserting and copying the files, Working with frames, Paragraph formatting, Columns, Pictures, Tables, Macros and Mail Merge.

Unit V: Network of computers: Types of networks. LAN, Intranet and Internet, Internet applications, World wide web, E-mail, browsing and searching, Search engines, Multimedia applications.

REFERENCES:

1. Alexis Leon and Mathews Leon (1999): Fundamentals of information technology, Leon Techworld Pub.
2. Jain, S.K. (1997): Information Technology "O" level made simple, BPB Pub.
3. Jain, V.K. (2000): "O" Level Personal Computer Software, BPB Pub.
4. Rajaraman, V. (2000): Fundamentals of Computers, Prentice Hall India.
5. Basics of Computer – P.K. Singh, V.K. (India) Enterprises, New Delhi

B.Com-301

~~E1(303)~~ COMMERCIAL LAWS

Objective: To make the students learn the basics of business laws and apply them in real life situations.

Unit I: Contract Act: Agreement and Contract: Definition and meaning - Essentials of a valid contract- types of contracts. Offer and Acceptance: Definition – Essentials of a valid offer and acceptance – communication and revocation of offer and acceptance. Consideration: Definition and importance.

Unit II: Discharge of a Contract: Void Agreements – wagering agreements and contingent contracts. Discharge of a contract – various modes of discharge of a contract – performance of contracts. Breach of a contract – types – remedies for breach of a contract

Unit III. Sale of Goods Act: Definition - features – definition of the term goods – types of goods – rules of transfer of property in goods – differences between sale and agreement to sell. Rights of an unpaid seller. Conditions and warranties – meaning and distinction – express and implied conditions and warranties.

Unit IV: Consumer Protection Act: Definitions of the terms consumer, unfair trade practices, restrictive trade practices and complainant – rights of consumers – consumer protection councils– consumer redressal agencies – penalties for violation.

Unit V: Intellectual Property Rights: Intellectual Property Rights: Meaning - Need and objectives-Meaning of the terms industrial property, literary property, copy right, patents, trade marks, trade names, trade secrets, industrial designs, geographical indications.

REFERENCES:

1. N.D.Kapoor, Business Laws, Sultan Chand & Sons., New Delhi.
2. G.K.Varshey, Elements of Business Law S.Chand & Co., New Delhi.
3. M.C.Shukla, A manual of Mercantile Law, S.Chand & Co., New Delhi.
6. Gogna: A Text books of Business and Industrial Law, S.Chand

B.Com - 302

E2(303) BUSINESS MATHEMATICS AND STATISTICS

Unit I: Set Theory and Functions: Definition of set, Types of sets, set operations, Venn diagrams, demorgans law (without proof). Applications of set theory, Concept and function, (domain & range, defined and undefined equality), graphical representation of real value function, Distinction between limit of a function and value of a function, statement of theories of limit.

Unit II: Calculus: Derivatives of implicit, explicit, exponential and logarithmic functions, Rules of differentiation (without proof), Higher ordered derivatives, maxima and minima (easy problems only), Integral Calculus: Indefinite integrals, Basic rules of integration, standard integrals, integration by substitution, Integration by parts, Definite integral, Simple properties of definite integral (without proof).

Unit III: Statistics: meaning, scope and function, limitation, collection of data, sample and sampling designs; classification and tabulation of data, diagrammatic and graphic presentation and interpretation; Measure of central tendency: arithmetic mean, geometric mean, harmonic mean, median, mode – their characteristics and applications.

Unit IV: Measures of dispersion: Range, mean deviation, standard deviation, coefficient of variation, Skewness, moments kurtosis, Lorenze curve- significant and applications.

Unit V: Correlation and Regression - Karl Pearson's coefficient of correlation: Elements of regression analysis, Analysis of the time series, importance, components, methods of measurement.

REFERENCES:

1. Jena R.K., Bal R.K., and Swain : Fundamentals of Business Mathematics (S.Chand & Co.)
2. Soni, R.K. Sharma, A.K. : Elements of Business Mathematics (Pitamber Pub. Co.)
3. Gupta, S.P.: Statistical Methods, (Sultan Chand)
4. Elhance, D.N.: Fundamentals of Statistics (Kitab Mahal)
5. Levin, I.R.: Statistics for Management (Prentice Hall)
6. Shenoy, G.V. Srivastava U.K. and Sharma S.C.: Business Statistics (New Age International).

~~E3(303)~~: MANAGEMENT ACCOUNTING

Objectives: To enable the students to understand the importance of the subject through analysis and interpretation of financial statements with a view to prepare management reports for decision making.

Unit I: Introduction: Meaning – objectives – nature and scope of management accounting – role of management accountant – relationship between financial accounting, cost accounting and management accounting.

Unit II : Financial Statement Analysis: Meaning – concept and types of financial analysis– methods of financial analysis – problems on comparative statements – common size statements – trend analysis .

Unit III: Ratio Analysis: Meaning – importance – utility of ratios – classification of ratios – calculation and interpretation of ratios – preparation of income statement and Balance Sheet with ratios.

Unit IV: Funds Flow And Cash Flow Analysis: Meaning – concept, uses and significance of funds flow statement – procedure for preparing FFS – Schedule of changes in working capital-statement of sources and application of funds - Cash Flow analysis –comparison between Funds Flow and Cash Flow statements – uses and significance of CFS- preparation of Cash Flow Statement as per Accounting Standards.

Unit V: Management Reporting: Methods of reporting –requirements of a good report – kinds of reports – principles of good reporting system – drafting of reports under different situations

REFERENCES:

1. S.N. Maheshwari : Principles of Management Accounting, Sultan Chand & Sons, New Delhi.
2. I.M. Pandey : Principles of Management Accounting, Vikas Publications, New Delhi
3. M.Y. Khan & : Management Accounting, Tata, Mcgraw Hill Publications, P.K. Jain New Delhi.
4. Gupta & Sharma : Management Accounting, Kalyani Publications, Ludhiana.
5. Bhabatosh Banerjee : Management Accounting and Financial Control, Prentice Hall of India, New Delhi.
6. Vinayakam & : Principles of Management Accounting, Himalaya Publishing Joshi House, Mumbai.
7. Ravi M. Kishore : Management Accounting, Taxmann Publications, New Delhi.
8. Kulshresta & Ramanathan: Management Accounting, Sultan Chand & Sons, New Delhi.

B.Com. (FC-4) SEMESTER IV

~~FC-2~~ ENVIRONMENTAL STUDIES

B.Com. - 401 ~~101-102~~ AUDITING

Objectives: To acquaint oneself with auditing procedure and report Writing.

Unit I: Introduction to Auditing: Definition-Evolution-Objectives-Importance. Types of audit: Based on ownership (Proprietorship, Partnership, Companies, Trusts, Cooperative Societies, Government Departments -Based on time (Interim, Final, Continuous, Balance Sheet)- Based on objectives (Independent, Financial, Internal, Cost, Tax, Government, Secretarial).

Unit II : Planning of Audit and Control: Auditor: Qualifications and disqualifications – Appointment and Reappointment – Remuneration – Removal – Rights – Duties – Liabilities. Audit planning: - Engagement letter - Audit programme -Audit note book - Audit papers - Audit work book - Audit contents - Audit markings - Internal check- Internal control – (Sales-Purchases-Fixed assets-Cash-Bank-Pay Roll) - Accounting controls and Sampling in audit.

Unit III: Vouching and Audit of Financial Statements: Vouching: Meaning- Vouching of cash and trading transactions –Investigation, Verification and Valuation of assets and liabilities. Audit of Financial Statements: Receipts – Payments – Sales – Purchases -Fixed assets– Investments - Personal ledger – Inventories- Capital and Reserves .

Unit IV: Audit of Institutions: Audit of institutions: Partnership - Manufacturing and Other Companies -Non-trading concerns. Audit Report: Contents - Preparation of audit report – Fair report - Qualified report.

Unit V: Report Writing: Business Correspondence and Report writing: Basic principles , Business letters. Business reports: Structure – Preparation of Routine reports and special reports.

REFERENCES:

1. Tandon, B. N. A Hand Book of Practical Auditing, S.Chand & Co., New Delhi.
2. Kamal Gupta and Ashok Arora, Fundamentals of Auditing, Tata Mc.Graw Hill, New Delhi
3. Kamal Gupta, Contemporary Auditing, Tata Mc. Graw Hill, New Delhi.
4. Ghatalia, Spicer & Pegler, Practical Auditing (Indian Edition), Allied Publishers, New Delhi.
5. Arens & Loebbecke, Auditing, Prentice Hall India, New Delhi.
6. Gray & Manson, The Audit Process , Van Nostrand Reinhold(International), New York.

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~~E2 (404)~~ ELEMENTS OF INCOME TAX

Unit-I: Introduction: Meaning and terms used : Person, Assessee, Previous year, Assessment year, Income, Gross Total Income, Total Income, Agricultural Income, Exempted Income (Concerned only with salary) Residential Status : Rules for determining residential status of Individual, HUF, Firm and Company, Incidence of tax .

Unit-II: Income from Salary : Salary, Allowances, perquisites and retirement benefits, deductions, computation of salary income. Practical problems.

Unit-III :Income from House Property : Annual Value, let out property, self occupied properties, deductions, computation of house property income. Practical problems.

Unit-IV :Income from Business : Depreciation and other permissible deductions, Disallowable expenses, income and expenses of illegal business, computation of Business income. Income from Profession: Computation of Doctors, Lawyers, Chartered Accountants, Civil Engineers, Practical problems.

Unit-V : Capital gains : Meaning of Capital assets, types of capital assets, transfer, selling expenses, treatment of advance money received, exemptions, computation of capital gains. Income from other sources : Specific income, computation of income from other sources, practical problems.

REFERENCES:

1. Vinod K. Singhania :Students' Guide to Income Tax, Taxmann Publications, Kapil Singhania New Delhi.
2. Mehrotra : Income Tax Law & Accounts, Sahitya Bhavan, Agra.
3. Bhagavati Prasad : Law and Practice of Income in India, New Age International Publishers, New Delhi.
4. Dr. Girish Ahuja & : Direct Taxes Bharat Publications, Ravi Gupta
5. Shri. T.N. Manoharan : Direct Taxes, Snow White Publications.

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~~E3~~ (404) COMPANY LAWS

Unit I: Joint Stock Company: Definition and characteristic features of a company, Advantages of incorporating a company, Types of companies - Public and private limited company - privileges of private limited company, conversion of a private limited company into public limited company - secretarial duties.

Unit II: Incorporation Of A Company: Promotion, legal position of a promoter - remuneration, duties, preliminary contracts, position of promoter during preliminary contract, Incorporation of a company - memorandum of association, Articles of association - contents and alteration, Memorandum of association vs. Articles of association, Prospectus - contents - consequences of misstatements in a prospectus, Obtaining certificate of commencement of business.

Unit III: Issue Of Shares: Procedure involved in issue of shares: SEBI guidelines, Allotment of shares, legal provisions and procedure of allotment of shares Secretarial duties; Membership in a company - initiation and cessation of membership Rights and liabilities of members, Share certificates and share warrant - legal rules, formal procedure and contents, Difference between share certificate and share warrants.

Unit IV: Calls, Forfeitures And Transfer Of Shares: Calls on shares, provisions, procedure- secretarial duties, Forfeiture; provisions and procedure - surrender of shares, secretarial duties, Transfer of shares, provisions, procedures, secretarial duties, Transmission of shares, provisions, procedures, Difference between transfer and transmission of shares.

Unit V: Company Meeting: Convening and conducting of meeting - notice and agenda, proper authority, Quorum, Types of meeting and procedures at meetings: Statutory, annual general and extraordinary meeting, Board of directors meeting and committee meetings, Procedures at meeting, Minutes - preparation and approval.

REFERENCES:

1. Kapoor, N.D., **Company Law and Secretarial Practice**, Sultan Chand & Co, New Delhi
2. Majumdar, A.L., and Kapoor, G.K., **Company Law**, Taxmann, Allied Services Private Ltd., New Delhi.
3. Avatar Singh, **Company Law**, Eastern Law Book House, Lucknow
4. Shukla, M.C., and Gulshan, **Company Law**, S.Chand and Co, New Delhi

SEMESTER V AND VI
~~Honours A. Accounting~~ Honours
~~B.Com - 501 (H) 505~~ **CORPORATE ACCOUNTING**

Objectives: To provide the knowledge relating to the Accounting Standards and to enable students to company final accounts.

UNIT-I: Accounting Standards - Valuation of Goodwill and Shares: Accounting Standards - Need and importance - An overview of Indian Accounting Standards. Valuation of Goodwill - Need and methods - Normal Profit Method, Super Profits Method - Capitalization Method Valuation of shares - Need for Valuation - Methods of Valuation - Net assets method, Yield basis method, Fair value method.

UNIT -II : Company final accounts : Preparation of Final Accounts - Provisions relating to preparation of final accounts - Profit and loss account and balance sheet - Preparation of final accounts. Issue of bonus shares-Provisions of company's Act and SEBI guide lines.

UNIT-III: Amalgamation and Absorption: Amalgamation -- In the nature of merger and purchase - Calculation of purchase consideration -Treatment in the books of transferor and transferee (as per Accounting Standard 14, excluding inter- company holdings) .

UNIT-IV: Internal Reconstruction: - Accounting Treatment- Preparation of final statements after reconstruction. Recording of transactions relating to Internal Reconstruction.

UNIT-V: Bank Accounts: Bank Accounts -Books and Registers to be maintained by banks-Slip system of posting-rebate on bills discounted-Schedule of advances -Non performing assets - Legal provisions relating to Preparation of final accounts - Preparation of bank final Accounts .

REFERENCES:

- 1.Principles and Practice of Accounting R.L. Gupta & V.K. Gupta Sulthan Chand &sons
- 2.Accountancy - S.P. Jain & K.L Narang Kalyani Publishers
- 3 Modern Accountancy Vol-II Haneef and Mukherjee Tata Mcgraw Hill co
- 4.Advanced Accountancy Vol-II S.N.Maheshwari & V.L.Maheswari Vikash Publishing co.
- 5.Advanced Accountancy: Shukla and Grewal S.Chand & Co
6. Advanced Accountancy: R.L. Gupta and Radhaswamy Sulthan Chand &sons

B.Com-502 (H-506) INDIRECT TAXES

Unit-I : Central Excise Law :Introduction, meaning of central excise, levy of central excise duty, nature and essential features of excise duty, important definitions- goods, excisable goods, manufacture, manufacturer, wholesale dealer, broker, sale and purchase, factory types of excise duties.

Unit -II : Classification of Excisable Goods :Features of central excise tariff Act- general principles for classification and rules for interpretations.

Unit-III : Valuation of Excisable Goods :Basis for valuation- specific duty-Ad Valorem-duty based on tariff value-duty based on percentage value- duty based on retail sales price, duty based on transaction value-valuation rules- computation of assessable value, computation of excise duty- practical problems.

Unit-IV: General Procedures for Registration- central excise rules- procedure for registration- exemptions from registration certificate, revocation of registration certificate.

Unit-V: CENVAT: Meaning, features, advantages, exemptions for captive use- exemptions for SSI – rate of duty.

References:

1. Balchandram : Indirect Tax, Sultan Chand Publication, New Delhi.
2. Goyal & Merhotra : Indirect Tax. Shitya Bhavan
3. Dinakar Pagare : Sultan Chand Publication, New Delhi.
4. Datey : Indirect Tax, Taxmann Publication, New Delhi.
5. Sareen & Sharma : Indirect Tax, Kalyani Publishers, New Delhi.

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(H)-507 FINANCIAL MANAGEMENT

Unit-I : Nature and Scope of Financial Management : Meaning - scope and significance – finance function –relationship of financial management with other functional areas of business- objectives of financial management: Profit maximization, wealth maximization.

Unit-II : Sources of Finance: Sources of Finance : Classification : Short term, long term, equity, financing and debt financing, kinds of ownership securities, no-par stock, kinds of debentures, differences between share and debentures, self-financing - factoring.

Unit-III : Cost of Capital : Cost of Capital : Meaning and definition- classification- computation of specific cost of capital; cost of equity, cost of debt, cost or retained earnings, cost of preference shares.

Unit-IV : Capitalisation and Capital Structure : Capitalisation : Meaning, concepts and types, theories of capitalization – overcapitalization and under-capitalization; merits, demerits and remedies. Capital Structure and financial structure : Significance of capital structure, Determination of Capital Structure, optimal capital structure, operating and financial average- Point : financial break even point, computation of E.P.S.& evaluation of Financial plans.

Unit-V : Basic Concepts of Working Capital Management : Meaning, definitions- classification, excess and inadequate working capital– determinants of working capital, working capital forecasting of manufacturing and trading concern: balance sheet approach and operating cycle approach – principles of working capital management .

REFERENCES:

1. S.N. Maheshwari : Principles of Financial Management, Sultan Chand & Sons, New Delhi.
2. Sharma & Gupta : Fundamentals of Financial Management, Kalyani Publishers, New Delhi.
3. Vanhorne : Fundamental of Financial Management, PHI, New Delhi.
4. Sharan : Fundamental of Financial Management, PHI, New Delhi.
5. Brigam : Fundamental of Financial Management, South West Publishers, Newyork.

(II)-608 ADVANCED ACCOUNTING

Objectives: To appraise the students about the application of accounting knowledge in special business activities and to develop the skills of recording of transactions relating to issue of shares and debentures, branches and departments.

Unit – I: Hire purchase and installment purchase system: Hire Purchase System - Features – Accounting Treatment in the Books of Hire Purchaser and Hire Vendor - Default and Repossession - Installment Purchase System - Difference between Hire purchase and Installment purchase systems -Accounting Treatment in the books of Purchaser and Vendor

Unit-II : Branch and Departmental Accounts: Dependent Branches: features-Books of accounts- methods of accounting of dependent branches - Debtors System, Stock and debtors system — Recording of transaction relating to branch accounts . Departmental Accounts: need, features, Basis for Allocation of Expenses, treatment of Inter - Departmental Transfer at cost or Selling Price-Treatment of Expenses - Preparation of departmental profit and loss.

Unit-III : Accounting of Non-Profit Organizations:– Accounting process-Preparation of summaries -Receipts and Payments Account, meaning and special features-Procedure for preparation-uses and limitations. Income and Expenditure Account- features, procedure for preparation of Balance Sheet

Unit - IV: Partnership Accounts: Legal provisions in the absence of Partnership Deed - Fixed and Fluctuating Capitals –Preparation of final accounts. – Accounting Treatment of Goodwill and Admission of a partner. Accounting treatment of Retirement and Death of a Partner .

Unit-V : Company Accounts: Issue of Shares at par, Premium and at Discount - Forfeiture and Reissue of Shares-Rights issue (Theory Only) - Recording of transactions relating to issue of shares. Issue and Redemption of Debentures - Redemption out of profits – sinking fund method. Recording of transaction relating to issue and redemption of debentures , Underwriting of Issue of Shares(Simple Problems)

REFERENCES:

- 1.Principles and Practice of Accounting R.L. Gupta & V.K. Gupta Sulthan Chand &sons
2. Accountancy – Tulasian TATA Mcgraw Hill Co
- 3.Accountancy - S.P. Jain & K.L Narang Kalyani Publishers
- 4.Financial Accounting – Dr.V.K.Goyal Excel Books
- 5.Introduction to Accountancy T.S.Grewal S.Chand and CO
- 6.Accountancy – Haneef and Mukherjee tata Mcgraw Hill co
- 7.Advanced Accountancy - Arulanandam Himalaya publishers
- 8..Advanced Accountancy- S.N.Maheshwari & V.L.Maheswari Vikash Publishing co.

(B) 609 ACCOUNTING INFORMATION SYSTEMS

Objectives: The objective of the course is to familiarize the students with the innovations in information technology in the area of financial, cost and management accounting.

Unit I: Financial Accounting System: Financial transactions, Books of original entry – ledger, trial balance, financial statements-profit and loss accounts and balance sheet.

Unit II: Cost Accounting System: Elements of Cost-classification-cost sheet-cost accounting methods and techniques-use of software packages of various types to obtain cost accounting output-analysis of cost-cost center wise-cost element wise-allocation of overheads -preparation of cost sheet.

Unit III: Management Accounting and software packages: Concepts-organization-accounting techniques -use of software packages to obtain different management accounting outputs – fund flow statement-ratio analysis-budget and budget variances projected financial statements-marginal costing

Unit IV: Management Information System: Accounting techniques and reports.

Unit V: Information System Audit: Basic idea of information audit-difference with the traditional concepts of audit –conduct and application of Information System.

REFERENCES:

1. Edwards, Ward, and Bytheway ; The essence of Information Systems
2. Garg and Srinivasan : Work Book on systems analysis and design.
3. Yeats : System analysis and design
4. Goyal : Management Information Systems
5. Timothy J.O'Leary : Microsoft Office 2000
6. Accounting Softwares: Tally, Miracle, Tata Exe etc

(II) 610 RESEARCH METHODOLOGY

Objective: To acquaint the student the methodology for preparing project report, field report or business report in depth study and research.

Unit I: Introduction: Definition Of Scientific Method: Nature & Uses of scientific method. Types Of Scientific Methods: Logical method; inductive and deductive method, statistical methods.

Unit II: Research Methods: Survey Method: Definition-Difference between social research and survey- planning social survey-Limitations and merits. **Case Study:** Definition-Assumptions-Importance- limitations and improvements. **Experimental Method:** Definition-Types of Experiments -merits and limitations.

Unit III: Collection of Data: Design Of Sample: census method of Investigations-sampling method types of sampling-how to select a sample-size of the sample-testing the reliability of sample and uses of sampling. **Schedules:** Definition-purpose -kinds and essentials of good schedule-procedure for framing a schedule -pre-test-advantages and limitations. **Questionnaire:** Types of questionnaires-form of questionnaire-pre-testing problems of response-reliability and validity advantages and limitations.

Unit IV: Data Analysis Techniques: Definitions, characteristics, functions, importance of statistical methods, averages, dispersion, skewness correlation and regression, test of significance for small sample, T-Test; chi square test and time series analysis; Index numbers.

Unit V: Presentation Of Data: Diagrams: Importance-Characteristics and kinds of diagrams (one dimensional: line diagram -simple bars-multiple bars-duo-directional bars-subdivided bars-percentage bars-deviation bars-sliding bars-pyramid diagrams.) **Two Dimensional:** Rectangles-squares-circles. **Three dimensions:** Cubes cylinders- globes pictograms: Cartograms- Sociological maps. **Graphs:** Construction of graphs-presentation of time series-false base linearization scale-frequency graph-cumulative frequency curve zone charts-band **The Report:** Purpose-contents and problems of report writing.

REFERENCES:

1. Wilkinson and Bhandarlar: Methodology and Technique of Social Research, Himalaya Publishing House, Bombay.
2. Clover, V.T. ; Business Research: Basic Principles and Techniques.
3. Goode & Hath : Methods in Social Research.
4. Kothari, C.R. : Research Methodology, New Age International, New Delhi.
5. Rao K.U. :Research Methodology for Commerce, Emerald Publisher, New Delhi.

FIELD WORK/ PROJECT WORK

Candidates offering for dissertation and viva-voce are required to submit a dissertation report under the guidance of one of the faculty members of the department. The report will be on a specified topic in honours paper. The report is to be submitted at the end of the session before final examination. The candidate is expected to know the application of analytical tools and use in actual business problem. The viva -voce examination will be conducted on the basis of the comprehensive dissertation report. It is designed to test the candidate's skill in communication and ability to articulate his/ her idea.

SEMESTER V AND VI

~~Honours B+ Management Honours~~B Com - 501 (H) 505 MARKETING MANAGEMENT

Objective: To provide knowledge of the basic principles of marketing and their application.

Unit I Marketing Concept: Concept, role and importance, Marketing management philosophies, production, product selling, Marketing Mix, Difference between selling and marketing, Consumer behaviour, Factors affecting consumer behaviour, types of buying decision, buying decision process.

Unit II Market segmentation, Designing Products, Brands, Packaging: Market segmentation concept, importance and process. Product concept, Product classification, Product line and product wide – Product life cycle, Product mix decision – Branding and Packaging, its impact, Pricing-method of pricing-adjusting the price of the product, initiating and responding to the price.

Unit III Product Development: New product concept, creativity, innovation, New product development process: New product pricing strategy - business analysis, Test marketing and commercialization.

Unit IV Distribution Management: Concept and importance, types of distribution channel, Channel behaviour and organisation, Channel selection, channel design and Channel management, Factor influencing channel selection.

Unit V Promotional Management: Sales Promotional management- concept, classification, planning of sales promotion, Advertising- concept, objective and budget personal selling- concept and importance, publicity- concept, nature and importance.

REFERENCES:

- (1) Philip Kotler and Gary Armstrong, Principles of Marketing, Prentice Hall of India. New Delhi.
- (2) McCarthy and Pereault; Basic Marketing, McGraw Hill.
- (3) RSN Pillai and Bagavanthi, Modern Marketing, S. Chand
- (4) Pride, William Mand D.C. Ferrell, Marketing, Houghton-Mifflin, Boston.
- (5) SHH Kazmi, Marketing Management, Excel Book
- (6) P.K. Agarwal, Marketing Management, Pragati Prakashan, Meerut

B.Com - 502

(II)-506 HUMAN RESOURCES MANAGEMENT

Unit I: Human Resource Management: Meaning, Importance, Objectives and functions, process, systems and techniques, Role of human resource manager, duties and responsibilities of human resource manager, typical organization set up of human resource department.

Unit II: Human Resource planning, Recruitment, Selection and Placement: Meaning and importance of human resource planning, benefits of human resource planning, Meaning of recruitment, selection, placement- Methods of Recruitment and selection - Uses of tests in selection, problems involved in placement.

Unit III: Training and Induction : Meaning of Training and Induction, objective and purpose of induction, Need for training, benefits of training, identification of training needs, methods of training.

Unit IV: Performance Appraisal and Compensation: Meaning of performance appraisal, objectives of performance appraisal, methods of performance appraisal and limitations. Principles and techniques of wage fixation, job evaluation, compensation - meaning of compensation, objectives of compensation.

Unit V: Promotion and Transfers: Purpose of promotion, basis of promotion, meaning of transfer, reasons for transfer, types of transfer, right sizing of work force. Need for right sizing, impact of globalisation on human resource management, problems in relation to transnational and multinationals.

REFERENCES:

1. DeCenzo, D. A. and Robbins, S. P- Fundamentals of Human Resource Management. John Wiley.
2. Dessler Gary, Human Resource Management- Pearson Education.
3. Ivancevich, John M. - Human Resource Management-Tata McGraw Hill.
4. Monappa, A. and Saiyadain, M. - Personnel Management-Tata McGraw-Hill, New Delhi.
5. Fisher Cythia D., Schoenfeldt Lyle F. and James B. Shaw, Human Resource Management. Bizantra.

B.Gm - 503

(H) 608 INDUSTRIAL RELATIONS

Unit I: Introduction to Industrial Relation: Definition, Concepts, Nature of industrial relations, Importance of industrial relations, Approaches to industrial relations.

Unit II: Collective Bargaining: Meaning of collective bargaining, Concept of collective bargaining, Prerequisites for collective bargaining, the collective bargaining process, Principles of Collective Bargaining, Essential conditions for the success of collective bargaining.

Unit III: Grievance and Industrial Discipline: Meaning & Concept of grievance – causes of grievance – effects of grievance - Grievance redressal procedure, purview of Industrial Employment (standing orders) Act 1946, Discipline, Meaning & Importance, Disciplinary Procedure and domestic enquiry.

Unit IV: Industrial Disputes : Meaning of Industrial Conflicts, Causes of Industrial Conflicts, Types of Industrial Conflicts - Strikes & Lockouts, Machinery for resolving Industrial Disputes under the Industrial Disputes Act 1947, , Arbitration, Adjudication, Prevention of Industrial Conflicts, Approaches to Conflict, Settlement of Conflicts.

Unit V: Collaboration and Workers Participation in Management: Bases of collaboration, Interventions for collaboration. Meaning of workers participation in management, concepts and objectives of workers participation in management, growth and development of workers participation in management, types of workers participation in management.

REFERENCES:

1. Katz, Harry, Thomas A. Kochan, & A. J.S. Colvin, An Introduction to Collective Bargaining and Industrial Relations, 4th Edition, The McGraw Hill Companies.
2. Farnham and Limlott, J., Understanding Industrial Relations, Cassell.
3. C.S. Venkat Ratnam, Industrial Relations: Text and Cases, Oxford University Press, Delhi.
4. Michael Salamon, Industrial Relations: Theory & practice , 4th Edition, Pearsonltigher Education.
5. BD Singh, Industrial Relation, Excel Book

~~B.Com~~ B.Com - 601

~~(H)~~ 608 RETAIL MANAGEMENT

Unit-I: Introduction to Retailing: Importance of retailing in economy; Meaning and nature of retailing; Career options in retailing; Retailing in India: Growth, present size and nature; Technology induction in retailing, Future of retailing.

Unit-II :Types of Retailing: Stores classified by owners; Stores classified by merchandising categories; Wheel of retailing; Traditional retail formats vs. modern retail formats in India; Store and non-store based formats; Cash and carry business - Meaning, nature and scope; Retailing models.

Unit-III :Retailing Regulations and Laws: Regulation of retail institutions in India: Shop and Establishment Act, Labour Laws - Factories Act, Workmen Compensation Act; An overview of the business laws governing retail business in India .

Unit-IV: Management of Retailing Operations: Retailing management and "the total performance model; Functions of retail management; Strategic retail management process.

Unit V: Retail planning: Retail planning - importance and process; Developing retailing strategies, objectives and action plans.

REFERENCES:

1. Newman, Andrew J. and Peter Cullen, Retailing Environment and Operations, Thomson Learning, India.
2. Larson, Carl M., Robert E. Wegand and John S. Wright, Basic Retailing, Prentice Hall, New Jersey.
3. Davidson, William R., Alton F. Doody and Daniel J. Sweeney, Retailing Management, The Ronald Press Company, New York.
4. Cox, Roger, Retailing: An Introduction, Pearson Education.
5. Gilbert, David, Retail Marketing Management.
6. Spector, Robert, Category Killers: The Retail Revolution and Its Impact on Consumer Culture, HBS Press, Boston.
7. Cox, Roger and Paul Brittain, Retailing: An Introduction, Pearson Education Ltd.
8. Gilbert, David, Retail Marketing Management, Pearson Education, New Delhi.

(H)-609 INTERNATIONAL MARKETING MANAGEMENT

Objective: The course intends to familiarise the students with the concept and issues of international marketing and enable them to be able to analyse the foreign market environment and develop international marketing strategies for a business firm.

Unit I. International Marketing: Nature and scope; International Market orientation and involvement; International marketing management process – an overview; International marketing information system.

Unit II. Analyzing International Marketing Environment: Framework for analysing international marketing environment; Geographic, demographic, economic, socio - cultural, political and legal environment.

Unit III. International Product Policy and Pricing : Planning and development of products for foreign markets; Product standardisation vs. adaptation. Pricing in International Markets: Pricing objectives; Determination of International Price; Delivery terms and price quotations; International pricing policies, Strategies; Transfer pricing.

Unit IV. International Distribution and Promotion : Distribution Channels and intermediaries for international markets; Selection, motivation and control of foreign middlemen. International Promotion: Complexities and issues in international promotion; Promotion tool for international markets; Developing the promotion campaign for foreign markets.

Unit V. Emerging Trends in International Marketing: Regionalism v/s Multilateralism; Trade Blocks; Important Grouping in the World; Legal Dimensions in International Marketing (Role of WTO); Marketing Research for Identifying Opportunities in International Markets.

REFERENCES:

1. Cateora, Phillip R., John L. Graham and Prashant Salwan, International Marketing, McGraw Hill.
2. Terpstra, Vern and Ravi Sarathy, International marketing, Harcourt Asia PTE Ltd., Singapore.
3. Onkvisit, S., and J.J. Shaw, International Marketing: Strategy and Theory, Routledge.
4. Keegan, Warran J. and mark C. Green, Global Marketing, 5th Pearson Education.
5. Czinkota, Michael R. and Illka A. Ronkainen, International Marketing, 8th Edition, Cengage Learning.

B. Com - 603

(H)-610 RESEARCH METHODOLOGY

Objective: To acquaint the student the methodology for preparing project report, field report or business report in depth study and research.

Unit I: Introduction: Definition Of Scientific Method: Nature & Uses of scientific method. Types Of Scientific Methods: Logical method; inductive and deductive method, statistical methods.

Unit II: Research Methods: Survey Method: Definition-Difference between social research and survey- planning social survey-Limitations and merits. **Case Study:** Definition-Assumptions-Importance- limitations and improvements. **Experimental Method:** Definition-Types of Experiments -merits and limitations.

Unit III: Collection of Data: Design Of Sample: census method of Investigations-sampling method types of sampling-how to select a sample-size of the sample-testing the reliability of sample and uses of sampling. **Schedules:** Definition-purpose -kinds and essentials of good schedule-procedure for framing a schedule -pre-test-advantages and limitations. **Questionnaire:** Types of questionnaires-form of questionnaire-pre-testing problems of response-reliability and validity advantages and limitations.

Unit IV: Data Analysis Techniques: Definitions, characteristics, functions, importance of statistical methods, averages, dispersion, skewness correlation and regression, test of significance for small sample, T-Test; chi square test and time series analysis; Index numbers.

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REFERENCES:

1. Wilkinson and Bhandarlar: Methodology and Technique of Social Research, Himalaya Publishing House, Bombay.
2. Clover, V.T. ; Business Research: Basic Principles and Techniques.
3. Goode & Hath : Methods in Social Research.
4. Kothari, C.R. : Research Methodology, New Age International, New Delhi.
5. Rao K.U. :Research Methodology for Commerce, Emerald Publisher, New Delhi.

FIELD WORK/ PROJECT WORK

Candidates offering for dissertation and viva-voce are required to submit a dissertation report under the guidance of one of the faculty members of the department. The report will be on a specified topic in honours paper. The report is to be submitted at the end of the session before final examination. The candidate is expected to know the application of analytical tools and use in actual business problem. The viva -voce examination will be conducted on the basis of the comprehensive dissertation report. It is designed to test the candidate's skill in communication and ability to articulate his/ her idea.

SEMESTER V AND VI

~~Honours~~ (C) Banking and Finance Honours
B. Com - 501

(H) ~~505~~ MONEY, BANKING AND INTERNATIONAL TRADE

Unit I: Money: Definition, functions, importance, process of creation and limitation.

Unit II: Monetary standards: Types of monetary system, managed currency, standard method of note issues, value of money and its determination, quantity theory, Fisher and Cambridge equations, income theory.

Unit III: Commercial Bank: Functions and services of a commercial bank, credit creation, balance sheet of a bank, sources of income, types and nationalization

Unit IV: Central Banking: Functions, methods of credit control quantitative and qualitative techniques, objectives of monetary policy, credit policy of R.B.I., credit policy and trends.

Unit V: International Trade: Foreign trade and modern trends in international trade, Gains from trade, terms of trade, Balance of payments, exchange control, IMF and the World Bank.

REFERENCES:

1. Mithani, D.M. : Money, Banking International Trade and Public Finance.
2. Sundharam K.P.M.: Money, Banking, Trade and Finance (Sultan Chand & Sons)
3. Vaish, M.C.: Money , Banking and International Trade, (New Age International Ltd.)
4. D.N.Ghosh : Banking Policy in India, (Allied Publishers)

B.Com. 502

(H) 506 MODERN BANKING

Unit-I : Development Banking : Meaning and nature of Development banking, Development Financial Institutions –IDBI, ICICI, SFCS, SIDBI, EXIM Bank their objective, functions and achievements.

Unit-II : Regional Rural Banks : Structure of RRB, Objectives functions and achievements in developing Indian Economy.

Unit-III : Non-banking finance companies. Definition, regulation, types of deposits, assets of NBFCs, investment norms for NBFCs, SEBI and RBI guidelines.

Unit-IV : Co-operative Banks, Meaning, Structure, Role of Co-operative banks in developing economy regulation of Co-operative banks.

Unit-V : Money and Capital market in India composition, Role of SEBI in developing capital market.

REFERENCES :

1. Srivatsav R.M. : Indian Financial System, Rishi Publications, Varnashi.
2. Khan M.Y. : Indian Financial System, TMH, New Delhi.
3. Ghosh, O.K. : Indian Financial System, Kitab Mahal, Allahabad.
4. Bhole L.M. : Financial Institutions and Markets, TMH, New Delhi.
5. A Raman : Central Banking in India, Bookland, Calcutta.
6. Rama Rao B. : Evolution of Central Banking in India, Vora Publishers, New Delhi.

B.Com. 503

(H) 507 INDIAN FINANCIAL SYSTEM

Objectives: The objective of this course is to familiarise the students with regard to structure, organization and working of financial system in India.

Unit I: Modern Services of the Banks : Changing role of commercial Banking – Modern service like 'e' banking, ATM, issue of credit and debit cards, Green cards etc.

Unit II: Merchant Banking : Meaning, definition, scope, functions and objectives of merchant banking; classifications of merchant bankers; regulation of merchant bankers by SEBI; Management of New Issues; Indian experience.

Unit III: Financial Institutions: NEFI, SFCS, SIDCS, LIC, Mutual Funds, EXIM Bank – Constitution, objectives and functions.

Unit IV: Lease Financing: Meaning, definition and types of leases; advantages and disadvantages, evaluation of lease financing- purchase v/s leasing; borrowing v/s leasing; evaluation from lessor and lessee's point of view.

Unit V: Mutual Funds and Securitisation : Meaning, types, functions, advantages of mutual funds; institutions involved in mutual funds; progress of mutual funds in India; securitization – meaning, objectives, significance and merits of securitization, progress of securitization.

REFERENCES:

1. Meir Kohn: Financial Institutions and Markets, Tata McGraw Hill B.Com. Syllabus -
2. L M Bhole: Financial Institutions and Markets, Tata McGraw Hill
3. Vasantha desai : The Indian Financial System, HPH
4. M Y Khan: Indian Financial System, TMH
5. P N Varshney & D K Mittal: Indian Financial System, Sulthan Chand & Sons
6. E Gardon & K Natarajan: Financial Markets & Services.
7. Nayak, Indian Financial System.
8. Pathak, Indian Financial System.

B.Com - 601
(H) 608-LAW & PRACTICE OF BANKING

Objectives: To familiarise the students to understand the law and practice of banking.

Unit I: Banker and Customer: General and special relationship, Paying Banker: Nature of banking business, negotiable instruments and their characteristics, payment of cheques and protection to the paying banker dishonors of cheques - grounds - payment of cheque and other instruments .

Unit II: Collecting-Banker: Collection of cheques and other instruments-protection to the collecting banks under the negotiable instruments Act - endorsements on cheques. Bills of exchange - different types of endorsements - forged endorsements, holder in due course.

Unit III: Types of Customers and Account holders: Procedure and practice is opening and conducting the accounts of customers particularly individuals including minors - joint account holders. Partnership firms - joint stock companies with limited liability-executors and trustees-clubs and associations joint Hindu family etc.

Unit IV: Services to Customers: Remittance of funds by demand drafts, mail transfers, and telegraph/telex transfers - safety lockers safe custody of articles - standing instructions - credit cards.

Unit V: Principles of Bank Lending: Different kinds of borrowing facilities granted by banks such as Loans, cash credit, overdraft, bills purchased, bills discounted, letters of credit, Types of securities, NPA.

REFERENCES:

1. Saxena, R.M. : Development Banking in India, Vora Publishers, Mumbai.
2. Vinod Batra : Development Banking in India, Printwell Publishers, Jaipur.
3. Tokhi & Sharma : Rural Banking in India, Oxford and IBM, New Delhi.
4. Desai SSM : Rural Banking in India, Himalaya Publishing House, Mumbai.
5. Subramanya, K.N. : Modern Banking in India, Deep and Deep Publishers, New Delhi
6. G.M. Laud : Co-operative Banking in India, Co-operators Book Depot, Bombay.
7. Muranjan, S.K. : Modern Banking in India, Karnataka Publications, Mumbai.

B. Com - 602

FUNDAMENTAL OF INSURANCE

Objective: This course enables the students to know the fundamentals of Insurance.

Unit I: Introduction to Insurance: Purpose and need of insurance; Insurance as a social Security tool; Insurance and economic development.

Unit II: Functions of the agent: Proposal form and other forms for grant of cover; Financial and medical underwriting; Material information; Nomination and assignment; Procedure regarding settlement of policy claims.

Unit III: Concept of Risk: (General Insurance) Loss prevention and Risk Management, Nature and sources of Risk, Classification of risk, Expectation of Loss.

Unit IV: Principles of Life Insurance: Life Insurance In India. Objectives of LIC of India, organizational set up, public and private insurance, companies, types of life policies, Prices of life insurance policies.

Unit V: Practice of General Insurance. Insurance agencies- Intermediaries, Structure of Commission; Pricing of general insurance product, Public and private insurance companies.

REFERENCES:

1. Mishra M.N: Insurance Principles and Practice; S.Chand and Co, New Delhi.
2. Insurance Regulatory Development Act 1999.
3. Life Insurance Corporation Act 1956.
4. Gupta OS: Life Insurance; Frank Brothers, New Delhi.
5. Vinayakam N., Radhaswamy and Vasudevan SV; Insurance- Principles and practice, S.Chand and Co., New Delhi.
6. Mishra MN: Life Insurance Corporation of India, Vols I, II & III; Raj Books, Jaipur.

B.Com - 603

RESEARCH METHODOLOGY

Objective: To acquaint the student the methodology for preparing project report, field report or business report in depth study and research.

Unit I: Introduction: Definition Of Scientific Method: Nature & Uses of scientific method. Types Of Scientific Methods: Logical method; inductive and deductive method, statistical methods.

Unit II: Research Methods: Survey Method: Definition-Difference between social research and survey- planning social survey-Limitations and merits. **Case Study:** Definition-Assumptions-Importance- limitations and improvements. **Experimental Method:** Definition-Types of Experiments -merits and limitations.

Unit III: Collection of Data: Design Of Sample: census method of Investigations-sampling method types of sampling-how to select a sample-size of the sample-testing the reliability of sample and uses of sampling. **Schedules:** Definition-purpose -kinds and essentials of good schedule-procedure for framing a schedule -pre-test-advantages and limitations. **Questionnaire:** Types of questionnaires-form of questionnaire-pre-testing problems of response-reliability and validity advantages and limitations.

Unit IV: Data Analysis Techniques: Definitions, characteristics, functions, importance of statistical methods, averages, dispersion, skewness correlation and regression, test of significance for small sample, T-Test; chi square test and time series analysis; Index numbers.

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3. Goode & Hath : Methods in Social Research.
4. Kothari, C.R. : Research Methodology, New Age International, New Delhi.
5. Rao K.U. :Research Methodology for Commerce, Emerald Publisher, New Delhi.

FIELD WORK/ PROJECT WORK

Candidates offering for dissertation and viva-voce are required to submit a dissertation report under the guidance of one of the faculty members of the department. The report will be on a specified topic in honours paper. The report is to be submitted at the end of the session before final examination. The candidate is expected to know the application of analytical tools and use in actual business problem. The viva -voce examination will be conducted on the basis of the comprehensive dissertation report. It is designed to test the candidate's skill in communication and ability to articulate his/ her idea.

SEMESTER V AND VI

~~HONOURS D: COMPUTER APPLICATION~~ Honours

B.Com- 501

(H) 505 BUSINESS ACCOUNTING SOFTWARE

Unit I: Introduction to Tally fundamentals: – Maintenance of Company Data - Concept of Ledger – Configuration of chart of Accounts – Maintaining Stock Details - How to make entries in Cash book – Purchase book – Sales book – Invoice – Purchase return book – Sales return book – Petty cash book – Configuration in tally.

Unit II: Introduction to Bills :– Details of bills – Description of: Accounting vouchers – Inventory vouchers – Cost centres and cost categories - Entries in Trial balance – How to create new groups – master configuration – Accounts masters– readymade creation.

Unit III: Introduction to VAT: – VAT activation and classification - Creation of leader – Stationary ledger – Display the created ledger – concepts of voucher – Creation of receipt voucher – Payment voucher – Credit note – Remove the voucher – Print the voucher – Accounting input credit on opening stock – Accounting of inter state branch transfer – VAT computation .

Unit IV: TDS Introduction: – Configuration of Tally for TDS - Creation of balance sheets – concept of trial balance in tally – balance sheet – sales registers – purchase registers – sales vouchers – concept of ageing – receivable ageing – TDS Report.

Unit V: Inventory: – concept of inventory – Inventory in tally – creation of stock category – stock groups – creation of multi stock item – inventory vouchers– inventory reports – Printing Reports – Consolidation of Accounts and other reports – Security control.

REFERENCES:

1. Tally, Sridharan, Narmadha publications.
2. E-commerce, a guidance, Rajamalar, Narmadha publications.
3. R.J. Tricker, Management Information and Control System, John Wiley and Sons, 1995.
4. Shyam Sunder, Theory of Accounting and Control , South Western College Publishing, 1997.

B.Com - 502 (H) 506 INTERNET AND WORLD WIDE WEB

Objective: This course aims at familiarizing the students with the basic concepts and ground rules of Internet and the various services it offers, including designing a website, security of data/information on the internet.

Unit I: The mechanism of the Internet: Distributed computing; Client-Server computing; Internet Protocol suite; Protocol stack; Open System Interconnection Reference Model (OSIRM) based on the International Organization of standardization (ISO); TCP/IP protocol suite model.

Unit II :Internet Enabled Services: Electronic mail (E-mail); Usenet & newsgroup; File transfer protocol (FTP); Telnet; Finger; Internet Chat (IRC); Frequently Asked Questions (FAQ); Exploring the World Wide Web.

Unit III: Designing Web Site: WW operations, Web standards, HTML-concept and version; Naming scheme for HTML documents; HTML editor; Explanation of the structure of the homepage; Elements in HTML documents; Tips for designing web pages.

Unit IV : Security of Data/Information: Security; Network security; PINA factor; privacy; integrity, non-repudiation, authentication; SSL; Encryption; Digital signature; Digital certificate; Server security; Firewall; Password; Biometrics; Payment security; Virus protection; Hacking.

Unit V: Web Browsing: Browsers; Basic functions of web browsers; Browsers with advanced facility; Internet explorer; Netscape navigator; Netscape Communicator.

REFERENCES:

1. Agarwal Kamlesh. N. and Agarwal Deeksha: Bridge to the Online Storefront; Macmillan India New Delhi.
2. Agarwal Kamlesh. N. and Agarwal Deeksha: Fatal Click: What to do when Viruses size your computer; Macmillan India New Delhi.
3. Philips Lee Anne: Practical HTML 4; Prentice Hall New Delhi.
4. Douglas E. Corner: The Internet Book; Prentice Hall New Delhi.
5. Minoli Daniel, Minoli Emma: Web commerce Technology Handbook; Tata McGraw Hill New Delhi.
6. Minoli Daniel: Internet & Intranet engineering; Tata McGraw Hill New Delhi.
7. Deitel Harvey M. and Deitel Paul J. and Neito T.R: Complete Internet and World Wide Web programming Training course; Prentice Hall New Delhi.

B.Com. 503

(A) 507 BUSINESS DATA PROCESSING AND SYSTEM ANALYSIS

Unit I: Introduction: Information needs to business types of information required and various levels of management, Decision support system.

Unit II: Data Processing Activities: Data capture, storage retrieval, transformation of data report generation and Communication, Manual Vs. Electronic Data processing, Features of EDP.

Unit III :EDP Resources: Hardware, software data and importance in an effective information system, Contemporary hardware, Components of Computer systems CPU, Primary Memory, Key-Board, Floppy Drives, Controllers, Magnetic Disks, Terminals, Code Readers, MIRC, OCR, CMR, Mouse, Mystich, Light pen scanners, Printers etc.

Unit IV :Computer Software: System Software consisting of operating system, Utilizing programmes, interpreters and compilers. Text processor (word processor) concept and text processing features, introduction to a text processing software package. Desktop publishing (DTP) basic concepts and advantage of using microcomputers for DTP.

Unit V :System Analysis: System Analysis and Design: Problem definition and classification, data collection and analysis system, planning, feasibility and proposal preparation design planning, alternative design consideration.

REFERENCES:

1. French C.S.: Computer Studies (Galotia Book)
2. Rajayaman : Fundamental of Computer (PHI)
3. Kakkar & Vaswani ; Fundamental of Computer Science (Himalaya Publishing House)
4. Donal H. Scanders : Computer in Business (Mc Graw Hill)
5. Ramani K.V. : Introduction to Computer System (PHI)

B.Com - 601
UNIT I: COMPUTER APPLICATIONS IN BUSINESS

Objectives: To enable the students to understand the application of computers in Business environment with an emphasis on Accounting.

Unit – I : Introduction to computers: Definition, Characteristics and limitations of computers - communications – FAX, Voice mail, and information services – E Mail – Creation of email id - group communication – Tele conferencing – Video conferencing – File exchange – Bandwidth – Modem – Network Topologies – Network types LAN, MAN, WAN and their architecture .

Unit – II : Operating System and Windows: Meaning, Definition, Functions and Types of Operating Systems - Booting process – Disk Operating System- Internal and External Commands – Wild Card Characters – Computer Virus, Cryptology, Windows operating system - Desktop, Start menu, Control panel, Windows accessories

Unit – III : MS Office I : MS Word : Word Processing : Meaning and features of word processing – Advantages and applications of word processing, Toolbars – Creating, Saving and closing a document – Opening and editing a document - Moving and copying text – Text and paragraph formatting.

Unit – IV : MS EXCEL : Features of MS Excel – parts of MS Excel window – Saving, Opening and Closing workbook – Insertion and deletion of worksheet – Entering and Editing data in worksheet – cell range – Formatting – Auto Fill – Formulas and its advantages

Unit- V : MS Office II : MS Access - Data, Information, Database, File, Record, Fields- Features, advantages and limitations of MS Access – Application of MS Access – parts of MS Access window – Tables, Forms, Queries and Reports – Data validity checks .

REFERENCES:

1. Information Technology : Dennis P. Curtin, McGraw Hill International
2. Fundamentals of Computers : P. Mohan, Himalaya Publishing House
3. Fundamentals of Computers : Atul Kahate, Tata McGraw Hill
4. Fundamentals of Computers : V. Srinivas, Kalyani Publications
5. E commerce : CSV Murthy, Himalaya Publishing House
6. Raymond Green Law : Fundamentals of the Internet, Tata McGraw Hill

B.Com - 602

(H) 609 MANAGEMENT INFORMATION SYSTEM

Objective: The objective of this course is to acquaint the students about the concept and application of management control system in large organizations and to make them familiar with modern control techniques.

Unit I. Nature of Control Function: Management Control: Nature and Scope, Strategic planning- Concept, Organisation goals and strategies, Organisation structure – Position of controller in the organisation structure.

Unit II . Management Control Process: Programming and budgeting. Preparation of functional budgets and master budget, Budgetary Control- Analysis of variances, Zero base budgeting, Performance budgeting, Analysing and Reporting.

Unit III . Management Control Structure: Types of responsibility centres, Inter - divisional transfer pricing and measurement of divisional performance.

Unit IV . Uses of variance analysis in cost control: Developments in the area of costing for control purposes such as Activity Based Costing – Concept and uses of ABC in management control, Activity Based Management.

Unit V . Accounting Information System: Nature and significance, Control reports and follow -up action, Problems of implementation and administration of Control System.

REFERENCES:

1. Robert N. Anthony and V. Govindrajana, Management Control Systems , 13th ed., Richard D. Irwin, 2006.
2. Joseph A. Maciariello and Calvin J. Kirby, Management Control System, 2nd ed. Prentice Hall, 1994.
3. R.J. Tricker, Management Information and Control System, John Wiley and Sons, 1995.
4. Shyam Sunder, Theory of Accounting and Control , South Western College Publishing, 1997.



B.Com-603

(H-610) RESEARCH METHODOLOGY

50

Objective: To acquaint the student the methodology for preparing project report, field report or business report in depth study and research.

Unit I: Introduction: Definition Of Scientific Method: Nature & Uses of scientific method. Types Of Scientific Methods: Logical method; inductive and deductive method, statistical methods.

Unit II: Research Methods: Survey Method: Definition-Difference between social research and survey- planning social survey-Limitations and merits. **Case Study:** Definition-Assumptions-Importance- limitations and improvements. **Experimental Method:** Definition-Types of Experiments -merits and limitations.

Unit III: Collection of Data: Design Of Sample: census method of Investigations-sampling method types of sampling-how to select a sample-size of the sample-testing the reliability of sample and uses of sampling. **Schedules:** Definition-purpose -kinds and essentials of good schedule-procedure for framing a schedule -pre-test-advantages and limitations. **Questionnaire:** Types of questionnaires-form of questionnaire-pre-testing problems of response-reliability and validity advantages and limitations.

Unit IV: Data Analysis Techniques: Definitions, characteristics, functions, importance of statistical methods, averages, dispersion, skewness correlation and regression, test of significance for small sample, T-Test; chi square test and time series analysis; Index numbers.

Unit V: Presentation Of Data: Diagrams: Importance-Characteristics and kinds of diagrams (one dimensional: line diagram -simple bars-multiple bars-duo-directional bars-subdivided bars-percentage bars-deviation bars-sliding bars-pyramid diagrams.) **Two Dimensional:** Rectangles-squares-circles. **Three dimensions:** Cubes cylinders- globes pictograms: Cartograms- Sociological maps. **Graphs:** Construction of graphs-presentation of time series-false base linearization scale-frequency graph-cumulative frequency curve zone charts-band **The Report:** Purpose-contents and problems of report writing.

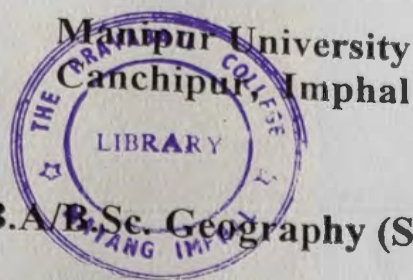
REFERENCES:

1. Wilkinson and Bhandarlar: Methodology and Technique of Social Research, Himalaya Publishing House, Bombay.
2. Clover, V.T. ; Business Research: Basic Principles and Techniques.
3. Goode & Hath : Methods in Social Research.
4. Kothari, C.R. : Research Methodology, New Age International, New Delhi.
5. Rao K.U. :Research Methodology for Commerce, Emerald Publisher, New Delhi.

FIELD WORK/ PROJECT WORK

50,

Candidates offering for dissertation and viva-voce are required to submit a dissertation report under the guidance of one of the faculty members of the department. The report will be on a specified topic in honours paper. The report is to be submitted at the end of the session before final examination. The candidate is expected to know the application of analytical tools and use in actual business problem. The viva -voce examination will be conducted on the basis of the comprehensive dissertation report. It is designed to test the candidate's skill in communication and ability to articulate his/ her idea.



Syllabus for B.A/B.Sc. Geography (Semester System)

1st Year	Semester – I		
	GG : E101	: Introduction to Geography	<i>Marks</i> 100
	Semester – II		
	GG:E202	: Physical Geography	100
2nd Year	Semester- III		
	GG:E303 (i)	: Human Geography	50
	GG:E303(ii)P	: Cartography-I	50 100
	Semester-IV		
	GG: E404(i)	: Population and Settlement Geography	50
	GG:E404(ii)P	: Cartography-II	50 100
3rd Year	Semester-V		
	GG:H505	: Geomorphology	100
	GG:H506	: Geography of India	100
	GG:H507(P)	: Cartography-III	100
	Semester-VI		
	GG: H608	: Economic Geography	100
	GG:H609	: World Regional Geography	100
	GG:H610(P)	: Cartography-IV	100
Total			1000

Unit – I	Nature of geography, emergence of geography as a subject, geography and other disciplines.	20 marks
Unit-II	Contributions of Greek and Arab geographers, contribution of German and French geographers.	20 marks
Unit-III	Geography as the study of environment, man-environment relationship, determinism, possibilism, neo-determinism; Dualism in geography – systematic-regional, physical-human, branches of geography.	20 marks
Unit-IV	Geography as human ecology; Areal differentiation and spatial organization; Concept of region - macro, meso and micro; Recent trends of study geography in India.	20 marks
Unit-V	Cartography and its history; Importance of quantitative techniques; Remote sensing and GIS, field works – physical and socio-economic surveys in geography.	20 marks

Suggested Readings :

1. Abler, Ronald.F. et.al *Geography's Inner Worlds: Pervasive themes in Contemporary American Geography*, Routledge New Jersey, 1992
2. Dikshit R.D.: *The Arts, Science of Geography Integrated Readings*, Prentice Hall of India, New Delhi, 1994.
3. Dikshit R.D. : *Geographical Thought – A Contextual History of Ideas*, Prentice Hall of India Pvt. Ltd. 2000.
4. Dohrs, F.E. and Sommers, L.W.(eds.) *Introduction to Geography*, Thomas Y. Crowell Co., New York, 1967.
5. Hartshorne, Richard : *Perspective on the Nature of Geography*, Rand McNally and Co., Chicago, 1959.
6. Harvey, David: *Explanation in Geography*, Edward-Arnold, London, 1972.
7. Holt-Jensen, A.: *Geography: Its History and Concepts*, Longmans, 1980.
8. Husain, Majid: *Evolution of Geographical Thought*, Rawat Publications, Jaipur, 1984.
9. James, P.E.: *All Possible Worlds: A History of Geographical Ideas*, Sachin Publication, Jaipur, 1980.
10. Johnston, R.J. and Claval, P. (eds.) : *Geography Since the Second World War*, Croom Helm, London/Bernes and Bable, N.J., 1984.
11. Jones, P.A.: *Fieldwork in Geography*, Longmans, 1968.
12. Lownsbury, J.F. and Aldrich, F.T.: *Introduction to Geographical Methods and Techniques*, Charles Merrill, Columbus, 1979.
13. Minshull, R.: *The Changing Nature of Geography*, Hutchinson University Library, London, 1970.
14. Wooldridge, S.W. : *The Geographer As Scientist*, Thomas Nelson and sons Ltd., London, 1956.
15. Singh, R.L. : *Elements of Practical Geography*, Kalyani Pub., New Delhi. 1969.

16. R.P. Misra: *Fundamentals of Cartography*, Prasaranga, University of Mysore, 1969
 17. Barrett E.C. and Curtis : *Fundamental of Remote Sensing and Air Photo Interpretation*, McMillan, New York, 1992.

BA/BSc. 1st Year
 Second Semester

GG: E202 Physical Geography

100 Marks

- | | | |
|----------|---|----------|
| Unit-I | The Solar system and origin of earth; Rocks – their origin and classification; Interior of the earth; Earth movements – organic and epeirogenic; Earthquakes and volcanoes, major land forms. | 20 Marks |
| Unit-II | Weathering, factors affecting weathering; Concept of cycle of erosion; works of running water, wind and glaciers; Karst and coastal regions; Drainage patterns, lakes and islands. | 20 Marks |
| Unit-III | Elements of weather and climate; Composition and structure of the atmosphere; Insolation, heat budget, vertical, horizontal and seasonal distribution of temperature. | 20 Marks |
| Unit-IV | Atmospheric pressure and winds, planetary, periodic and local winds, evaporation, condensation and precipitation; Cyclones and anticyclones; Climatic types and their association with major natural regions. | 20 Marks |
| Unit-V | Configuration of ocean floor; Temperature and salinity distribution of ocean water; Ocean currents, marine deposits, Corals and atolls; Global distribution of major plant and animal communities; Concept of ecosystem and food chain. | 20 Marks |

Suggested Reading :

1. Ahmed Enyat : *Geomorphology*, Kalyani Publishers, New Delhi, 2001.
2. Blomm A.L: *Geomorphology-A Systematic Analysis of Late Canezoic landforms*, Prentice Hall Englewood Cliffs, N.J. 1978.
3. Dayal, P. : *A textbook of Geomorphology*, Sukla Book Deport, Patna 1996.
4. Critchfield, H.: *General Climatology*, Prentice-Hall, New York, 1975.
5. Monkhouse, F.J.: *Principles of Physical geography*
6. Sharma, R.C. and Vatal, M. : *Oceanography for Geographers*
7. Strahler, A.N. & Strahler A.H : *Modern Physical Geography*, John Wiley & Sons revised edition, 1992.
8. Kale, V.S. and Gupta, A. : *Introduction to Geomorphology*, Orient Longman, Kolkata, 2001.
9. Thornbury. W.D.: *Principles of Geomorphology*, Wiley Eastern, 1969
10. Wooldridge, S.W. and Morgan, R.S. : *An Outline of Geomorphology : The Physical Basis of Geography- An Outline of Geomorphology*, Longman Green &Co., London 1959. .

BA/BSc. 2nd Year
Third Semester

GG:E303(I) Human Geography

50 Marks

Unit-I	Nature and scope of human geography, branches of human geography, approaches to the study of human geography :Primitive life style of mankind and subsequent migration.	15 Marks
Unit-II	Division of mankind : spatial distribution of racial and linguistic groups; Human adaptation to the environment (i) cold region - Eskimo, (ii) hot region - Bushman (iii) plateau - Gonds, (iv) mountain - Gujjars, nomads and (v) natural hazards.	20 Marks
Unit-III	Economic activities of mankind: food gathering, hunting, fishing, vegiculture, shifting cultivation; Economic activities in modern society - industry, transport and agriculture, trade and commerce.	15 Marks

Suggested Readings :

1. Bergwan, Edward E: *Human Geography; Culture, Connections and landscape*, Prentice-Hall, New Jersey, 1995.
2. Carr, M. : *Patterns, Process and Change in Human Geography*, MacMillan Education, London, 1987.
3. Fellman, J.L. : *Human Geography-Landscapes of Human Activities*, Brown and Benchman Pub., U.S.A. 1997
4. DeBlij H.J.: *Human Geography, Culture Society and Space*, John Wiley, New York, 1996.
5. Johnston, R.J. (editor) : *Dictionary of Human Geography*, Blackwell, Oxford, 1994.
6. Mc Bride, P.J. : *Human Geography Systems, Patterns and Change in Human Geography*, Nelson, U.K. and Canada, 1996.
7. Michael, Can: *New Patterns: Process and Change in Human Geography* Nelson, 1997.
8. Peter Daniels, Michael B. Denis S. and James, S: *Human Geography*, Pearson Education, Delhi, 2003.
9. Rubenstein, J.H. and Bacon R.S.: *The cultural Landscape-an Introduction to Human Geography*, Prentice hall, India, New Delhi, 1990.
10. Singh, K.N.: *People of India, An introduction*, Seagull Books, 1992.
11. Majid Husain : *Human Geography*, Rawat Publication. Jaipur, 2003
12. UNDP: *Human Development Report*, Oxford University Press, 2001

GG:E303(ii)P Cartography-I

50 Marks

comparative ;

Unit I:

Scale: representative fraction, plain linear, diagonal and
Identification of rocks and minerals, fibers and crops.

10 marks

Unit II:

Methods of showing relief-hachure, shading, contours and layer tints;
Representation of different landforms by contours; Drawing of profiles-cross
and long profiles, superimposed, projected and composite profiles and their
relevance in landform mapping and analysis.

15 marks

Unit III:

Representation of temperature and rainfall data by line and bar graphs. Drawing
of climograph and hythergraph and their interpretation; Interpretation of Indian
weather maps for July and January months; Reading of meteorological
instruments- maximum & minimum thermometers, wet & dry thermometers, rain
gauge, barometer, wind vane and anemometer.

15 marks

Record book

05 marks

Viva -voce

05 marks

Note: Questions are to be set according to the marks allotted to units at the time of
examination.

Suggested Readings :

1. Lawrence, G.R.P. : *Cartographic Methods*, Methuen, London, 1968.
2. Monkhouse, F.J. & Wilkinson, H.R.: *Maps and Diagrams*, Methuen, London, 1994.
3. Robinson A.H.: *Elements of Cartography*, John Wiley & Sons, Newyork, 1998(fifth edition).
4. Singh, R.L. : *Elements of Practical Geography*, Kalyani Pub., New Delhi.1969.
5. R.P. Misra: *Fundamentals of Cartography*, Prasaranga, University of Mysore, 1969
6. Raisz, Erwin: *Principles of Cartography*, Mc Graw-Hill, Newyork, 1962.

GG:E404(i) Population and Settlement Geography

50 Marks

- | | | |
|----------|--|----------|
| Unit-I | Nature and scope of population geography, world population growth, density and distribution; Composition of population: age and sex, rural and urban, economic composition, fertility and mortality with reference to India; Migration – internal and international; Population problems and policies with reference to India. | 25 marks |
| Unit-II | Nature and scope of settlement geography, evolution of settlements, spatial distribution and associated factors; Settlements of rural and urban. | 10 Marks |
| Unit-III | Types and patterns of rural settlements, distribution of rural settlements; Growth of urban settlements, morphology, urbanization trends in the world, functional classification of towns, urban problems and planning. | 15 Marks |

Suggested Readings :

1. Bose Ashish et al : *Population in India's Development* (1947-2000), Vikas, New Delhi, 1974.
2. Chandna R.C.: *Geography of Population*, Kalyani Pub, New Delhi, 2000.
3. Chandna r.C.: *Geography of Population: Concept, Determinants and Patterns*, Kalyani, New Delhi, 2000.
4. Clarke John I : *Population Geography*, Pergarnon Press, Oxford 1973.
5. Crook, Nigel : *Principles of Population and Development*, Pergarnon Press, N.Y. 1977.
6. Garnier B.J. : *Geography of Population*, Longman, London 1970.
7. Mamoria C.B.: *India's Population Problem*, Kitab Mahal, New Delhi 1981.
8. Mitra Ashok: *India's Population: Heading Towards a Billion*, B.R. Publ. Corp. 1991.
9. Srinivasan K. and M.B. Vlassoff : *Population Development Nexus in India : Challenges for the Millenium*, Tata McGraw Hill, New Delhi 2001.
10. Sundaram K.V. and Sudesh Nangia (Ed): *Population Geography*, Heritage, Delhi 1986.
11. UNDP : *Human Development Report*, Oxford University Press, Oxford 2000.
12. Wood R. : *Population Analysis in Geography*, Longman, London, 1979.
13. Carter H. : *The Study of Urban Geography*, Edward Arnold, London, 1972.
14. Rao, VLSP: *Urbanization in India: Spatial Dimensions*, Concept Publication. New Delhi. 1996
15. Singh, R.L. & Singh, K.N.(eds): *Readings in Rural Settlement*, BHU, Vanarasi.
16. Singh, R.Y: *Geography of Settlements*, Rawat, Jaipur, 1998
17. ~~Singh, R.L. & Singh, K.N.(eds): *Readings in Rural Settlement*, BHU, Vanarasi~~

GG : E404(ii)P Cartography-II

50 Marks

Unit I:

Cartographic symbols and their uses: points-dots, proportional circles and spheres, lines- isopleths and flow lines, areas- choropleth.

Use of line and bar graphs for representing population, agriculture, industry and transport data. 15 marks

Unit II: Mean, median, mode, standard deviation, correlation coefficient.

10 marks

Unit III:

Representation of population distribution, density and growth, land use, cropping pattern, industries and transport by cartographic techniques other than line and bar graphs. Interpretation of Survey of India (SOI) topo-sheets of an area in respect of (i) relief, (ii) drainage, (iii) settlement and (iv) communication pattern.

15 marks

Record book

05 marks

Viva-voce

05 marks

Note: Questions are to be set according to the marks allotted to units at the time of examination.

Suggested Readings :

1. Monk house, F.J. : *Maps and Diagrams*, Methun & Co Ltd. , London, 1971.
2. Raizel, Erwin. : *Principals of Cartography* : Me Graw Hill, Newyork, 1982.
3. Elhance, D.N.: *Fundamental of Statistics*, Kitab Mahal, Allahabad, 1972.
4. Robinson A.H. and Sale R.D. : *Elements of Cartography*, John Wiley, New Jersey, 1953. S. Singh, R.L. : *Elements of Practical Geography*, Kalyani Publishers, New Delhi, 1979
6. Birch, T.W. : *Maps : Topographical and Statistical* , Clarendon Press, Oxford, 1949.
7. R.P. Misra: *Fundamentals of Cartography*, Prasaranga, University of Mysore, 1969.
8. Aslam Md.: *Statistical Method in Geographical Studies*, Rajesh Publication, New Delhi, 1976.
9. Pal, S.K. : *Statistics for geoscientists – Techniques and Applications*, Concept, New Delhi, 1998.
10. Gregory S: *Statistical Methods and the Geographer*, Longman S. London, 1963.

GG:H505 Geomorphology

Unit-I	The nature, scope and concepts of geomorphology; Relationship of geomorphology with other branches of earth sciences; Geological time scale.	100 Marks 20 Marks
Unit-II	Earth's interior, Wegener's theory of Continental drift, Plate Tectonics; Earth movements – orogenic and epeirogenic; Types of folds and faults, isostasy, earthquakes and volcanoes, types of mountains.	20 Marks
Unit-III	Rocks and minerals – origin and composition of rocks, classification of rocks; Weathering, formation of regolith and soils, rocks and relief.	20 Marks
Unit-IV	Geomorphic agents and processes, erosion, transportation and deposition; Mass wasting; Evolution of landscape; Concept of cycle of erosion, interruption to cycle of erosion, fluvial, arid, glacial, karst and coastal landscapes.	20 Marks
Unit-V	Applied geomorphology : settlements, transport, land-use, mining, resource evaluation, environmental and assessment.	20 Marks

Suggested Readings :

1. Dayal, P: *A Text book of Geomorphology*, Shukla Book depot, Patna, 1996.
2. Dury, G.H. : *essays in Geomorphology*, Heinmann, London, 1966.
3. Ernst, W.G.: *Earth systems – Process and Issues*, Combridge University Press, 2000.
4. ICSSR : *A Survey of Research in Physical Geography*, Concept, New Delhi, 1983.
5. Kale V. and Gupta, A : *Element of Geomorphology*, Oxford University Press, Calcutta, 2001.
6. Monkhouse, F.J.: *Principles of Physical geography*, Hodder and Stoughton, London, 1960.
7. Pitty. A. : *Introduction of Geomorphology*, Methuen, London, 1974.
8. Sharma, H.S. : *Tropical Geomorphology*, Concept, New Delhi, 1987.
9. Singh, S. : *Geomorphology*, Prayag Pustak Bhawan, Allahabad, 1998.
10. Small, R.J. : *The Study of Landforms*, Mc Graw Hill, New York, 1985.
11. Sparks, B.W.: *Geomorphology*, Longmans, London, 1960.
12. Steers, J.A.: *The Unstable Earth. Some Recent Views in Geography*, Kalyani Publishers, New Delhi, 1964.
13. Strahler, A.N.: *Environmental Geo-Science*, Hamilton Publishing, Santa Barbara, 1973.
14. Strahler, A.N. and Strahler, A.H.: *Modern Physical Geography*, John Wiley & Sons, revised edition 1992.
15. Su mmerfield, M.A. : *Global Geomorphology*, Longman, 1991.
16. Thornbury, W.D. : *Principles of Geomorphology*, Wiley Eastern, 1969.
17. Wooldridge, S.W. and Morgan, R.S. : *The Physical Basis of Geography – An Outline of Geomorphology*, Longman Green & Co., London, 1959.
18. Wooldrige, S.W.: *The Geographer as Scientist*, Thomas Nelson and Sons Ltd. London, 1956.
19. Holmes, A.: *Principles of Physical Geology*, ELBS/VanNostrand Reinhold, 1978 (third edition)

Unit-I

India in the context of south and south east Asia; India: a land of unity and diversity; Structure and relief, drainage, climate and vegetation, natural regions.

20 Marks

Unit-II

Agriculture and agricultural development planning, mineral and power resources, the status of their use and need for conservation; Location and distribution of iron and steel, textile, petrochemical, cement and forest based industries.

20 Marks

Unit-III

Transport and communication, trade and commerce, basis of regional divisions of India – macro, meso and micro – regions of India and planning.

20 Marks

Unit-IV

North East India : structure and relief, climate soils and natural vegetation, resource utilization, population structure and settlement patterns.

20 Marks

Unit-V

Manipur : structure and relief, drainage, climate, soils and natural vegetation, agriculture, mineral and power resources, population, tribes, settlements

20 Marks

Suggested Readings :

1. Deshpande C.D: *India-A Regional Interpretation*, Northern Book Centre, New Delhi, 1992.
2. Farmer, B.H.: *An Introduction to South Asia*, Methuen, London, 1983.
3. Govt. of India: *India-Reference Annual*, 2001 Pub. Div. New Delhi 2001.
4. Govt. of India: *National Atlas of India*, NATMO Publication Division, New Delhi. 1965.
5. Govt. of India: *The Gazetteer of India*. Vol. I & III, Publication division, New Delhi. 1965.
6. Learmonth. A.T.A. et.al(ed): *Man and Land of South Asia*, Concept, New Delhi.
7. Mitra, A.: *Levels of Regional Development India*, Census of India, Vol.I, Part I-A(i) and (ii) New Delhi, 1967.
8. P.Nag and P.Roy : *Geography of India*, Concept Publication, New Delhi 1998.
9. Shafi, M. : *Geography of South Asia*, McMillan & Co., Calcutta, 2000.
10. Singh, R.L(ed): *India : A Regional Geography*, National Geographical Society. India, Varanasi, 1971.
11. Spate, O.H.K. and Lear month, A.R.A.: *India and Pakistan: Land, People and Economy*, Methuen & Co., London, 1967.
12. Valdi ya, K.S.: *Dynamic Himalaya*, University Press, Hyderabad, 1998.
13. Wadia, D.N.: *Geology of India*, McMillan & Co., London, 1967.
14. Kullar, D.: *India- A Comprehensive Geography*, Kalyani Publishers, New Delhi, 2000
15. Singh ,R.P.: *Geography of Manipur*, NBT, New Delhi
16. Taher, M & Ahmed, P.; *Geography of North East India*, Mani-Manil Prakash, Guwahati, 2000.
17. Ansari S.A: *Economic Geography of Manipur*, Trio Book House, Imphal

GG:H507 P Cartography -III

Unit I:	Preparation of cross and longitudinal profiles of streams; preparation of average slope map, block diagram, area height curve, hypsometric curve and drainage frequency and density map.	100 Marks 20 marks
Unit II:	Interpretation of geological maps and drawing of geological sections to show the sequence and relationships of structure with relief.	15 marks
Unit III:	Basic principles of land surveying (i) chain and tape, (iii) prismatic compass and (iv) plane table surveying- radiation, intersection and three point problem.	20 marks
Unit IV:	Map projection: general principles, classification; Draw graticules on the following projections by graphical / mathematical methods with suitable outline maps and their properties and uses : Zinithal orthographic, Stereographic, Equal area and Equidistant projections.	15 marks
Unit V:	Map projection : Conical -Bond's, Polyconic and International projections ; Cylindrical-Marcator's , Gall's and Mollweide projections (construction of suitable outline maps by graphical/mathematical methods and properties and uses of the projections).	15 marks
	Record book	7 marks
	Viva -voce	8 marks

Note: Questions are to be set according to the marks allotted to units at the time of examination.

Suggested Reading :

1. Monk house, F.J. : *Maps and Diagrams*, Methuen & Co Ltd. , London, 1971.
2. Nag.P. : *Thematic Cartography and Remote-Sensing*, concept publication, New Delhi, 1953.
3. Raize , Erwin. : *Principals of Cartography* : Mc Graw Hill, Newyork, 1982.
4. Robinson A.H. and sale R.D. : *Elements of Cartography*, John Wiley and sons, New Jersey, 1985
5. Singh, R.L. : *Elements of Practical Geography*, Kalyani Publishers, New Delhi, 1979
6. R.P. Misra: *Fundamentals of Cartography*, Prasaranga, University of Mysore, 1969
7. Gopal Singh: *Map Work and Practical Geography*, Vikas Publishing House Pvt. Ltd., New Delhi, 1996
8. Pal, S.K. : *Statistics for geoscientists – Techniques and Applications*, Concept, New Delhi, 1998.
7. Steers, J.A.: *Map Projections.*, University of London Press, London.

Unit-I	Definition, nature, scope and recent trends in Economic Geography, its relations with economics and allied subjects, sectors of economy –primary, secondary, tertiary and quaternary.	20 marks
Unit-II	Natural resources : Renewable and non-renewable, biotic and abiotic, conservation of resources; Agriculture-- factors of crop production, major food crops and cash crops of the world.	20 marks
Unit-III	Minerals and Industries : classification of minerals and their world distribution; Industries : factors of localization; Major industries – iron and steel, textile, chemicals, cement, paper, ship building, small scale and cottage industries.	20 marks
Unit-IV	Trade and Transport : geographical factors in their development, water, land and air transport, internal and international trade.	20 marks
Unit-V	Global distribution and concentration of quaternary activities; Disparity between developed and developing countries; India's position in quaternary sector, Impact of globalization and India's economy, role of multinational companies and rise of IT industry in India.	20 marks

Suggested Readings :

1. Boesch, H.: *A Geography of World Economy*, D.Van Nostrand Co., New York, 1964.
2. Chapman, J.D.: *Geography and Energy*, Longman, London, 1989.
3. Gregor, H.F.: *Geography of Agriculture*, Prentice Hall, New Jersey, USA. 1970
4. Griggs, D.B.: *The Agricultural Systems of the World*, Cambridge University Press, New York, 1974.
5. Gordon L. Clark, Maryann, P.F. and Meric, S.G. : *The Oxford Handbook of Economic Geography*, Oxford University Press, New York, 2000.
6. Hartshorne, T.N. and Alexander, J.W.: *Economic Geography*, Prentice Hall, New Delhi, 1986.
7. Ones, C.F. and Darkenwald, G.G.: *Economic Geography*, McMillan Co., New York, 1975.
8. Millar E.: *Geography of Manufacturing*, Prentice Hall, New York, 1962.
9. Raza. M and Agrawal, Y.: *Transport Geography of India*, Concept, New Delhi, 1986.
10. Smith, D.M. : *Industrial Location – An Economic Geographical analysis*, John Wiley, New York, 1971.
11. Thomas, R.S.: *The Geography of Economic Activities*, McGraw Hill, New York 1962.
12. Alexander, J.W.: *Economic Geography*, Prentice hall, 1974.
13. Berry, B.J.L, et at. : *Global Economy*, Prentice hall Englewood Cliffs, New Jersey, 1993.
14. Boesch, H: *A Geography of World Economy*, D.Van Nostrand Co., New York, 1964.
15. Cryson, J. Henry, N., Keeble D. and Martin, R.: *The Economic Geography Reader*, John Wiley & Sons Ltd., Chichester, 2004.
16. Jones, C.F. and Darkenwald, G.G.: *Economic Geography*, Mc Milan Co., New York, 1975.

17. Lee, R. And Wills J. : *Geographies of Economies*, Arnold, London, 1997.
 18. Leong G. C. and Nmorgen, G.C. *Human and Economic Geography*, Oxford University Press, London, 1982.

GG: H-609 : World Regional Geography

Marks: 100

- Unit I: Asia-Terrain, pattern, drainage, climate, natural vegetation, soils, spatial distribution of population and economic base of the continent in general; Regional studies of south and south-east Asia. 35 marks
- Unit II : Europe- Physical, economic and demographic characteristics of the continent; Regional studies of British isles and European Union. 20 marks
- Unit III: North and North America- Physical, economic and demographic setup; Regional studies of USA and Brazil. 15 marks
- Unit IV: Australia and Newzealand and Pacific islands- Physical, economic and demographic set up. 15 marks
- Unit V : Africa- Physical , economic and demographic setup. 15 marks

Suggested Readings :

1. Cole, J.: *A Geography of the World's Major Regions*, Routledge, London, 1996.
2. Cole, J.P. : *Latin America-Economic and Social Geography*, Butterworth USA, 1975.
3. DeBlij, H.J. : *Geography : Regions and Concepts*, John Wiley, New York, 1994.
4. Dickenson, J.P. et at.: *The Geography of the Third World*, Routledge, London, 1996.
5. Dourou, P. : *The Tropical World*, Longman, London, 1980.
6. Jackson, R.H. and Hudman, L.E.: *World Regional Geography: Issues for Today*, John Willey, New York, 1991.
7. Kolh, A.: *East Asia-Geography of a Cultural Region*. Mathuen, London, 1977.
8. Minshull, G.N. : *Western Europe*, Hoddard & Stoughton, New York, 1984.
9. Patterson, J.H.: *Geography of Canada and the United States*, Oxford University Press, 1985.
10. Songquiao, Z.: *Geography of China*, John Wiley, New York, 1994.
11. Ward, P.W. and Miller, A. : *World Regional Geography : A Question of Place*, John Wiley, New York, 1989.

Note: Internet sources may be used for the areas for which books are not available.

GG :H 610 P Cartography- IV

100 Marks

- Unit I: Dumpy level for preparation of road profile and contouring and theodolite for measurement of heights and distances. 20 marks
- Unit II: Remote sensing : orientation of areal photographs under mirror stereoscope , determination of photo scale, identification of objects from the aerial photographs, preparation of base map from the aerial photographs, visual interpretation of satellite imagery for drainage and land use mapping.; Introduction to GIS and GPS. 25 marks
- Unit III: Field work and field report under the guidance of teachers: select any area near the institution or elsewhere, collect topo sheets of the area 1:50,000 scale or satellite image , visit the area and identify the land forms , settlement , land use features and compare the same with the topo sheets and / or satellite image , draw sketches and maps of the selected area; conduct field survey and prepare field report. 40 marks
- Record book 7 marks
- Viva -voce 8 marks

Note: Questions are to be set according to the marks allotted to units at the time of examination.

Suggested Readings:

1. American Society of Photogrammetry : *Manual of remote Sensing*, ASP, Falls Church, V.A. 1983.
2. Barrett E.C. and Curtis : *Fundamental of Remote Sensing and Air Photo Interpretation*, McMillan, New York, 1992.
3. Jefreys, S and John E. : *Geographic Information System – An Introduction*, prentice Hall, New Jersey, 1990.
4. Jones,P.A: *Field Work in Geography*, Longman, London, 1968
5. Luder D : *Aerial Photography Interpretation : Principles and Application*, McGraw Hill, New York, 1959.
6. Monk house, F.J. : *Maps and Diagrams*, Methuen, London, 1967.
7. Nag.P. : *Thematic Cartography and Remote-Sensing*, Concept publication, New Delhi, 1953.
8. Raize I. : *Principals of Cartography* : Me Graw Hill, New ork, 1982.
9. Kanitkar, T.P.: *Surveying and Leveling*, Roorkee University, Roorkee, 1965
10. Robinson A.H. and sale R.D. : *Elements of Cartography*, John Wiley, New Jersy, 1953.

**Manipur University
Canchipur, Imphal**

Syllabus for B.A/B.Sc. General Geography (Semester System)

1st Year

Semester - I		
GG:E101	: Introduction to Geography	Marks 100
Semester - II		
GG:E202	: Physical Geography	100

2nd Year

Semester- III		
GG:E303 (i)	: Human Geography	50
GG:E303(ii)P	: Cartography-I	50
		100
Semester-IV		
GG:E404(i)	: Population and Settlement Geography	50
GG:E404(ii)P	: Cartography-II	50
		100

3rd Year

Semester-V			
GG:G505(i)	: Geomorphology	5 th Semestr	75
GG:G506(ii)P	: Cartography-III		25
Semester-VI			
GG:G607(i)	: Regional Geography of India		75
GG:G608(ii)P	: Cartography-IV	6 th Semestr	25
	Total		600

BA/BSc 3rd Year Geography(General)
Fifth Semester

GG:G505(i) Geomorphology

75 Marks

Unit- I: Nature and scope of geomorphology, development of geomorphic idea, Approaches to the study of geomorphology; Theories of Continental drift, isostasy, tetrahedral and plate tectonic.
30marks

Unit- II: Exogenic processes: concept of gradation, agents and processes of gradation, mountain building, classification of mountains; Geomorphic cycle, interruptions and movement of base level and its expression in landforms development.
30marks

Unit III: Hydrological cycle, runoff, evaporation and percolation, water table and underground water, drainage system and pattern.
15marks

Suggested Readings :

1. Chorley, R.J. : Spatial Analysis in Geomorphology, Methuen, London, 1972.
2. Dayal, P: *A Text book of Geomorphology*, Shukla Book Depot, Patna, 1996.
3. Garner, H.F.: *The Origin of Landscape -A Synthesis of Geomorphology.*, Oxford University Press, London, 1974.
4. Kale V. and Gupta, A : *Element of Geomorphology*, Oxford University Press, Calcutta, 2001
5. Mitchell, C.W. : *Terrain Evaluation*, Longman , London, 1973
6. Singh, S. *Geomorphology*, Prayag Publication, Allahabad, 1998
7. Strahler, A.N. and Strahler, A.H. : *Modern Physical Geography*, John Wiley & Sons, revised edition 1992.
8. Small, R.J. : *The Study of Landforms*, Mc Graw Hill, New York, 1985.
9. Thornbury, W.D. : *Principles of Geomorphology*, Wiley Eastern, 1969.
10. Woodridge, S.W. and Morgan, R.S. : *The Physical Basis of Geography - An Outline of Geomorphology*, Longman Green & Co., London, 1959

G-G:G506(II)P Cartography -III

25 Marks

Unit I : Preparation of drainages frequency and density map; Interpretation of conformity and unconformity geological maps by drawing of geological sections.

8 marks

Unit II : Map projection : Draw graticules on the following projections by graphical / mathematical methods with suitable outline maps with their properties and uses.

9marks

- (a) Zenithal Stereographic and orthographic
- (b) Single cylindrical and cylindrical equal area.
- (c) Mercator's and Mollweide projections.

Unit III : Record book and viva-voce

(4+4)=8 marks

Note: Questions are to be set according to the marks allotted to units at the time of examination.

Suggested Readings:

1. Misra, R.P: *Fundamentals of Cartography*, Prasaranga, University of Mysore, 1969
2. Monkhouse, F.J. & Wilkinson, H.R: *Maps and Diagrams*, Methuen & Co Ltd. , London, 1971.
3. Raize I. : *Principals of Cartography* : Me Graw Hill, New ork, 1982.
4. Robinson A.H. and sale R.D. : *Elements of Cartography*, John Wiley, New Jersy, 1953.
5. Singh, R.L. : *Elements of Practical Geography*, Kalyani Publishers, New Delhi, 1979

GG:G607(i) Regional Geography of India

75 Marks

Unit I : India in the context of South and South East Asia; structure and relief, drainage, climate and vegetation, population characteristics, agriculture, location and type of industries, mineral and power resources.

35 marks

Unit III: North East India – structure and relief, climate, natural vegetation, resource utilization of forest, agriculture, mineral, power, population, tribes and settlement pattern of rural and urban.

20 marks

Unit IV : Manipur – Relief features, climate, soil and natural vegetation, agriculture, forest, power, transport, minerals, population, rural and urban settlements. 20 marks

Suggested Readings:

1. Ansari S.A: *Economic Geography of Manipur*, Trio Book House, Imphal
2. Bhattacharyya, N.N.: *North East India: A Systematic Geography*, New Delhi, Rajesh Publications, 2005.
3. Dickenson, J.P. et al.: *The Geography of the Third World*, Routledge, London, 1996.
4. Ganguly, J.B.: *Urbanization in the North eastern Region: Trends and Policy Implications*, New Delhi, Deep and Deep Publications, 1995.
5. Jackson, R.H. and Hudman, L.E.: *World Regional Geography: Issues for Today*, John Willey, New York, 1991.
6. Kolh, A.: *East Asia-Geography of a Cultural Region*. Mathuen, London, 1977.
7. Songquiao, Z.: *Geography of China*, John Wiley, New York, 1994.
8. Singh, R.L(ed): *India : A Regional Geography*, National Geographical Society. India, Varanasi, 1971.
9. Spate, O.H.K. and Learmonth, A.R.A.: *India and Pakistan: Land, People and Economy*, Methuen & Co., London, 1967.
9. Valdiya, K.S.: *Dynamic Himalaya*, University Press, Hyderabad, 1998.
10. Wadia, D.N.: *Geology of India*, McMillan & Co., London, 1967.
11. Kullar, D.: *India- A Comprehensive Geography*, Kalyani Publishers, New Delhi, 2000
12. Singh, R.P.: *Geography of Manipur*, NBT, New Delhi
13. Taber, M & Ahmed, P.: *Geography of North East India*, Mani-Manil Prakash, Guwahati, 2000.

GG : G507(P)Cartography- IV

25 Marks

- Unit I : Surveying : Chain and tape, plane table and prismatic compass. 7 marks
- Unit II : Field study report based on collected data from the field by the students under the guidance of teachers. 10 marks
- Unit III: Record book and viva voce. (4+4)= 8 marks

Note: Questions are to be set according to the marks allotted to units at the time of examination.

Suggested Readings:

1. Kanitkar, T.P.: Surveying and Leveling, Roorkee University, Roorkee, 1965
2. Misra R.P. : *Research Methodology: A Handbook*, Concept Publishing Company, New Delhi, 1998.
3. Robinson A.H. and Sale R.D. : *Elements of Cartography*, John Wiley, New Jersey, 1953.
4. Singh, R.L. : *Elements of Practical Geography*, Kalyani Publishers, New Delhi, 1979
5. Stoddard, R.H. : *Field Techniques and Research Methods in Geography*, Kendall Hunt, Publ., Dabaque, 1982.
6. Sharma, B.A.N. et al. *Research Methods in Social Sciences*, Sterling Publishers, New Delhi, 1983.



MANIPUR UNIVERSITY
CANCHIPUR: IMPHAL

Syllabus for Bachelor of History
(Semester System)



1ST SEMESTER

Paper – 101: *History of Ancient India from Early Period to 6th Century BC*

2ND SEMESTER

Paper – 201: *History of Delhi Sultanate (1200 – 1526.)*

3RD SEMESTER

Paper – 301: *History of Modern India (1600 – 1857)*

4TH SEMESTER

Paper – 401: *History of Modern Europe (1789 – 1945)*

5TH SEMESTER

Paper – 501(Hons): *History of Ancient India (600 B.C. – 1200 A.D.)*

Paper – 502 (Hons): *History of Mughol India (1526 – 1707)*

Paper – 503 (Hons): *History of Indian National Movement (1885 – 1947)*

6TH SEMESTER

Paper – 601 (Hons): *History of Manipur from 33 AD – 1891*

Paper – 602 (Hons): *History of South East Asia (1800 to 1945)*

Paper – 603 (Hons): *History of America (1766- 1945)*

PAPER - 101

HISTORY OF INDIA FROM EARLY PERIOD TO THE 6TH CENTURY B.C.

Unit - I: Sources of Ancient Indian History

Unit - II: Archaeology - Its Definition, Method and Prehistory

Unit - III: Harappan Culture

Unit - IV: Vedic civilization: Early Vedic and later Vedic

Unit - V: Indian religious movements in 6th Century B.C. (Buddhism and Jainism)

References:

1. REM Wheeler; *The Indus Civilization*, Cambridge
2. Romila Thappar; *History of India Vol-I*
3. R.S. Tripathi; *History of Ancient India*
4. R.C. Majumdar, H.C. Raichandhuri, KK Datta; *An Advanced History of India*
5. SN Sen; *Ancient Indian History Civilization*
6. R.C. Majumdar, *Ancient India*
7. H.D. Sankalia; *Indian Archaeology Today*

PAPER 201

TITLE : HISTORY OF DELHI SULTANATE (1200-1556)

- Unit-I :** Sources of Early Medieval Indian History
- Unit-II:** Ghori's conquest of India: its causes and consequences; Sultanate under Iltutmish, India under the Khaljis and the first two Tughluqs: Economic policies; Political and administrative structure, the Lodhis.
- Unit-III:** Vijayanagar Empire Bahmani Kingdom, administration and socio-economic aspects.
- Unit-IV:** Outline of culture during 13th – 16th Century: Sufism: its main concepts and orders.
- Unit-V:** Bhakti Movement: Leaders of the Movement; its impact.

Reference :

1. Habib, Irfan(ed), Medieval India-Research in the History of India 1200-1750 (Delhi OUP, 1992)
2. Habib, Mohammed Politics and Society in Early Medieval period, Vol I & II Delhi, pptt, 1974
3. Habib, Mohammed and K.A. Mizami (ed) Comprehensive History of India Vol.V A.D. 1206-1526, The Delhi Sultanate Delhi (pptt.1987)
4. Moreland, W.H. Agrarian System of Moslem India, A Historical Essay with Appendices Edn2 (Delhi, Oriental Book)
5. Satish Chandra, Medieval India, From Sultanate to the Mughal, Part I, Delhi Sultanate (1205-1526) Delhi Har Anand, 1977.
6. Habib and Nizami: Comprehensive History of India, Vol.-V.
7. R.P. Tripathi: Some Aspects of Muslim Administration.
8. Yusuf Husain: Some Aspects of Medieval Indian culture.

PAPER 301

HISTORY OF MODERN INDIA (1600 – 1857)

Unit – I: European Commercial Interest

- A. *The Portuguese*
- B. *The Dutch*
- C. *The English & The French*

Unit – II: British Annexation and Consolidation:

- A. *Occupation of Bengal*
- B. *Carnatic War*
- C. *Relations with Bengal, Marathas, Sikhs*

Unit – III: British Expansionist Policies

- A. *Subsidiary Alliance*
- B. *Doctrine of Lapse*

Unit IV: Structure and Administrative Organization of the Company

- A. Regulating Act, 1773; Pitts India Act, 1784; Charter Acts(1793,1813,1833 & 1853)
- B. Civil Services, Army & Police
- C. Judicial Organization

Unit – IV: Revolt of 1857

- A. Causes
- B. Courses
- C. Impact

Readings:

1. H. Dodwell, *Cambridge History of India*, Vol. V, CUP, London, 1936
2. B.B. Misra, *The Administrative History of India*, Oxford, 1970.
3. P. E. Roberts, *History of British India*, London, 1970.
4. B.L. Grover & S. Grover, *A New Look on Modern Indian History*, Sultan Chand & Company Ltd., New Delhi, 1990(reprint).

PAPER, 401

TITLE : HISTORY OF MODERN EUROPE (A.D. 1789-1945)

- Unit-I French Revolution : Emergence of Republic. The Reign of Terror. The Directory 1795-99
- Unit-II Emergence of Napoleon Bonaparte, Expansion, consolidation and Downfall and the Congress of Vienna, 1815.
- Unit-III Social and Political Development 1815-1848 : Metternich-Forces of Conservatism, re-orientation of the old hierarchies, Revolutionary Movements of 1830 and 1848.
- Unit-IV Unification of Italy and Germany (Making of National States. Liberalism and Democracy in Britain
- Unit-V Europe in the I and II world war power blocks and Alliance, and world war I Fascism and Nazism origins of the world war II.

Suggested Reading :

1. Hobsbawm, E.F. Nation and Nationalism
2. Lefevre, George, Coming of the French Revolutions (Princeton university press, 1989)
3. Locus, colin, The French Revolution and making of modern political culture Vol. 2 (Pergamon, 1988)
4. Evan J. The Foundation of a modern state in Europe
5. Modern Europe to 1870 Carlton J.H. Hayes
6. Contemporary Europe Since 1870, Carlton J.H. Hayes
7. David Thompson, Europe Since Napoleon
8. JR Marriot, A History of Europe
9. E. Lipson Europe in the 19th and 20th Centuries 1815-1939 ELBS, 1960.
10. Grant Templary -

PAPER: 501 (HONS)

TITLE : HISTORY OF ANCIENT INDIA FROM THE 6TH CENTURY B.C. TO 12 CENTURY AD

100 marks

- Unit – I:** Period of Mahajanapadas; rise of Magadha, Republics and Monarchies, Iranian and Macedonian invasions and their impact
- Unit –II :** Foundation of the Mauryan Empire –Chandragupta Maurya to Ashok; Dharma of Ashoka; Mauryan Administration; Decline of the Mauryas
- Unit –III:** The Kusans; the Sungas and Satavahanas; the Gupta Empire, Harshavardhan
- Unit-IV :** Chalukyas, Pallavas, Rastrakutas, Cholas, Gujara Pratihara and Palas.
- Unit-V :** Arab conquest of Sindh

Reference books :

1. R.S. Sharma, Ancient India's Past
2. Romila Thapar, History of India Vol.I
3. R.S. Tripathi, History of Ancient India
4. S.N. Sen, Ancient India History and Civilization
5. B.G. Gokhale – Ancient Indian History & Culture Bombay, 1974
6. S.G. Malik – Indian Civilization, Simla, 1968
7. K.M. Panikar – A Survey of Indian History, Bombay , 1974
8. A.L. Basham – The Wonder That was India, London, 1968
9. H.C. Raychandhuri, Political History of India Calcutta, 1965.
10. G.P. Singh – Early Indian Historical Tradition & Archaeology
11. R.C. Mazumdar – Rigvedic Age
12. R.C. Mazumdar – Ancient India
13. K.A.N. Shastri – A History of South India.

● PAPER 502

TITLE : HISTORY OF MUGHAL INDIA A.D. 1526-1707

- Unit-I:** A brief survey of source material; Political conditions of North India in 1526 Babur and the establishment of the Mughal Empire; Humayan and his difficulties; Sher Shah and his administration.
- Unit-II :** **Akbar:** Early problems and difficulties, Regency of Bairam Khan; Rajput Policy; Religious Policy.
- Unit-III :** **Jahangir:** Accession, Court politics, Religious policy, Relations with Rajputs, **Shahajahan:** Expansion in the Deccan, Relations with Central Asia and Iran.
- UNIT-IV:** **Aurangzeb:** The War of Succession, Religious policy, Policy towards the Rajputs, the Deccan policy, Rise of the Marathas, Maratha – Mughal Struggle.
- UNIT-V:** Mughal Administration, Factors responsible for the decline of the Mughal Empire.

Reference :

1. R. P. Tripathi: Rise and fall of the Mughal Empire
2. Anirodha Roy: Some Aspects of Mughal Administration.
3. Mohibbul Hasan: Babur, the Founder of Mughal Empire
4. Habib, Inrfan Agrarian System of Mughal India, 1526-1707 (Mumbai, Asia, 1963)
5. V.A. Smith: Akbar the Great
6. K.A. Nizami: Akbar and Religion
7. S.R. Sharma: Religions Policy of the Mughal Emperors.
8. Satish Chandra: Medieval India, From Sultanate to the Mughals Part II, the Mughal (1526-1750) Delhi.

PAPER 503

HISTORY OF INDIAN NATIONAL MOVEMENT (1885 – 1947)

Unit I: Emergence of Indian Nationalism

- A. Growth of New Ideas
- B. Factors of Indian Nationalism
- C. Growth of Associations

Unit – II: The Early Phase

- A. *Foundation of Indian National Congress*
- B. *The Moderates and the Extremists*

Unit – III: Protest and Communalism

- A. *Partition of Bengal & Swadeshi Movement*
- B. *Communalism- its genesis*
- C. *Home Rule Movement*

Unit – IV: Gandhian Era

- A. *Khilafat*
- B. *Non-Cooperation*
- C. *Civil Disobedience*

Unit – V: The Last Phase

- A. *Quit India*
- B. *INA*
- C. *Partition*

Readings:

1. Bipan Chandra & Others, *India's Struggle for Independence*, New Delhi, 1998.
2. B.R. Nanda, *Essays in Indian Nationalism*, New Delhi, 1978.
3. R. P. Dutt, *India Today*, Calcutta, 1999.
4. Sumit Sarkar, *Modern India*, New Delhi, 1983.

PAPER 601

TITLE : HISTORY OF MANIPUR FROM 33A.D. 1891

HISTORY OF MANIPUR

Unit-I Sources of History

- 1) Pre and Proto History Manipur
- 2) Literary Sources
- 3) Historiography

Unit-II Evolution and expansion of Kingdom

- 1) Nongda Lairen Pakhangba
- 2) Kiyamba
- 3) Khagemba

Unit-III Sanskritisation

- 1) Garibniwaz
- 2) Bhaigachandra

Unit-IV Establishment of relationship with British

- 1) Treaty of 1762
- 2) 7 year Devastation
- 3) Establishment of Political Agency

Unit-V Anglo Manipur war 1891

Reference Book:

- 1) L. Kunjeswori Devi; Archaeology of Manipur
- 2) Lal Dena Edt.; History of Modern Manipur, 1826 – 1949
- 3) Gangmumei Kamei; History of Manipur in Pre-colonial period
- 4) N. Joykumar Singh; Colonialism to Democracy, History of Manipur – 1819-1972
- 5) R.K. Jhalajit Singh; A Short History of Manipur
- 6) J. Roy; History of Manipur
- 7) Lal Dena; British Policy toward Manipur 1762 - 1947

PAPER 602

TITLE: SOUTHEAST ASIA, 1800-1945

Unit - I: Contact with the West.

20 marks

- 1) *Land and people*
- 2) *European Interests.*
- 3) *Patterns of European settlement.*

Unit - II: Anglo Dutch imperialism

20 marks

- 1) *Dutch colonial interest in Java - culture system and ethical policy*
- 2) *British policy in Malaysia*
- 3) *Anglo Burmese relation*

Unit - III: Spanish, USA and French colonial expansion

20 marks

- 1) *Philippines: From Spanish to American rule.*
- 2) *French colonial expansion in Laos, Cambodia and Indo-china (Vietnam)*
- 3) *French colonial administration in Indo-China*

Unit - IV: Thailand's resurgence

20 marks

- 1) *Internal developments*
- 2) *Revolution of 1932 and its impact*
- 3) *Modernization and Westernization*

Unit - V: Growth of nationalist movements

20 marks

- 1) *Filipino nationalist movement*
- 2) *Burmese nationalism between the wars.*
- 3) *Beginnings of nationalist agitation in Indo-China (Vietnam)*
- 4) *Political movements in Indonesia*

TITLE : HISTORY OF AMERICA / USA 1776-1945

- Unit-I:** American revolution : Colonial background sources of conflict, Revolutionary groups and ideological basis; and war of Independence
- Unit-II:** Making of the constitution
- Unit-III:** Sectional conflict and civil war: Emancipation of slavery.
- Unit-IV:** Reconstruction : Presidential; Radical and Congressional plans; the emergence of New South.
- Unit-V:** America between I and II World Wars; Economic Depression and the New Deal; Entry into world war II and its consequences.

Reference :

1. Beard, Charles. An Economic Interpretation of the Construction of the United State (Free Press 1986)
 2. Bojer, Paul. Havand stikoff, Nancy Et.al The Enduring Vision : A History of the American people Vol I and II.
 3. Hofstadter, Richard, The Age Reform, from Bxyan to FDR (Randeom, 1960)
 4. Krisol, Iremy, Godon wood et.al. American continuing Revolution (An Enterprises, 1975)
 5. Randall, James et.al. The civil war and Reconstruction (Health and)
 6. Tripathi, Devijendra and SC, Tiwari, Themes perspective of American History
 7. Hick, John, D. The Federal Union : A History of USA since 1865.
 8. Henry Bamford Parkes: The United States of America.
-

References:

1. John F. Cody; *South Asia: Its historical development.*
2. D.G.E. Hall; *Southeast Asia.*
3. D.R. Sardesai; *Southeast Asia, Past and Present*
4. Brian Harrison; *A Short History of Southeast Asia.*
5. D.J.M.; *The Making of Southeast Asia*
6. Mukherjee; *Southeast Asia*
7. Rich and Allen; *An Introduction to the History of Politics of Southeast Asia.*
8. Housraj; *A History of Southeast Asia*
9. Cambridge; *Cambridge History of Southeast Asia Vol.-II*
10. Harold C. Vinacke; *A History of Far East in Modern Times (Relevant Chapters on southeast Asia)*

Syllabus for History
(Fifth Semester)

- Unit I:- India under the British Crown - Queen's Proclamation.
- Unit II:- Formation of Early Political Associations - Foundation of Indian National Congress;
Evolution of the Nationalist Politics - Moderates and Extremists.
- Unit III:- Partition of Bengal, 1905; Swadeshi Movement.
- Unit IV :- Gandhi's early experiments; Khilafat and Non Co-operation; Civil Disobedience and
Quit India movement,
- Unit V:- Independence and Partition; Cabinet Mission Plan, Govt. of India Act 1947

Textbooks:

1. Sekhar Bandyopadhyay, *From Plassey to Partition - A History of Modern India*, Orient BlackSwan, Hyderabad, 2010
2. Sekhar Bandyopadhyay, *Nationalist Movement in India*, OUP, New Delhi, 2009
3. Bipin Chandra, Mridula Mukherjee, Aditya Mukherjee, K.N. Panikkar & Sucheta Mahajan - *India's Struggle for Independence*, Penguin (latest edition)
4. Sumit Sarkar - *Modern India (1885 to 1947)*, Macmillan, (latest edition)

References:-

1. A.R. Desai - *Social Back ground of Indian Nationalism*, Popular Prakashan, Bombay (latest edition)
2. R.C.Majumdar, H.C. Raychaudhuri & Kalikindar Datta - *An Advanced History of India*.



Sixth Semester

British Relation with North East Indian States

- Unit I:- Capt. Welsh's Expedition (1792) and the British Occupation of Assam.
- Unit II:- Anglo-Manipuri Relation: Treaty of 1762, Treaty of Yandaboo (1826), Anglo Manipuri War (1891)
- Unit III:- Naga Hills expedition and establishment of Colonial administration.
- Unit IV :- Lushai Expedition.
- Unit V:- Khasi Rebellion (1829 – 1833), Revolt of the Jaintias (1860 – 1863)

Textbooks:

1. S.K. Bhuyan – Anglo Assamese Relations, 1771 – 1826
2. E.A. Gait – A History of Assam
3. H.K. Barpujari – Comprehensive History of Assam, Vol. I & II
4. H.K. Barpujari – Problems of Hill Tribes North East India.
5. Lal Dena (ed.) – History of Modern Manipur
6. N. Joykumar – Colonialism to Democracy (History of Manipur from 1819 – 1972)
7. J. Roy – History of Manipur
8. M. Alemchiba – A brief Historical Account of Nagaland
9. Alexander Mackenzie – The North East Frontier of India
10. R.G. Woodthorpe – The Lushai Expedition of 1871 – 1872
11. Dr. Hamlet – The History and the culture of the Khasi People.

SEMESTER - I

Bachelor of Home Science

Theory: 75

FOOD SCIENCE AND NUTRITION

Paper : Hs(E) 101

Unit - I Food groups and Nutrients

15 Marks

Functions and Basic terms of Food and Nutrition, its relation to health, physical development and well-being. Balance diet meaning and definition. Classification, functions, sources, deficiency, digestion, absorption and metabolism of Carbohydrates, Fats, and proteins, Functions, requirements, sources and deficiency of vitamins, Minerals and water

Unit - II Food Preparation and Study of Food Groups

15 Marks

Basic terminology used in food preparation, objectives, methods and effect of cooking for improving nutritional quality of foods - Combination of foods, germination, fermentation and supplementation food group : Basic five and Basic seven food consumer protection : food legislation in India. Standards for ensuring quality of products.

Unit - III Meal planning and Nutritional

15 Marks

Principles, factors and importance of meal planning. Nutrition for mother - Nutritional requirements and diet during normal pregnancy and lactation. Nutrition during infancy - nutritional requirements, weaning and supplementary foods. Nutrition for specific age groups - preschoolers, school children, adolescents and elderly.

Unit - IV Food Habits and Nutrition education

15 Marks

Factors affecting food habits, Food adulteration - type of adulteration and common adulterants, effects of adulteration. Food Poisoning, food allergy, food fads and fallacies, malnutrition - definition, types, causes and prevalence and malnutrition in India. Nutrition education meaning and importance of nutrition education. National organizations (ICAR, ICMR) and international organization (FAO, WHO, UNICEF, CARE) in community nutrition and health.

Unit - V Study of Energy

15 Marks

Body's need for energy - definition of Calorie - determination of energy value of food by bomb Calorimeter - physiological fuel value - of food by bomb Calorimeter - physiological fuel values - B.M.R - Factors influencing measurement of B.M.R. - Total energy requirement and factors influencing - estimation of energy requirements - Indian reference man and woman.

Contd. (2)

SEMESTER - I

Food Science and Nutrition

Bachelor of Home Science

PRACTICAL

Paper : HS(E) 101

Full Marks - 25

1. Finding out deficiency symptoms of kwashiorkor, megaloblastic anemia, beri - beri, goiter, rickets 4 Marks
2. Simple cooking - preparation, serving and calculation of cost - cereals, pulses, vegetables, fruits, milk, egg etc. 4 Marks
3. Planning, Calculation and preparation of a meal (Lunch) for Adult woman / man 4 Marks
4. Planning, Calculation and preparation of low cost diet for under nourished groups childhood stage - early and late childhood 4 Marks
5. Height - Weight measurement : Record your height and weight and score your general nutritional condition by comparison with standards. 4 Marks
6. Notebook 3 Marks
7. Viva - Voce 2 Marks

REFERENCES :

FOOD SCIENCE AND NUTRITION

1. Mudambi Suneti R. Rajgopal M.V., Fundamentals of Food and Nutrition, Wiley Western Ltd., New Delhi.
2. Proffit Fairfax T. & Robinson Corinne H., Normal and Therapeutic Nutrition, Oxford and IBH Publishing Co., New Delhi.
3. Franzier W.C., Food Microbiology, Tata Mac Graw Hill Publishing Co., New Delhi.
4. Shakuntala N. & Shadak Shraswamy M Food facts and principles, New Age International Ltd. New Delhi
5. B. Srilakshmi, Dietetics, New Age International (P) Ltd.
6. Kalia M. and Sood S., Food Preservation and processing, Kalyani Publishers.
7. The Educational Planning Group, Food and Nutrition, Arya Publishing House, New Delhi

BACHALOR OF HOME SCIENCE SEMESTER II

Family Resource Management Theory

Full Mark 75.

Unit I: Meaning and definition of Home Management- function of house, selection of site. Principles of House planning. House plan for different income group. Factors affecting house planning. Building materials for construction. low cost building materials and economy in constructing a house. House wiring electrical fitting and fixtures. Kitchen arrangement-Principles of planning kitchen. types of Kitchen. Functional designing of work areas and storage space management.

15 marks.

Unit II - Resource in the family- Definition, types, factors affecting use of resources, guide to increasing satisfaction from resources. Management process - Meaning and element of the management process, stages of family life cycles, types of family, life style, Qualities of an efficient home maker.

15 marks.

Unit III Motivation in Management - Philosophy, definition, formation, significance, types. Values - importance, sources of values, classification, characteristics, changing of values. Goals: definition, types, goal setting, changing of goals. Standards - definition, significance, classification. Decision making - definition, types of decisions steps in decision making.

15 marks.

Unit IV Interior decoration: - Elements of Art, Types of design, Principles of design. Colour qualities of colour. Prang colour system, colour schemes, emotional effects of colour, use of colour in interior decoration for different rooms. Study of lighting in interior decoration, types of lighting. Floor Arrangement - different types, styles, shapes, principles, method of drying flower and foliage - Floor decoration - Rangoli, Aplana Kolam

15 marks.

Unit V Equipment for the home - Classification of equipment: Factors affecting the selection, use and care of household equipment such as cooking ranges, Oven, Stoves, Pressure Cooker, Refrigerator, Washing Machine, Water heater, Vacuum cleaner, Smokless chulah and Solar Cooker

15 marks.

BACHALOR OF HOME SCIENCE SEMESTER II

Family Resource Management

Practicals:

Marks 25.

1. House plan for different income groups i.e. low income/middle income/high income with diagrams.
4 marks.
2. Planning models of different types of kitchen plans:
4 marks.
3. Visit to families of rural and urban areas to study the work culture and writing a report.
4 marks.
4. Different types of floor decoration and flower arrangement.
4 marks.
5. Care and use of House hold equipment.
4 marks.

Note books – 3 marks.

Viava - 2 marks.

SEMESTER II
Family Resource Management
References

1. Goldstein H., Goldstien V., Art in Everyday life, Modriuan Co., New York.
2. Mullick P., Home Management, Kalyani Publishers, New Delhi.
3. Gross, I.H. I Grandall E. W., Kuall M.M.; Management of Modern Families, Prentice Hall, Inc., New Jersey.
4. Varghese, M.A., Ogale, N. & Srinivason K, Home Management, Wiley Eastern Ltd.
5. Rutt A., Home Furnishing, Wiley Eastern Pvt. Ltd., New Delhi.
6. Deshpande, R.S., Modern Indian Homes to India. United Book Corporation., Pune.
7. Dorsey, Nickell, Management in Family Living, Wiley Eastern Pt. Ltd.
8. The Educational Planning Group, Home Management, Arya Publishing House, New Delhi.

HOME SCIENCE
Paper : HS(E) 303
HUMAN DEVELOPMENT

SEMESTER - III

Total Marks : 100

Theory : 75

Practical : 25

Course Content : Theory

Theory : 75

Unit I : Introduction to Human Development :

Meaning and principles of Human Development, Factors affecting growth and development, influence of heredity and environment on development, stages of Human Development-Prenatal, Infancy, Babyhood, Childhood, Puberty, Adolescence and Adulthood, Beginning of new life, Time table of Prenatal development.

15 marks

Unit II : Development during babyhood :

Characteristic, Development task of babyhood, pattern of physical development, physiological functions, skills of babyhood, emotional behaviour, common play patterns of babyhood, physical and psychological hazards, educational and recreational values of toys, selection of toys for babyhood.

15 marks

Unit III : Early Childhood and Education :

Characteristics, developmental tasks, physical development, physiological habits, skills of early childhood, emotions and emotional patterns, socialization, social and unsocial behaviour patterns, moral development, discipline in early childhood, Pre-school education - meaning, objectives, and goals, types of pre-school, programme planning for a Nursery school

15 marks

Unit IV : Late Childhood and Children with Special Need :

Characteristics, developmental tasks, common emotional patterns of late childhood, social grouping and social behaviour in late childhood, role of disciplines in moral development sex role typing and its effects ; cause and categorization and educational provision for exceptional children.

15 marks

Unit V : Child Welfare Services :

Services for normal children-pre-school education, creche, day care center services for children in difficult circumstances, Institutional and non-institutional, services for economically and educationally handicapped children, Different agencies working for children-Indian council for child welfare, Central social welfare Board, WHO, UNICEF, UNESCO, FAO.

15 marks

Course Contents : Practicals

- | | | |
|----|--|---------|
| 1. | Anthropometries measurement - height, weight head, mid-arm and chest circumference of an infant. Preparation of charts showing the 7 dimension of human development. | 4 marks |
| 2. | Preparation of soft toys- low cost and expensive one. visit to a creche and writing a report. | 4 marks |
| 3. | Planning a weekly programme for a Nursery school. Planning a lesson related to any activities. | 4 marks |
| 4. | Visit to institutions dealing with exceptional children, Planning and emplementing a simple project to any one of the special institution. | 4 marks |
| 5. | Participation in Balwadi / Nursing schools - Informal talk, story telling. | 4 marks |
| 6. | Record | 3 marks |
| 7. | Viva | 2 marks |

References :

1. Hurlock, Elizabeth B, Developmental Psychology, Tata Mcgraw Hill Publishing Company, New Delhi.
2. Diane E Papalia & Sally Wendkos Olds, (2001), Human Development, Tata Mcgraw Hill Publishing Company, New Delhi.
3. Suriyakanthi A. Child Developmen, Kavita Publication, Gandhigram.
4. Devadas, Rajmmal P, A Textbook on Child Development, Mac Millan India Ltd.
5. Chaube S.P. & Chaube A., Child Psychology, Laxmi Narain Agrowal Hospital Road, Agra.
6. Vatsayayan, Developmental Psychology, Kedar Nath Ram Nath, Delhi.

SEMESTER IV

Theory: 75 marks

Bachelor of Home Science

Textile, Clothing & Home Science Extension

Paper: HS (E) 404

Unit I Introduction to textiles

Classification of textile fibers and their properties. Yarns: Meaning and types. Process of yarn spinning - Mechanical and Chemical. Fiber grain, fabric count, fabric length, fabric width, fabric Weight, selvedge. Preparation/Manufacture of vegetable, animal and synthetic fibers.

15 marks

Unit II Weaving & Stitches

Weaving: Types of weaves, Loom and its different parts. Knitting, Non-Woven and decorative. Fabric construction- braiding lacing, Knotting and netting. Stitches- Basic and Embroidery. Selection of fabrics according to age, Fashion, Climate, occupation and occasion.

15 marks

Unit III Fashion Designing and garment technology

Fashion: Fashion Cycle, Trends in India, Terminologies, Fashion Merchandising, Sales and marketing. Methods of taking body measurements, Techniques of pattern making- principles and applications. Basic bodice block. Drafting of Jhangia, jabla, Saree- blouse and nighty.

15 marks

Unit IV Extension Education

Principles and objectives of extensions. Difference between extension education and formal education. Qualities of home science extension worker. Meaning, importance and function of communication. Models of communication, key elements in communication process. Meaning and importance of motivation in extension. Techniques of motivation in extension work. Concept of need. Types of need- felt and unfelt needs,

15 marks

Unit V Extension teaching methods and aids

Selection of effective teaching methods. Planning lessons. Classification of extension teaching methods according to form and use. Individual, group and mass approach. Lecture method, demonstration, discussion, workshop, assignment, special report and field trip. Their advantages and disadvantages. Selection of appropriate teaching aids and their classification- projected and non projected aids, three dimensional aids, display aids, graphical aids and audio aids. General objectives of adult education. Teaching and evaluation methods of adult education.

15 marks.

PRACTICAL

HS (E) 404

Full Marks 25

1. Identification of different fibres by different methods (4 marks)
2. Preparing a scrap book on different basic and embroidery stitches (4 marks)
3. Drafting and stitching of jhangia, jabala, saree blouse and nighty (4 marks)
4. Visit to adult education centers in Manipur and writing a report on it. (4 marks)
5. Demonstration on handling and operation of OHP and writing an assignment on it (4 marks)
6. Practical notebook (3 marks)
7. Viva Voce (2 marks)

REFERENCES

1. Marjory L. Joseph, Introductory to textile science, Holt, Rine wart and Winston. New Delhi.
2. Harriet, M. Mc. Jishmey, Art and Fashion in clothing Selection, Iowa State University Press. USA.
3. Brockam Helen-L., Theory of Fashion Design, John Wiew & Sons, New York.
4. Chakravarty, R.P., A Glimpse on the chemical Technology of Textile Fibers, Caxton Press.
5. Dentkar, Household Textiles & Laundry work, Atma Ram and Sons, Delhi.
6. Dantyagi,S, Fundamentals of Textiles & Their Care, Orient Longman Ltd, New Delhi.
7. Dhahama O.P and Bhatnagar O.P., Education and Communication for Development, Oxford and IBH Publishing.
8. Rathore, O.S., Dhakar, S.D., Chauhan M.S., Ohja S.N., Handbook of Extension Eduacation, Agrotech Publishing academy, Udaipur.
9. Chandha P.C. and Moquemuddin M., Audio Visual Education, Prakash Brothers, Ludhiana.
10. Supe S.V. , An Introduction To Extension Education, Oxford and IBH Publishing.
11. Chandra A, Shah A. & Joshi U. Fundamentals of Teaching Home Science, Sterling Publication, New Delhi.

SEMESTER - V

Bachelor of Home Science

Theory: 100

(THEORY)

H.S(H) 505

FOOD SCIENCE AND NUTRITION

Unit -I Food Microbiology _____

Principles underlying food spoilage and food preservation Introduction to microbes: classification of microbes into their different types and their characteristics - protozoa, algae, fungi, bacteria Importance of food preservation.

General principles of food preservation for arresting microbial growth
-High/low temperature (pasteurization/refrigeration/deep freezing)
-Drying (sun-dryings
-Radiation.

20 Marks.

Unit-II Diet Therapy - _____

Introduction to diet therapy: therapeutic adaptations of the normal diet

- a. Soft diet
- b. liquid diet
- c. bland diet
- d. low fibre diet

Causes, symptoms and principles of dietary management of gastro intestinal disorders/liver disorders -

- a. gastro intestinal disorders:
 - i. Peptic ulcer
 - ii. Ulcerative colitis
 - iii. Diarrhea and constipation
- b. liver disorders:
 - i. viral hepatitis
 - ii. Cirrhosis
 - iii. Hepatic coma
- c. Gall bladder disorder
 - i. Cholecystitis
 - ii. Cholelithiasis

20 Marks.

Unit-III Weight Management and Diabetes Mellitus - _____

Causes, symptoms and principles of dietary management of obesity and over weight

- a. types and causes of obesity
- b. criteria for obesity and overweight
- c. dietary management of obesity
-fats in diet, types of diet, desirable rate of loss of weight
- d. role of exercise
- e. effects of untreated obesity

malnutrition and problems associated
Causes, symptoms and principles of dietary management of diabetes mellitus.

a. diabetes mellitus

i. normal blood glucose level, types of diabetes mellitus

ii. treatment: oral hypoglycemic drugs and insulin

b. food exchange list: its use in diet plan

Causes, symptoms and principles of dietary management of hypertension, coronary heart diseases and renal disorders -

a. hypertension

i. normal blood pressure and types of hypertension

ii. role of sodium/salt in hypertension

iii. role of diet in management of hypertension

b. coronary heart disease

i. I

hyperlipidemias

-types

-role of diet

ii. Atherosclerotic heart disease

-types

-role of diet

-prevention, control of risk factors and life style changes

c. renal disorders

i. glomerulonephritis

ii. nephritic syndrome

iii. acute and chronic failure

iv. importance of dialysis

v. renal calculi

20 Marks

Unit -IV Conditions Requiring Nutritional Support -

Causes, symptoms and principles of dietary management of some of the special conditions requiring nutritional support

a. fevers : short and long

b. anemia - types

c. surgery : pre and post operative care

d. protein-energy malnutrition

20 Marks

Unit-V

Human Nutrition - Human body composition - compositional changes in different stages of life, physiological influence, methods of determining body composition, body composition in relation to basal metabolic rate.

Dietetics - Importance of dietetics, role of food service managers and dietitians.

Therapeutic adaptations to normal diet for consistency, temperature, nutrient and quantity.

Modes of feeding - tube feeding and composition of tube feeding, parenteral feeding, Nutrition and dietary counseling for other health conditions - arthritis, cancer, Gout, Diet management of industrial worker, sports persons, Diet and nutritional care during emergencies.

20 Marks

REFERENCES :

1. M. Swaminathan. Advanced text book on Food and Nutrition Vol.11. The Bangalore printing and publishing Co.Ltd. 88, Mysore Road, Bangalore-5600018.
2. M. Swaminathan 'Hand book Food Science and Experimental Foods. The Bangalore Printing and publishing Co.Ltd.88, Mysore Road, Bangalore-5600018.
3. Raheena Begum, A Text book of Foods, Nutrition and Dietetics. Sterling publishers Pvt.Ltd.
4. W. Shakuntala Manay and Shadakshre Swamy, Foods Facts and Principles, New age International Publishers, New Delhi.
5. Norman. N. Potter, Food Science CBS Publishers and Distributors, New Delhi.
6. Food and Nutrition: The Educational Planning group, Arya Publishing House, 3rd edition, 1991.
7. Profit Fairfax T.P Robinson Corinne H; Normal and Therapeutic Nutrition, Oxford and IBH. Publishing Company, New Delhi-1
8. The Educational Planning group, Food and Nutrition Arya Publishing House, New Delhi-5.

BACHALOR OF HOME SCIENCE SEMESTER V

Family Resource Management

Paper: HS (H) 506

Theory

Total 100 marks.

Unit – I: Management of Time:

Importance; Time plans – Factors to consider, steps and guides controlling and evaluating, Tools in time Management – peak loads, work curve, leisure time, emergency period.

20 marks.

Unit – II: Management of Energy:

Importance of evrgy, evergy cost, effort required in home making activities, Fatigue – tyupes and method to overcome fatigue, work simplification principles and teachniques, Mundel's classes change.

20 marks.

Unit – III: Management of Money:

Family Income, types and sources of income method of handling money, supplemtnting the family income. Family expenditure: Family budget – types, objective, items in the budget, staps in making family budget, Engel's law of consumption, Finalicial records of househod : Savings and investment.

20 marks.

Unit IV: Consumer Education – aim and purpose :

Consumer – definition and role, consumer problems in rural and urban areas, consumerism and its growth, consumer's rights and responsibilities, unfair trade practices – Adulteration, Faulty weight and measures. Sources of consumer information, advertisements, printed information, consumer protection laws, consumer aids. Factors influencing human wants. Buying practices:

20 marks.

Unit V: Application of Management Principles – Experimental house.

a). Recognition of theory in action b). Objective c). Changes d). Organization – I) Position of mager ii) Rotation of duties iii) group finance iv) Manu Planning and work simplification through Menu Planning v) work plans vi) Evaluation in residence course.

20 marks.

References :

1. Nickel P. and Dorsey, J.M. Management in Family living, Wiley Eastern Private Ltd. New Delhi, 1976
2. Cross I.M. and Cradall Management for Modern families.
3. Graig and Rush. Homes with character D.C. Heath and Company Boston.
4. Goldstein H. and Goldstein, Art in every day life Macmillan company, New York. 197.
5. Faulkner R. Faulkner S. Inside Today's Home Stolt Renshaw and Winston New York 1974.
6. Graing, H.T. and Rush G.K. Home with character D.C. Heath and Company, Boston 1962.

SEMESTER - V

Food Science and Nutrition, Family Resource Management
Bachelor of Home Science

PRACTICAL

Paper : HS(H) 507

Full Marks - 100

1. Preparation of the following 6 Marks
 - (a) Jams
 - (b) Sauce
 - (c) Pickles
 - (d) Squash

2. Planning, Calculation & Preparation of a meal (Lunch) 6 Marks
 - (a) Adolescent girl / boy (16 - 18 yrs)
 - (b) Pregnant Woman
 - (c) Lactating Woman

3. Preparation and evaluation of therapeutic adaptations of the normal 6 Marks
 - (a) Liquid diet
 - (b) Soft diet
 - (c) Bland diet

4. Planning, Preparation and calculation of the following therapeutic diets with emphasis according to related disorders 6 Marks
 - (a) high protein
 - (b) low protein
 - (c) high calorie
 - (d) low calorie
 - (e) high fibre
 - (f) low fibre
 - (g) low fat
 - (h) high iron
 - (i) low sodium

5. Planning, and calculation for the following disorders 6 Marks
 - (a) Gastro intestinal disorders : peptic ulcer, diarrhea, constipation
 - (b) Liver disorders : jaundice - mild / severe
 - (c) Renal disorders : acute nephritis / acute nephrosis
 - (d) Fever : short and long duration

6. Preparation a model family budget for a family 6 Marks

Contd. (2)

7. Problems of consumers - adulteration of food detecting mal - practices in weights and measures ————— 6 Marks
8. Analysing activities in the house / lab, to study pathway chart, record of time study 6 Marks
9. Planning of time for college student - weekly, daily 6 Marks
10. Residence stay for one week incorporating principles of resource management, housing and equipment, and principles of interior decoration, as the practical with internal and external assessment 6 Marks
11. Notebook ————— 10 Marks
12. Record and Report Writing 10 Marks
13. Classwork 10 Marks
14. Viva - Voce 10 Marks

HOME SCIENCE

Paper : HS (II) 608

Adolescence, Dynamics of Marriage and Counselling :

Theory : 100 marks

Unit -I Adolescence :

Characteristics, developmental tasks, Emotionality during adolescence, social change during adolescence, sex interest and sex behaviour during adolescence, sex role typing and its effects on adolescence, sex education, family relationships during adolescence, body changes - changes in body size, changes in body proportion, development of primary and secondary sex characteristics.

20 marks

Unit-II Adulthood :

Early adulthood - characteristics, changes in interest, sex role adjustments personal and social hazards, success of adjustment to adulthood; middle adulthood - characteristics, adjustment to physical changes, adjustment to mental changes, personal and social hazards, vocational and marital hazards ; old age - characteristics, adjustment to physical changes, changes in physiological functions, adjustment to retirement and loss of spouse, problems of old age.

20 marks

Unit-III Marriage and Family :

Meaning, definition, types, motives and functions of marriage; Readiness for marriage - Physiological, social psychological and economical, selection of life partner, marital adjustment, divorce and its effects on man and woman ; customs, traditions and marriage ritual in different community ; Planning for parenthood ; Family - main interpersonal relations in the family ; parent and child relationships , husband and wife relationship.

20 marks

Unit -IV Guidance and counselling :

Definition, nature and need types of guidance, need for guidance at various levels of education, history of guidance movement in India, Description, application and utility of different techniques of guidance - observation, questionnaire, interview and self report technique ; guidance services in schools with special reference to secondary level ; characteristics of a good counsellor.

20 marks

Unit -V Intervention Programme for Family and Community :

Theoretical orientation in planning intervention programme for young children, Meaning, need, scope and objectives of parent and community intervention. Methods of parent education, Approaches and techniques in parent and community education, Need for family life education, Infant Stimulation - need and scope for stimulation, Brain growth and effect of stimulation on development of infants, Factors to be considered in developing, implementing and evaluating intervention programmes.

20 marks

References :

1. Elizabeth B. Hurlock, 2001, Developmental Psychology : Tata McGraw Hill Publishing Co., New Delhi.
 2. Diane F. Papalia & Sally Wendkos Olds, (2001). Human Development, Tata McGraw Hill Publishing Company, New Delhi.
 3. Narayan Rao, 1981, Counselling Psychology : Tata McGraw Hill Publishing Co., New Delhi.
 4. Coleman, 1988, Abnormal Psychology and Modern life : D.B. Taraporevala Sons & Co. Pvt. Ltd.
 5. Landis and Landis, 2nd edition, 1953, Marriage and Family, Building a successful marriage: Prentics Hall INC Eaglewood Cliffs N.J.
 6. Kapadia M.M., 6th edition, 1981, Marriage and Family in India : Oxford University Press, Delhi / Bombay/ Madras.
 7. Freeman, Theory and Practice of Psychological Testing : Oxford & Publishing Co., New Delhi, Bombay, Culcutta.
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Unit I Dyeing, Printing and Finishing.

Dyes: Meaning, history and classification. Suitability of different dyes to different fabrics. Dyeing different methods- plain dyeing, different types of tie and dye. Difference between dyeing and printing. Types of printing—direct (block, stencil, screen) resist (batik), discharge printing. Finishing: meaning, needs and classification on the basis of degree of permanence (permanent, durable, semi durable and temporary) and on the basis of textile processing (chemical and mechanical)

20 marks

Unit II Traditional Textiles and Embroideries of India

History of Indian Textiles and Embroideries. Textile- Muslins, Dacca Sarees, Brocade, Chanderi Sarees. Baluchar Buttedar, Paithani and Pitambar, Patola, Bandhanis, Kalamdar. Embroidered Fabric—Phulkari, Chamba Roomals, Kanthas, Kasheeda, Namdas, Chikankari. Some traditional Textiles and Embroideries of Manipur.

20 marks

Unit III Stain Removal and Laundry

Stains: classification, principals of stain removal, stain removing reagents and its uses on different fabric. Identification and techniques of Removal of various stains. Laundry: principals of laundering, materials and equipment use in laundry. Laundry agents: Definition, properties and effect of soaps and detergents on cleaning of different fabric. Laundering process of cotton, wool and silk.

20 marks

Unit IV Leadership in Extension and Extension Programme Planning

Theories of leadership, identifying local leaders in extension works. Community development- concepts, objectives and essential elements. Panchayati Raj- concept structure and functions. Extension programme planning- meaning, importance, principles and process. Developing plan of work and its factor to be considered. Evaluation- meaning, purposes and characteristics.

20 marks

Unit V Social Survey and Social Organization

Social survey- meaning, importance, types and steps involved. Tools of data collection- questionnaire, observation, interview and schedule. Data analysis by calculating percentage. Development programme – need, importance and objectives. IRDP, ICDS, NAEP, DWACRA, TRYSEM.

20 marks

References:

1. Vani K.T., Fancy Weaving mechanism, Mahajan Book Distributors, Ahmadabad
2. Banarjee N.N., Non woven Manufacture ,Smt. T. Banerjee, Berhampore, West Bengal
3. Corbman Bernard P, Textiles Fibre to Fabric, Greggy Division, Mc Graw Hill Book Co, USA
4. Singh K, Rural Sociology, Prakashan Kendra, Lucknow
5. Roy, G L, Extension Communication and Management
6. Bajpai, S R , Social Survey and Research, Kitab Ghar,Kanpur, UP
7. Mukherjee , N. < Participatory Rural Appraisal and Questionnaire Survey, Concept Publishing Co., New Delhi

HOME SCIENCE

Paper : HS(H) 610

Human Development, Textile clothing and Extension Education : Practical - 100 marks

- | | | |
|-----|--|----------|
| 1. | Study of problems of old age Visit to old aged home and writing reports. | 6 marks |
| 2. | Project work (on any one) | 6 marks |
| | a) Counselling | |
| | b) Marriage | |
| | c) Family | |
| 3. | Seminar on adolescent problems. | 6 marks |
| 4. | Classroom discussion with resource person : on Marriage laws, Dowry laws, Family laws. | 6 marks |
| 5. | Study of interest, values and extracurricular activities, media consumption, prejudice / gender stereotype, self concept of adolescence. | 6 marks |
| 6. | Study of different types of dying and printing. | 6 marks |
| 7. | Preparing an album on traditional textiles and embroideries. | 6 marks |
| 8. | Removal of different types of stains on different fabrics. | 6 marks |
| 9. | Conducting a social survey in a village and writing a report. | 6 marks |
| 10. | Visit to different Home Science Colleges and writing a report on it. | 6 marks |
| 11. | Record | 10 marks |
| 12. | Practical Note books | 10 marks |
| 13. | Articles prepared during the course. | 10 marks |
| 14. | Viva-voce | 10 marks |

— X —

Manipur University: Canchipur

B.A. Syllabus: Manipur

1. M.I.L. 1: Sheireng, Wareng amasung Grammar
2. M.I.L. 2: Drama, Novel amasung Warimacha

M.I.L. 1: Sheireng, Wareng amasung Grammar

100 Marks

1. Sheireng:

25 Marks

Lamabam Kamal	:	Chandranadi
Khwairakpam Chaoba	:	Ningkhaire
Elangbam Nilakanta	:	Kadomdano Lambisibu
Laishram Samarendra	:	Ingagi Nong
Sribiren	:	Laireibakki Momon Minok
Arib Sheireng	:	Yakeiba

2. Wareng:

25 Marks

Khwairakpam Chaoba	:	Kabi
Ashangbam Minaketan	:	Androgi Mei
S. Krishnamohon	:	Laan
Manisna Shastri	:	Fajaba
Chongtham Manihar Singh	:	Lai Haraoba
I.R. Babu	:	Brindaban-gi Lambida

Tamgadaba Lairiksing:

1. Canchi Sheireng, 2000, Imphal, Manipur University, Canchipur
2. Manipuri Sheireng, 1988, Imphal, Manipuri Sahitya Parishad
3. Canchi Wareng, 1999, Imphal, Manipur University, Canchipur
4. Apunba Wareng, 1986, Imphal, Manipur University, Canchipur
5. Manipuri Wareng, 1986 (2 suba khutnam), Imphal, The Cultural Forum, Manipur.

1. Grammar:

a. Phonology:

10 Marks

- i. Vowel
- ii. Consonant, Clusters, Sequence
- iii. Tone
- iv. Syllable

2. i) Morphology:

10 Marks

- a. Morpheme
- b. Roots
- c. Affixes
- d. Word Formation: Affixes, Compounding

ii) Syntax

10 Marks

- a. Case
- b. Clause
- c. Sentence Types (Functional): Negation, Interrogative, Imperative

3. Manipuri Composition:

- i. Essay 10 Marks
- ii. English-tagri Manipuri-da handokpa 5 Marks
- iii. Comprehension 5 Marks

Mateng Lougadaba Lairik:

1. P.P. Thoudam : Remedial Manipuri
2. Wangkheimayum Tomchou Singh : A Study of Meitei Phonology
3. M.S. Ningombam : Meitei Lonmit
4. Ch. Yashawanta Singh : Manipuri Grammar
5. P. Modhubala Devi : Manipuri Phonology

M.I.L. 2: Drama, Novel amasung Warimacha

100 Marks

1. Drama: 25 Marks
Chengni Khujai : G.C. Tongbra
2. Novel 25 Marks
Laman : Hijam Guna Singh
3. Parishad-ki Khangatlaba Warimacha: 30 Marks

Tamgadaba Warimachasing

- (a) Inthokpa : Rajkumar Shitaljit Singh
- (b) Karinunggino : R.K. Elangbam
- (c) Liching : Nongthombam Kunjamohan Singh
- (d) Tatkhraaba Pungsi Leipun : Nilbir Shastri

4. Anubad Sahitya:

20 Marks

Kapalkundla : Ayekpam Shyamsundar Singh

ELECTIVE (Manipuri)

- E (101) : Sheireng amasung Sanda Alangkar
E (202) : Novel amasung Warimacha
E (303) : Introduction to Linguistics and Manipuri Language
E (404) : Sahitya Neinarol

E (101) : Sheireng amasung Sanda Alangkar

a) Manipur University : Canchi Sheireng

b) Naharol Sahitya Premi Samiti : Atoppa Khonjel

1. Sheireng :

60 Marks

Tamgadabasing

Lamabam Kamal	:	Nirjanta
Khwairakpam Chaoba	:	Tonu Laijinglembi
Ashangbam Minaketan	:	Kamalda
Elangbam Nilakanta	:	Lammangnaba
Laishram Samarendra	:	Khul Amagi Wari
Thangjam Ibopishak	:	Bhoot Amasung Maikhum
Yumlembam Ibomcha	:	Jagoi Jagoi
M. Barkanya	:	Mongfamgi Minok

2. Sanda Alangkar:

i) Manipuri Kabitagi Sanda

15 Marks

ii) Alangkar

15 Marks

a) Anupras, b) Jamak, c) Shlesh, d) Rupak, e) Upma, f) Bakrokti, g) Byatirek, h) Samasokti, i) Atishyokti, j) Utpreksha, k) Pratip, l) Nidarshan, m) Birodhabhas

Mateng Lougadaba Lairik:

1) Elangbam Nilakanga	:	Manipuri Kabitagi Sanda
2) Gokul Shastri	:	Sahityagi Mingshel, Part 1-2
3) Dwijamani Dev Sharma	:	Alangkar Shastra
4) O. Ibochaoba Singh	:	Manipuri Kabya-Kanglon
5) Brajabihari Sharma	:	Alangkar Koumudi

E (202) : Novel amasung Warimacha

100 Marks

a) Novel

60 Marks

1. Khwairakpam Chaoba Singh	:	Labangalata
2. Hijam Anganghal Singh	:	Jahera
3. Loitongbam Pacha Meetei	:	Imphal amasung Magi Ishing Nungshitki Fivam

b) Warimacha

40 Marks

Tamgadaba Lairikshing:

i) Canchi Warimacha	:	Manipur University
ii) Anouba Manipuri Warimacha	:	The Cultural Forum, Manipur

Tamgadaba Warimachasing:

i) M.K. Binodini Devi	:	Shagol Sanaabi (Canchi Warimacha)
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- ii) Khumanthem Prakash Singh : Kanagi Mantri (Anouba Manipuri Warimacha)
- iii) Elangbam Dinamani Singh : Kanagi Mantri (Anouba Manipuri Warimacha)
- iv) Yumlembam Ibomcha Singh : Nongthak Khongnang (Anouba Manipuri Warimacha)
- v) Keisham Priyokumar Singh : Nongdi Tarakkhidare (Canchi Warimacha)
- vi) Lamabam Birmani Singh : Kwakki Macha Kwak, Urokki Macha Urok (Anouba Manipuri Warimacha)

- E (303) : Introduction to Linguistics and Manipuri Language 100 Marks
- a) Introduction to Linguistics: 50 Marks
1. Language: 10 Marks
- i. Definition
 - ii. Theories of Origin of Language
 - iii. Key-Properties of Language, Animal and Human Communication
2. Linguistics:
- i. Definition
 - ii. Descriptive Linguistics
 - iii. Historical Linguistics
 - iv. Comparative Linguistics
3. Phonology: 15 Marks
- i. Phone, Allophone, Phoneme
 - ii. Segmental Phoneme, Supra Segmental Phoneme
 - iii. Minimal Pair, Contrast
 - iv. Free Variation
4. Morphology: 15 Marks
- i. Morph, Morpheme, Allomorph
 - ii. Root
 - iii. Affixes
- b) Manipuri Language: 15 Marks
- Vowel, Consonant, Diphthong, Consonant Cluster, Tone, Root, Syllable, Word, Word Formation, Affixes, Sentence type (structural): Simple, Complex, Compound.

Mateng Lougadaba Lairik:

- 1. Charles P. Hockett : A Course in Modern Linguistics
- 2. W. Tomchou Singh : A Study of Meitei Phonology
- 3. H.D. Sharma : Language and Phonology
- 4. Benedict Paul : Sino-Tibetan A Conspectus
- 5. Victoria Fromkin : An Introduction to Language
- 6. P.C. Thoudam : Remedial Manipuri
- 7. M.S. Ningomba : Meiteilongi Lonmit
- 8. George Youle : The Study of Language

9. Pushpinder Syal and D.V. Jindal : An Introduction to Linguistics, Language, Grammar and Semantics
10. Ch. Yasahawanta Singh : Manipuri Grammar
11. P. Modhubala Devi : Manipuri Phonology

E (404) : Sahitya Neinarol 100 Marks

i) Bharat: 50 Marks

- a) Kabya amasung mashigi makhal : Kabyagi Sampradaising
b) Rash Sampradai
c) Alangkar Sampradai

ii) Nongchup: 50 Marks

- a) Critical amasung mashigi mathou
b) Anganba matamgi criticism (Aristotle) : Poetics
c) Romantic criticism (Wordsworth) : Preface to the Lyrical Ballades
d) S.T. Coleridge : Biographia Literaria (Book-xii-xiii)
e) T.S. Eliot : Tradition and Individual Talent

Mateng Lougadaba Lairik:

- | | |
|----------------------------|----------------------------------|
| 1. G. Jijaybardhan | - An Outline of Sanskrit Poetics |
| 2. Gokul Shastri | - Sahitya Mingshel, Part 1-2 |
| 3. Dwijamani Dev Sharma | - Sahitya Mimangsa |
| 4. Elangbam Dinamani Singh | - Bharatki Kabya Shastra |
| 5. W.H. Scott James | - The Making of Literature |
| 6. Dr. I.R. Babu Singh | - Uropeki Sahitya Neinarol |
| 7. DJ Enright and Chickera | - English Critical Text |
| 8. S.T. Coleridge | - Biographia Literaria |

HONOURS

- H (505) : Kabya amasung Drama
H (506) : Bharatki Anubad Sahitya
H (507) : Manipuri Sahityagi Itihas
H (508) : Ariba Manipuri Sahitya
H (509) : Manipuri Culture
H (610) : Folkloristics and Manipuri Folklore

H (505) : Kabya amasung Drama 100 Marks

- | | | |
|---|--|----------|
| 1. Hijam Anganghal | : Khamba-Thoibi Sheireng
(San Senba, Kang sannaba) | 20 Marks |
| 2. S. Nilbir Shastri | : Khongjom Tirtha | 20 Marks |
| 3. The Cultural Forum, Manipur (fongba) | : Manipuri Lilamacha
Tamgadabasing:
Tomchou – Bus Stop
Kanhailal – Tamnalai | 20 Marks |
| 4. Arambam Samarendra | : Judge Sahebki Imung | 20 Marks |
| 5. Haobam Tomba | : Tamna | 20 Marks |

H (506) : Bharatki Anubad Sahitya 100 Marks

Drama

- | | | |
|-------------------------|-----------------|----------|
| 1. E. Dinamani (Anubad) | - Ingagi Nongma | 30 Marks |
|-------------------------|-----------------|----------|

Novel

- | | | |
|----------------------------------|----------------------------|----------|
| 2. A. Shyamsundar Singh (Anubad) | - Shrikant (Ahanba sharuk) | 30 Marks |
|----------------------------------|----------------------------|----------|

Warimacha:

- | | | |
|-----------------------------------|--|----------|
| 3. i) Dr. S. Tomba Singh (Anubad) | - Bharat Sahityagi Warimacha:
Bholaramgi Thawai, Awabagi marup Nungaiba | 25 Marks |
|-----------------------------------|--|----------|

- | | |
|------------------------------|--|
| ii) A. Kumar Sharma (Anubad) | - Hindi Warimacha:
Pukchel Chaobagi Dandi, Maithibagi Joy |
|------------------------------|--|

Sheireng:	15 Marks
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- | | |
|--|--|
| 4. The Cultural Forum, Manipur (fongba)-
Tamgadabasing- | Bharatki Khangatlaba Sheireng:
Karna Kunti Sangbad, Madhushala, Brischikki
Ahing |
|--|--|

H (507) : Manipuri Sahityagi Itihas: 100 Marks

- | | |
|---|----------|
| 1. Lon, Matam khaiba amasung Anganba Matam: | 50 Marks |
| i) a) Manipuri Longi Mashak | |
| b) Manipuri Sahityagi Matam Khaiba | |
| ii) Anganba Matam: | |
| a) Anganba Matamgi Sahityagi mashak | |

- b) Hiram, Lon Amasung Khut-E
- iii) Mayai Chanba amasung Anouba Matam 50 Marks
- i) Mayai Chanba Matam (18 amasung 19 suba Chahicha):
- a) Manipuri Sahityada Hinduismgi Ithil
- b) Sahityagi Makhal, Lon amasung Khut-E
- ii) Anouba Matam:
- a) Anouba Matamgi Manipuri Sahityagi Ichel
- b) Sahityagi Machalsing (Genre sing)
- c) Bharat amasung Nongchuplomgi Sahityagi Ithil

Mateng Lougadaba Lairiksing:

- | | | |
|---------------------------|---|-----------------------------------|
| 1. CH. Kalachand Shastri | : | Ashamba Manipuri Sahityagi Itihas |
| 2. N. Khelchandra Singh | : | Ariba Manipouri Sahityagi Itihas |
| 3. Rajkumar Jhaljit Singh | : | A History of Manipuri Literature |
| 4. CH. Manihar Singh | : | A History of Manipuri Literature |
| 5. Naharol Sahitya Premi | : | Manipuri Sahityagi Mamal Leppa |

H (508) : Ariba Manipuri Sahitya 100 Marks

- | | | | |
|---------------------------------|---|---------------------------|----------|
| 1. O. Bhogeshwar Singh (Sampa) | : | Numit Kappa | 25 Marks |
| 2. N. Khelchandra Singh (Sampa) | : | Chothe Thangwai Pakhangba | 25 Marks |
| 3. N. Manaoyaima Singh (Sampa) | : | Tutenglon | 25 Marks |
| 4. O. Bhogeshwar Singh (Sampa) | : | Chandrakirti Jila Changba | 25 Marks |

H (509) : Manipuri Culture 100 Marks

- | | |
|---|------|
| 1. Anganba Matamgi Manipuri Lammit-Tummit,
Ngamkhei, Shinfam, Wayel Thouda | - 20 |
| 2. Shen Thumgi Fibam, Lalon Itik,
Lambi Thong, Chathok Chatsin | - 10 |
| 3. Laining Laison, 18-19 suba Chahi-Chagi Manipuri
Culture da Hinduismgi Ithil | - 25 |
| 4. Lai Haraoba, Jagoi-Ishei, Shanna-khotnaba: Shagol
Kangjei, Kang, Yubi Lakpi; Hiyang | - 35 |
| 5. Phijet-Leiteng, Yumsha-Keisha, Yekpa-Khotpa,
Murti Kalagi Thabak | - 10 |

Mateng Lougadaba Lairiksing:

- | | | |
|------------------------------|---|---|
| 1. L. Bhagyachandra | : | A Critical Study of the Religious
Philosophy of the Meiteis Before the
Advent of Hinduism |
| 2. Naorem Sanajaoba (Editor) | : | Manipur Past and Present, Volume -2 |

- | | | |
|--|---|--|
| 3. Mutuwa Bahadur | : | Traditional Textiles of Manipur |
| 4. Naoroibam Indramani Singh | : | Meitei Yumsharol |
| 5. Wangkheimayum Budha | : | Meiteigi Mahoushadagi Leijaraklaba
Mashannasing |
| 6. PH. Nandalal Sharma | : | Meitrabak |
| 7. NG. Kullachandra Singh | : | Meitei Lai Haraoba |
| 8. Mani Singh amasung Kulabidhu | : | Kang |
| 9. KH. Tolhan Singh | : | Kang |
| 10. L. Ibungohal Singh
amasung N. Khelchandra Singh (Sampa) | : | Cheitharol Kumbaba |
| 11. KH. Yaima Singh | : | Meitei Jagoi |
| 12. Manipouri Sahitya Parishad (Phongba) | : | Manipurgi Maramda Wareng |
| 13. Mutuwa Bahadur | : | Manipur Artki Wari Shingbun |
| 14. N. Khelchandra Singh | : | Ariba Manipuri Sahityagi Itihas |
| 15. Rajkumar Sanahal Guneshwar Singh | : | Meitrabakki Thang-Tagi Maram |
| 16. Manipur State Kala Academy (Phongba) | : | Manipuri Lai Haraobagi Festival |
| 17. Rajkumar Sanahal Singh | : | Pangal Thorakpa |
| 18. N. Khelchandra Singh (Sampa) | : | Phamlon |
| 19. KH. Chandrashekhar Singh (Sampa) | : | Loiyumba Shinyen |
| 20. PH. Iboton Sharma | : | Meetei Phijet Leiteng |
| 21. CH. Manihar Singh | : | A History of Manipuri Literature |
| 22. Manipuri Sahitya Parisad (Phongba) | : | Glimpses of Manipuri Language, Literature
and Culture |
| 23. S. K. Chatterji | : | Kirat Jankriti |
| 24. T.C. Hudson | : | The Meiteis |
| 25. N. Ibobi Singh | : | The Manipur Administration |
| 26. E.W. Doon | : | Gazetteer of Manipur |
| 27. W. McCulloch | : | Account of the Valley of Manipur |

H (610) : Folkloristics and Manipuri Folklore 100 Marks

i) Folkloristics: 40 Marks

1. Folklore – Definition, Nature, Scope amasung Function
2. Folkloreghi Theorising –
 - i. The Solar Mythology Theory
 - ii. The Diffusion: Theory of Borrowing
 - iii. The Anthropologists: Polygenesis
3. Folkloreghi Field Method –
 - i. Pre Field Preparation, Interview Method,
Questionnaire Method, Observation Method

ii) Manipuri Folklore 60 Marks

4. Myth, Legend amasung Folktale (Definition, Classification amasung Function)

5. Folksong, Proverb amasung Riddle (Difinition, Classification amasung Function)

Mateng Lougadaba Lairiksing

1. R.M. Dorson (Sampa) : Folklore and Folklife: An Introduction, 1972
2. Alan Dundes (Sampa) : The Studies of Folklore, 1965
3. Kenneth W, Clark and Marry W Clark : Introducing Folklore, 1964
4. Jawaharlal Handu : Folklore an Introduction, 1989
5. Jawaharlal Handu : Theoretical Essays in Indian Folklore, 2000
6. B. Dutta, N.C. Sharma : A Handbook of Folklore Material of North East India, 1994
- amasung P.C. Das (Sampa)
7. Krappe, A.H. : The science of folklore
8. Kenneth S. Goldstein : A Guide for Field Workers in Folklore
9. Mazharul Islam : Folklore, the Pulse of the People
10. Maria Leach (Sampa) : Standard Dictionary of Folklore, Mythology and Legend
11. William R. Bascom : Contributions to folkloristics (1981)
12. Stith Thompson : The Folktale, 1950
13. O. Ibochaoba Singh : Folklore Machak Khomjin Peishinba amasung Neinaba
14. O. Ibochaoba Singh : Folklore Bigyan

Man. G(505) : Manipuri Sahityagi Itihas amasung Ariba Manipuri Sahitya 100 Marks

1. Manipuri Sahityagi Matam Khaiba 12
2. Anganba Matamgi Sahitya:Hiram, Lon Amasung Khut-E 12
3. Mayai Chanba Matamgi Manipuri Sahitya:Hiram Lon amasung Khut-E 12
4. Anouba Matamgi Manipuri Sahityagi Ichel 14
5. Khongjomnupi Nongarol 25
6. Takhel Ngamba 25

Mateng Lougadaba Lairiksing:

1. CH. Kalachand Shastri : Ashamba Manipuri Sahityagi Itihas
2. N. Khelchandra Singh : Ariba Manipouri Sahityagi Itihas
3. Rajkumar Jhaljit Singh : A History of Manipuri Literature
4. CH. Manihar Singh : A History of Manipuri Literature
- Naharol Sahitya Premi : Manipuri Sahityagi Mamal Leppa

Man. G(606) : Manipuri Culture amasung Folklore

100 Marks

- | | |
|--|----|
| 1. Culturegi definition amasung aspect | 10 |
| 2. Britishna Manipur Lousindringeigi leibak wayel: lalup, Loucha pthap amasung Pana | 20 |
| 3. Anganba Matamgi Meitei Laining, 18-19 suba chahichagi Manipurgi cultured Hindu lainingi Ithil | 20 |

Folklore

- | | |
|--|----|
| 1. Folklore – Definition, Nature, Scope amasung Function | 15 |
|--|----|

Folk Literature

35

- | | |
|---|--|
| 2. Myth, Legend amasung Folktale (Definition, Classification amasung Function) | |
| 3. Folksong, Proverb amasung Riddle (Definition, Classification amasung Function) | |

Mateng Lougadaba Lairiksing

- | | |
|---|---|
| 1. R.M. Dorson (Sampa) | : Folklore and Folklife: An Introduction, 1972 |
| 2. Alan Dundes (Sampa) | : The Studies of Folklore, 1965 |
| 3. Kenneth W, Clark and Marry W Clark | : Introducing Folklore, 1964 |
| 4. Jawaharlal Handu | : Folklore an Introduction, 1989 |
| 5. Jawaharlal Handu | : Theoretical Essays in Indian Folklore, 2000 |
| 6. B. Dutta, N.C. Sharma amasung P.C. Das (Sampa) | : A Handbook of Folklore Material of North East India, 1994 |
| 7. Krappe, A.H. | : The science of folklore |
| 8. Kenneth S. Goldstein | : A Guide for Field Workers in Folklore |
| 9. Mazharul Islam | : Folklore, the Pulse of the People |
| 10. Maria Leach (Sampa) | : Standard Dictionary of Folklore, Mythology and Legend |
| 11. William R. Bascom | : Contributions to folkloristics (1981) |
| 12. Stith Thompson | : The Folktale, 1950 |
| 13. O. Ibochaoba Singh | : Folklore Machak Khomjin Peishinba amasung Neinaba |
| 14. O. Ibochaoba Singh | : Folklore Bigyan |

(10)

**POLITICAL SCIENCE
PAPER I
POLITICAL THEORY**

- Unit I Political Theory : Concept, Nature, Scope; Methods and Approaches to the Study of Political Science.
- Unit II State : Theories of State – Organic, Mechanistic and Marxian; Purpose and Limitations of State; Characteristics of Sovereignty.
- Unit III Democracy: Concepts and Kinds; Liberty, Equality, Rights and Duties.
- Unit IV Socialism and Communism; Liberalism; Fascism
- Unit V Modern Political Theory : Behaviouralism and Post-Behaviouralism; Political Culture and Political Socialisation.

REFERENCE BOOKS :

1. A.C. Kapoor, Principles of Political Science
2. A. Appadorai, Substance of Politics
3. Eddy Asirvatham and K.K. Mishra, Political Theory .
4. O.P. Gauba, Political Theory
5. Chandran Kukathas and Gerald F. Gaus, Handbook of Political Theory
6. Rajeev Bhargava and Ashok Acharya (eds), Political Theory : An Introduction
7. S.P. Verma, Modern Political Theory.
8. David Easton, Political System
9. Gaeriel Almond, Comparative Politics – A Developmental Approach

Paper II: Western Political Thought

Full Marks: 100

- Unit I: Plato: State, justice, education, communism, and philosopher king.
- Unit II: Aristotle: State, justice, citizenship, slavery and revolution.
- Unit III: Machiavelli - Separation of Politics from ethics and religion; influence and contribution.
- Bodin - State and Sovereignty.
- Unit IV: Hobbes; Lock; and Rousseau: *State of Nature, Social contract, General Will*
- Unit V: Hegel (dialectics and state); Marx (dialectical materialism & materialistic interpretation of history); and Lenin (theory of imperialism).

References:

1. V.V. Rao: A History of Political Theories.
2. D.R. Bhandari: History of European Thought.
3. R.G. Gettel: History of Political Thought.
4. C.L. Wayper: Political Thought.
5. Earnest Barker: Political Thought of Plato and Aristotle.
6. Ebenstein: Political Thought.
7. „ Great Political Thinkers
8. G.H. Sabine: A History of Political Theories.
9. Subrata Mukherji & Shushila Ramaswamy: A History of Political Thought, PHI Learning Pvt. Ltd., New Delhi-01.

3

POLITICAL SCIENCE
PAPER III
INDIAN GOVERNMENT AND POLITICS

- Unit I Socio-historical and Religious Background - Indian Freedom Struggle
- Unit II Constitutional Structure : Preamble, Nature of Indian Federation, Parliament, Executive
- Unit III Centre- State Relations, Role of Planning Commission, Panchayati Raj, Womens Empowerment
- Unit IV Party System, Political Behaviour, Caste and Politics
- Unit V Communalism, Regionalism, National Integration

REFERENCE BOOKS :

1. Granville Austin - Indian Constitution, Cornerstone of a Nation
2. Norman D. Palmer, - Indian Political System
3. Rajni Kothari - Politics in India
4. Rajni Kothari - Caste in Indian Politics
5. Rajni Kothari - India's Voting Behaviour
6. K. Seshadri, - Government and Politics in India
7. Hartmann - Political Parties in India
8. V.M. Sirsikar - Political Behaviour in India
9. C.P. Bhambri - Bureaucracy and Politics in India
10. K.V. Rao - Parliamentary Democracy in India
11. Iqbal Narain (ed.) - State Politics in India
12. D.D. Basu - The Constitution of India
13. M.P. Jain - The Indian Constitution

INTERNATIONAL POLITICS

- Unit I Nature and Scope of International Politics; Systems and Realist Theories of International Politics.
- Unit II National Power: Components and Limitations; Balance of Power: Principles and Methods.
- Unit III The League of Nations: Structure and Functions, Achievements and Failure; The United Nations: Structure and Functions, Achievements and Limitations.
- Unit IV Factors Influencing Foreign Policy; Basic Principles of India's Foreign Policy.
- Unit V Issues of Indian Foreign Policy:
- (i) Kashmir Issue
 - (ii) Causes of Sino-Indian War of 1962 and its impacts
 - (iii) US stand on Sino-Indian War of 1962, Indo-Pak Wars of 1965 and 1971
 - (iv) Soviet stand on Sino-Indian War of 1962, Indo-Pak Wars of 1965 and 1971

REFERENCE BOOKS

1. Mahendra Kumar, *Theoretical Aspects of International Politics*. Agra: Shiva Lal Agarwala, 1967.
2. Hans J Morgenthau, *Politics Among Nations*. McGraw Hill, 7th Edition 2005.
3. J.A.Naik, *A Text Book of International Relations*. MacMillan India, 2nd Edition, 2000.
4. Palmer and Perkins, *International Relations*. New Delhi: A.I.T.B.S.Publishers, 3rd Revised Edition 2002.
5. S.J.R.Bilgrami, *International Organisations*. New Delhi : Vikas Publishing, 1977.
6. Charles Heimsath and Surjit Mansingh, *A Diplomatic History of Modern India*. Bombay: Allied, 1971.

POLITICAL SCIENCE
PAPER - VI
SOCIALIST THOUGHT

- Unit I Utopian Socialism – Main Ideas of Robert Owen, Charles Fourier.
- Unit II The main ideas of Marx, Engels and Lenin : Dialectical materialism, Materialist Conception of History, Class struggle, State, Revolution, Dictatorship of the Proletariat, Imperialism.
- Unit III Stalin : State and Revolution; National Question.
- Unit IV Mao : Theory of Revolution; Cultural Revolution.
- Unit V Main Principles : Anarchism; Fascism.

REFERENCE BOOKS :

1. Cookers, Recent Political thought, Cooker.
2. VD. Mahajan, Recent Political Thought.
3. Marx and Engels – Communist Manifesto
4. F. Engels – The Origin of the Family, Private Property and the State
5. F. Engels – Socialism : Utopian Scientific
6. V. Lenin – State and Revolution. Three Sources and Three Component parts of Marxism. The National Liberation Movement in the East (selected articles) Imperialism, the Highest stage of Capitalism.
7. J.V. Stalin – Problems of Leninism, Marxism, the National Questions.
8. Mao Ze Don, - Four essays on Philosophy, Peking Foreign Language press, 1968. On New Democracy, Peking, Foreign Language Press 1967.
9. Milorad S. Draskatah – Marxism in the Modern World Progress, Publishers, ABC of Dialectical and Historical, Moscow Materialism 1977.
10. GCH Cole, - A History of Socialist Thought
11. D.R. Bhandari – History of European Political Philosophy.

POLITICAL SCIENCE

PAPER IV

Comparative Government and Politics

U.K., U.S.A, JAPAN, CHINA & SWITZERLAND

- Unit I U.K.: Sources of the constitution, Parliamentary Government, Monarchy, Cabinet, Parliament, Political Parties.
- Unit II U.S.A: Federal System, President, Congress, Supreme Court, Separation of Powers and Checks and Balances, Political Parties.
- Unit III Japan: Emperor, Constitution 1947, Diet, Political Parties, Factional Politics.
- Unit IV People's Republic of China: Cultural Revolution, Nature of the Political System, National People's Congress (NPC).
- Unit V Switzerland : Federal System, (Legislature), Referendum, Initiative, Recall, Political Parties.

REFERENCE BOOKS :

1. D. Deol, - Comparative Government and Politics : A study of Comparative Politics with special reference to Political system of UK, USA, USSR and China, New Delhi, Sterling, 1978.
2. K.R. Bombwal, - Major Contemporary Constitutional Systems, Ambala, Modern Publications, 1980.
3. S. Banerjee, - The Chinese Government and Politics, Calcutta, K.P. Bagchi, 1980.
4. J.H. Price, - Comparative Government : Four Modern Constitution, New Delhi, I. Publications, 1974.
5. R.M. Punnet, - Government and Politics in Britain, London, St. Paul, 1970.
6. Claudies O. Johnson, -Government in the United States, New Delhi, Thomas Growel, 1970.
7. Pritahett, C.H. - American Constitution, New Delhi, Metropolitan Book, Report, 1984.
8. Vishnu Bhagwan & V. Bhuran, World Constitutions.

Syllabus for Undergraduate Programme
B.A. / B. Sc . In Statistics
Manipur University, Canchipur
B.A/B.Sc.-I
Semester-1
Statistics
Paper-I (Theory)/STA: 101
Full Marks-75
Pass Marks: 25
Approximate lectures: 90

Unit-1 Descriptive Statistics 12 marks (15 lectures)

- 1.1 Meaning of Statistics and its definition.
- 1.2 Importance of Statistics.
- 1.3 Scope of Statistics: In the areas of Industry, Biological Sciences, Medical Sciences, Economics Sciences, Social Sciences, Management Sciences, Agriculture, Insurance, Information Technology, Education and Psychology.
- 1.4 Types of characteristics:-
Attributes: Nominal scale, ordinal scale, Variables: Interval scale, ratio scale; discrete and continuous variables, difference between linear scale and circular scale.
- 1.5 Types of data: (a) Primary data, Secondary data
(b) Cross-sectional data, time series data.
- 1.6 Statistical population: Finite population, infinite population, homogeneous population and heterogeneous population, notion of sample.
- 1.7 Graphical presentation of data: Bar diagram (simple, multiple, sub-divided, percentage), pie diagram, pictogram, cartogram, stem and leaf chart.
- 1.8 Classification: Raw data and its classification, discrete frequency distribution, continuous frequency distribution, inclusive and exclusive method of classification, open-end classes, cumulative frequency distribution.
- 1.9 Graphical presentation of frequency distribution: Histogram, frequency curve, frequency polygon, ogive curves.

Unit-2 Measures of Central Tendency 13 marks (15 lectures)

- 2.1 Notion of Central Tendency: Average, characteristics of an ideal average.
- 2.2 Arithmetic Mean (A.M): Definition, effect of change of origin and scale, combined mean of a number of groups, merits and demerits, its applications.
- 2.3 Mode: Definition, formula for computation (with deviation), graphical method of determination of mode, merits and demerits, its applications
- 2.4 Median: Definition, formula for computation (with derivation), graphical method of determination of median, merits and demerits, its applications.
- 2.5 Empirical relation between mean and median and mode.
- 2.6 Partition Values: Quantiles, Deciles and Percentiles, their applications.
- 2.7 Geometric Mean (G.M): Definition, merits and demerits, its applications
- 2.8 Harmonic Mean (H.M): Definition, merits and demerits, its applications
- 2.9 Relation between A.M., G.M., and H.M.
- 2.10 Weighted Mean: Weighted A.M., G.M. and H.M.

Unit-3 Measures of Dispersion 13 marks (15 lectures)

- 3.1 Concept of dispersion, characteristics of an ideal measure of dispersion.
- 3.2 Range: Definition, merits and demerits.
- 3.3 Semi-interquartile range (Quartile deviation).
- 3.4 Mean deviation: Definition, minimality property (without proof).
- 3.5 Mean square deviation: Definition, minimality property of mean square deviation (with proof), Variance and standard deviation – definition, merits and demerits, effect of change of origin and scale
- 3.6 Determination of variance of a combine series
- 3.7 Measures of dispersion for comparison: coefficient of range, coefficient of quartile deviation and coefficient of mean deviation, coefficient of variation (C.V)

Unit-4 Moments 12 marks (15 lectures)

- 4.1 Raw moments for grouped and ungrouped data.
- 4.2 Moments about an arbitrary constant for grouped and ungrouped data.
- 4.3 Central moments for grouped and ungrouped data, Effect of change of origin and scale, Sheppard's correction for moments up to fourth order (without proof).
- 4.4 Relations between central moments and raw moments (up to fourth order)

Unit-5 Skewness and Kurtosis: 12 marks (15 lectures)

- 5.1 Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution.
- 5.2 Bowley's coefficient of skewness.
- 5.3 Karl Pearson's coefficient of skewness
- 5.4 Measures of skewness based on moments
- 5.5 Concept of kurtosis, leptokurtic, mesokurtic and platykurtic frequency distributions.
- 5.6 Measures of kurtosis based on moments

Unit-6 Probability 13 marks (15 lectures)

- 6.1 Random experiment, sample space (for finite), events, algebra of events with illustration by using Venn diagram.
- 6.2 Definition of probability- classical, statistical (their criticism) and axiomatic, Probability space
- 6.3 Elementary properties of probability:
 - i) $P(\emptyset) = 0$ ii) $P(A) = 1 - P(A')$ iii) If $A \subset B$, then $P(A) \leq P(B)$
 - iv) $P(A' \cap B) = P(B) - P(A \cap B)$
- 6.4 Conditional probability.
- 6.5 Addition and Multiplication theorems of probability for two events.
- 6.6 Boole's inequality.
- 6.7 Bayes' Theorem and its application

**Practical
Paper-I
STA: 101(P)
Full Marks: 25
Pass Marks: 10**

Sl.No. Topic No. of experiments

1. Diagrammatic representation of statistical data -----	3
2. Construction of frequency distribution and its graphical representation. -----	3
3. Measures of Central Tendency, partition values -----	3
4. Measures of dispersion, coefficient of variation -----	2
5. Calculation of Moments -----	2
6. Measures of skewness and kurtosis -----	2

Total 15

Instructions:

i) To solve 2 experiments out of 3 experiments.

ii) Each experiment carries 9 marks

iii) Note Book carries 4 marks Viva voce carries 3 marks

Books recommended:

1. Goon, Gupta and Dasgupta: Fundamentals of Statistics, Vol.1, The World Press Pvt. Ltd., Kolkata.
2. Goon, Gupta and Dasgupta: Basic Statistics, The World Press Pvt. Ltd., Kolkata.
3. S.R. Chakravarti & N. Giri: Basic Statistics, South Asian Publishers, New Delhi
4. J.N. Kapur & H.C. Saxena: Mathematical Statistics, S. Chand & Co., New Delhi
5. J. Medhi: Statistical Methods, Wiley Eastern
6. Miller and Freund: Modern Elementary Statistics.
7. Snedecor and Cochran: Statistical Methods, Oxford and IBH Publishers.

Semester-2
Statistics
Paper-II (Theory)/STA: 202
Full Marks-75
Pass Marks: 25
Approximate lectures: 90

Unit-1 Random variables, Mathematical Expectations and Generating functions-I
13 marks (15 lectures)

- 1.1 Definition of random variable.
- 1.2 Types of random variables- discrete and continuous
- 1.3 Probability Density Function (pdf) and Probability Mass Function (pmf) and its properties
- 1.4 Distribution function (df) of a r.v. and its properties
- 1.5 Joint distribution, marginal and conditional distribution and its properties (without proof)
- 1.6 Independent r.v.'s, pair-wise independence and mutual independence for 3 events.
- 1.7 Relation between pdf and distribution function (df)
- 1.8 Transformation of r.v.'s (up to 2 r.v.'s), Jacobian of a transformation.

Unit-2 Random variables, Mathematical Expectations and Generating functions-II
13 marks (15 lectures)

- 2.1 Moments generating function (mgf) and its properties)
 $M_{cx}(t)=M(ct)$ ii) $MX_1+X_2+\dots X_n=MX_1(t).MX_2(t) \dots \dots MX_n(t)$
iii) Effect of change of origin and scale iv) Uniqueness theorem
- 2.2 Cumulating generating function and its properties i)
i) Additive property of cumulants ii) Effect of change of origin on cumulants
- 2.3 Probability generating function (for discrete r.v) and convolution
- 2.4 Moments from mgf using: i) Expansion method ii) Differentiation method,
- 2.5 Relation between moments and cumulants (without proof) upto fourth order
- 2.6 Characteristic function and its properties (without proof).
- 2.7 Mathematical expectation of a r.v. and its properties
i) $E(a) = a$ ii) $E(aX) = a E(X)$
- 2.8 Addition and Multiplication theorems of expectation
- 2.9 Variance and covariance of r.v.'s of linear forms
i) $Cov(aX, bY) = ab Cov(X, Y)$
ii) $Cov(X+a, Y+b) = Cov(X, Y)$
iii) $Cov[(X-x/\sigma), (Y-y/\sigma)] = [1/(\sigma^2\sigma^2)] Cov(X, Y)$
iv) $Var(aX) = a^2 Var(X)$
v) Variance of the sum and variance of the difference of two random variables
vi) Standardised random variable

Unit-3 Correlation 12 marks (15 lectures)

- 3.1 Bivariate distribution, bivariate frequency distribution, bivariate frequency table, correlation table and contingency table.
- 3.2 Correlation, scatter diagram and its merits and demerits
- 3.3 Karl Pearson's correlation coefficient: derivation of limits of correlation coefficient and effect of change of origin and scale, assumptions underlying Karl Pearson correlation coefficient.
- 3.4 Rank correlation coefficient, derivation of Spearman's rank correlation coefficient (Untied and tied cases), limits of rank correlation coefficient.

Unit-4 Curve fitting and Regression Analysis 12 marks (15 lectures)

- 4.1 Concept of curve fitting
- 4.2 Method of least square, most plausible values
- 4.3 Fitting of polynomials (1st and 2nd degree)
- 4.4 Regression: Linear and curvilinear
- 4.5 Lines of regression (for two variables), interpretation of slope and intercept, and their uses.
- 4.6 Regression coefficient and its properties.

Unit-5 Limit Theorems 12 marks (15 lectures)

- 5.1 Cauchy-Schwartz and Chebyshev's inequalities and their applications.
- 5.2 Convergence in probability, almost sure convergence
- 5.3 Weak law of large number (Bernoulli and Khinchin) and their applications, Strong Law of Large Number (Statement only)
- 5.4 Convergence in distribution, convergence of mean square
- 5.5 Central limit theorem (iid case) – (De-Moivre- Laplace, Lindeberg-Levy) with illustration and their application to standard distributions

Unit-6 Finite difference and numerical analysis-I 13marks (15 lectures)

- 6.1 Basic concept of finite difference theory
- 6.2 Operators Δ and E and their relations, construction of diagonal and horizontal difference tables, determination of the values of n th and $(n+1)$ th degree difference of the polynomial of degree n (Theorem with proof).
- 6.3 Concept of interpolation and extrapolation and their importance, derivation of Newton's forward and backward interpolation formula (without remainder terms),
- 6.4 Construction of divided difference table and its properties, Newton's divided difference interpolation formula and Lagrange's interpolation formula for unequal intervals (without remainder terms)
- 6.5 Numerical integration, derivation of general quadrature formula.
- 6.6 Deduction of Trapezoidal, Simpson's 1/3rd and 3/8th rules of numerical integration from general quadrature formula.

**Practical
Paper-II
STA: 202 (P)
Full Mark: 25
Pass Mark: 10**

Sl.No. Topic No. of experiments

1. Karl Pearson's Correlation coefficient-----	2
2. Spearman's rank correlation coefficient-----	2
3. Fitting of 1st and 2nd degree polynomial-----	2
4. Fitting regression line (for 2 variables) -----	2
5. Interpolation -----	4
6. Numerical integration -----	3

Total 15

Instructions:

- i) To solve 2 experiments out of 3 experiments.*
- ii) Each experiment carries 9 marks*
- iii) Note Book carries 4 marks*
- iv) Viva voce carries 3 marks*

Books recommended:

1. Goon, Gupta and Dasgupta: Fundamentals of Statistics, Vol.1&II, The World Press Pvt. Ltd., Kolkata.
2. Goon, Gupta and Dasgupta: Basic Statistics, The World Press Pvt. Ltd., Kolkata.
3. S.R. Chakravarti & N. Giri: Basic Statistics, South Asian Publishers, New Delhi
4. J.N. Kapur & H.C. Saxena: Mathematical Statistics, S. Chand & Co., New Delhi
5. J. Medhi: Statistical Methods, Wiley Eastern
6. Snedecor and Cochran: Statistical Methods, Oxford and IBH Publishers.
7. Mukhopadhyay, P.: Mathematical Statistics, New Central Book Agency, Calcutta,
8. S.C. Gupta and V.K.Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.
9. Hogg, R.V. and Craig R.G.: Introduction to Mathematical Statistics, MacMillan Publishing Co., New York.
10. Mood, A. M. and Graybill, F.A. and Boes D.C.E.: Introduction to Theory of Statistics, McGraw Hill and Kagakusha Ltd. London.

Semester-3
Statistics
Paper-III (Theory)/STA: 303
Full Marks-75
Pass Marks: 25
Approximate lectures: 90

Unit-1 Discrete Probability Distributions 13 marks (15 lectures)

- 1.1 Bernoulli trial, Binomial distribution: derivation, properties and practical applications
- 1.2 Poisson distribution (as a limiting case of binomial), properties and practical applications.
- 1.3 Rectangular, Multinomial, Geometric, Hypergeometric, Negative binomial; derivation of means, variance and mgf of these distributions.

Unit-2 Continuous Probability Distributions 13 marks (15 lectures)

- 2.1 Distributions: Uniform, Laplace, Exponential, Cauchy, Beta (both first and second), Gamma, Weibul; derivation of first two moments and mgf of these distributions.
- 2.2 Normal distribution: definition, mean, median, mode, quartiles, mean deviation, variance, moments, points of inflexion of normal curve, mgf and characteristic function of standard normal variate, importance and properties. (Without proof /derivation).

Unit-3 Theory of estimation-I 12 marks (15 lectures)

- 3.1 Concept of parameter and statistic, parametric space, problem of estimation.
- 3.2 Types of estimation: Point and interval estimations
- 3.3 Criteria of a good estimator- unbiasedness, consistency, sufficiency and efficiency, with simple examples.
- 3.4 Methods of point estimation- Maximum likelihood estimation (mle), least square, moments
- 3.5 Properties of m.l.e. (without proof), application of the method of m.l.e. and method of moments- for obtaining estimates of the parameters of binomial, Poisson and Normal distributions.

Unit-4 Sample Survey-I 13 marks (15 lectures)

- 4.1 Introduction, concept of statistical population and sample.
- 4.2 Difference between census and sample survey, advantages of sample survey over census and vice versa.
- 4.3 Principles of sampling theory – validity, regularity and optimization.
- 4.4 Principle steps involved in a large scale sample survey, preparation of questionnaire and schedule, sampling and non-sampling errors.
- 4.5 Some sampling techniques: purposive, quota, snowball, volunteer; simple random sampling, stratified random sampling, systematic sampling, cluster sampling, multistage sampling, multiphase sampling (no theorems)
- 4.6 Simple random sampling (with and without replacement): techniques of selecting a random sample – lottery method & use of Random Number Tables, estimation of population total and mean, variance and S.E. of the estimates, unbiasedness of sample mean for the population mean, merits and demerits, comparison of simple random sampling with and without replacement.

Unit-5 Theory of Attributes 12 marks (15 lectures)

- 5.1 Attributes: classification, notion of manifold classification, dichotomy, class frequency, order of class, positive class-frequency, negative class frequency, quanta class frequencies, ultimate class frequency, relationship among different class frequencies (up to three attributes), dot operator to find the relation between frequencies, fundamental set of class frequencies.
- 5.2 Consistency of data (up to 3 attributes), condition for consistency of data.
- 5.3 Concept of independence and association of two attributes.
- 5.4 Yule's coefficient of association (Q)

Unit-6 Demography 12 marks (15 lectures)

- 6.1 Introduction to demography- source of vital statistics, deficiencies of census and registration system data.
- 6.2 Measurement of Mortality rates- CDR, ASDR, STDR
- 6.3 Complete Life Table- assumptions, description and construction
- 6.4 Stationary and stable population (concept only)
- 6.5 Measurement of Fertility rates- GFR, ASFR, TFR
- 6.6 Measurement of reproduction rate- GRR, NRR
- 6.7 Logistic curve- derivation and its fitting by using Pearl and Reed method and its uses in population projection.

**Practical
Paper-III
STA: 303 (P)
Full Mark: 25
Pass Mark: 10**

Sl.No. Topic No. of experiments

1. Consistency of qualitative data and coefficient of Association, independence of attributes -----	2
2. Mortality and fertility Life table -----	4
3. Construction of complete Life table -----	2
4. Population growth and projection (including logistic curve) -----	2
5. Selection of simple random sample by using Random Number Table and estimation of population total, variance and S.E of the estimates -----	3
6. Fitting of Binomial and Poisson distributions-----	2

Total 15

Instructions:

- v) To solve 2 experiments out of 3 experiments.*
- vi) Each experiment carries 9 marks*
- vii) Note Book carries 4 marks*
- viii) Viva voce carries 3 marks*

Books recommended:

1. Goon, Gupta and Dasgupta: Fundamentals of Statistics, Vol.1&II, The World Press Pvt. Ltd., Kolkata.
2. Goon, Gupta and Dasgupta: Basic Statistics, The World Press Pvt. Ltd., Kolkata.
3. S.R. Chakravarti & N. Giri: Basic Statistics, South Asian Publishers, New Delhi
4. J.N. Kapur & H.C. Saxena: Mathematical Statistics, S. Chand & Co., New Delhi
5. J. Medhi: Statistical Methods, Wiley Eastern
6. S.C. Gupta and V.K.Kapoor: Fundamentals of Mthematical Statistics, Sultan Chand and Sons, New Delhi.
7. S.C. Gupta and V.K.Kapoor: Fundamentals of Applied Statistics, Sultan Chand and Sons, New Delhi.

Manipur University
B.A/B.Sc.-II
Semester-4
Statistics
Paper-IV (Theory)/STA: 404
Full Marks-75
Pass Marks: 25
Approximate lectures: 90

Unit-1 Sampling distribution-I 12 marks (15 lectures)

- 1.1 Concept of sampling distribution and standard error (SE), SE of mean and variance of normal distribution (with derivation)
- 1.2 Distribution of a random sample from a continuous distribution of i.i.d. random variables X_1, X_2, \dots, X_n .
- 1.3 Distribution of $s^2 = \frac{1}{n} \sum (x_i - \bar{x})^2$ for a random sample from normal population using orthogonal transformation, independence of \bar{x} and s^2 .
- 1.4 Sampling distributions: t, F, χ^2 distributions (without derivation) and Fisher's Z transformation (Statement only) and its applications.

Unit-2 Testing of hypotheses-I 13 marks (15 lectures)

- 2.1 Statistical hypothesis- simple and composite, null and alternative hypothesis, one and two-tailed test, non-critical and critical region (acceptance and rejection region), level of significance.
- 2.2 Test of a statistical hypothesis, Type I and II errors, p-value, size of a test, power and power function of a test.
- 2.3 Concept of test of significance, assumptions and their validity.
- 2.4 Large sample test for
 - i) Test of single proportion
 - ii) Test for difference of two proportions
 - iii) Test for single mean
 - iv) test for difference of two means

Unit-3 Testing of hypotheses – II 13 marks (15 lectures)

- 3.1 Application of t-distribution:
 - i) Test for single mean
 - ii) Test for difference of two means (independent and not independent samples) test for sample correlation coefficient
- 3.2 Application of F-distribution:
 - i) Test for the equality of two population variances
- 3.3 Application of χ^2 distribution:
 - i) Test for population variance $H_0: \sigma^2 = \sigma_0^2$
 - ii) Test of goodness of fit (1st and 2nd degree equations, Binomial, Poisson and Normal distributions)
 - iii) Test of independence of attributes
- 3.4 Application of Fisher's Z-distribution: To test $H_0: \xi = \xi_0$

Unit-4 Time Series-I 12 marks (15 lectures)

- 4.1 Introduction and importance of time series analysis, components of time series.
- 4.2 Additive and multiplicative models of time series.
- 4.3 Objective of measuring trend, measurement of trend by the methods of graphical, semi-averages, principle of least square and moving averages (for linear cases only)

Unit-5 ANOVA & Design of Experiments-I 13 marks (15 lectures)

- 5.1 Analysis of variance, fixed effect model, estimation of parameters by the method of least square with special reference to one and two way classified data (one observation per cell)
- 5.2 Design of experiments, principles of design of experiment- randomization, replication and local control.
- 5.3 CRD, RBD (one observation per cell) and its statistical analysis.

Unit-6 Index Numbers 12 marks (15 lectures)

- 6.1 Introduction, problems involved in the construction of index numbers.
- 6.2 Laspeyre's, Paasche's, Fisher's, Marshall-Edgeworth, Dorbish-Bowley index numbers.
- 6.3 Requirements of a good index number – time reversal test, factor reversal test and circular test, Fisher's index number's reversibility.
- 6.4 Construction of wholesale and cost of living index number

Practical
BA/B.Sc.-II
Paper-IV
STA: 404 (P)
Full Mark: 25

Pass Mark: 10**Sl.No. Topic No. of experiments**

- | | |
|---|---|
| 1. Determination of trend by moving average method ----- | 2 |
| 2. Construction of index numbers and reversibility test (Fisher's Index Number),
cost of living index number ----- | 3 |
| 3. Analysis of CRD, RBD ----- | 2 |
| 4. Large sample tests ----- | 4 |
| 5. Small sample tests ----- | 4 |

Total 15*Instructions:*

- ix) To solve 2 experiments out of 3 experiments.
- x) Each experiment carries 9 marks
- xi) Note Book carries 4 marks
- xii) Viva voce carries 3 marks

Books recommended:

1. Goon, Gupta and Dasgupta: Fundamentals of Statistics, Vol.1&II, The World Press Pvt. Ltd., Kolkata.
2. J.N. Kapur & H.C. Saxena: Mathematical Statistics, S. Chand & Co., New Delhi
3. J. Medhi: Statistical Methods, Wiley Eastern
4. S.C. Gupta and V.K.Kapoor: Fundamentals of Applied Statistics, Sultan Chand and Sons, New Delhi.
5. Snedecor and Cochran: Statistical Methods, Oxford and IBH Publishers.

B.A/B. Sc III
Semester V
Statistics (Pass)
Paper-V (Theory) STA: P501

Full Mark: 75

Pass Marks: 25

Approximate lectures: 90

Unit-1 Basic Mathematics

- 1.1 Set, Types of sets, operations on sets and their properties (with proof)
- 1.2 Intervals, open, closed, half open, half closed
- 1.3 Countable and uncountable sets, Open and closed sets, compact sets and their elementary properties
- 1.4 Convergence of sequence, Cauchy criterion
- 1.5 Infinite series: Cauchy criterion for convergence, geometric series, convergence test of positive term series by (i) comparison test (ii) Cauchy's root test (iii) D' Alembert's ratio test (iv) Raabe's test (application only for the above tests)
- 1.6 Alternating series test of convergence (Leibnitz test), concept of absolute convergence, conditional convergence
- 1.7 Infinite and improper convergence (concept only), Gamma and Beta function and their elementary properties (with proof)

Unit-II Computer Programming

- 2.1 Introduction to computer, Computer generations, classification of computer- (i) All purpose and specific purpose (ii) Digital, Analogue and Hybrid (iii) Notebook, Personal, workstation, mainframe system and super computers
- 2.2 Basic computer organization, Input unit and its devices, output unit and its devices, CPU, Storage unit, Arithmetic Logic Unit (ALU), Control unit, system board, Primary memory –RAM, ROM, secondary memory
- 2.3 Software introduction, system software, application software
- 2.4 computer language, Machine language, High level language, Compiler, Interpreter, assembler
- 2.5 Binary numbers, Binary number system, conversion of decimal to binary and vice versa, binary arithmetic- addition, subtraction and complement
- 2.6 Internet, Introduction to internet service provider (ISP), WWW, webpage, HTML, web browser, search engine, web browsing/ net surfing. IP address, domain name
- 2.7 Concept of windows, desktop, toolbar, taskbar, folder, icon, creation of files and folder, My computer
- 2.8n User of MSEXCEL for drawing charts, calculation of sum, product, quotient

Unit III Normal Probability distribution

3.1 Normal distribution, definition, derivation as limiting case of binomial distribution, mean, median, mode, quartiles, mean deviation, variance, moments, point of inflexion of normal curve, mgf and characteristic function of standard normal variate, importance and discussion of properties (with proof)

3.2 Bivariate random variables or vector (X,Y)- discrete and continuous

3.3 Joint probability functions- mass function and density function

3.4 Joint distribution function its property (without proof)

3.5 Marginal and conditional distributions

3.6 Independence of random variables

Unit IV Theory of Estimation

4.1 Minimum variance estimator (MVE), Rao Blackwell theorem (only statement), Minimum variance unbiased estimator (MVUE) and its uniqueness (with proof), Cramer Rao inequality (special case of iid random variables) (with proof)

4.2 Interval estimation, confidence interval, confidence coefficient (one method of obtaining confidence limits), confidence interval for mean and variance of normal distribution

Unit V Design of Experiment

5.1 LSD-its statistical analysis, advantages and disadvantages, critical difference for comparing treatment means

5.2 Missing Plot technique, one missing observation for CRD, RBD

5.3 Factorial Experiments, their advantages and comparison with simple experiments

5.4 Analysis of 2^2 and 2^3 factorial experiments applied in RBD

5.5 Concept of 3^2 and 3^3 factorial experiments (without analysis)

5.6 Confounding in factorial experiments (Total confounding 2^2 and 2^3)

5.7 Series of experiments (without analysis)

Unit VI Sample survey

6.1 Stratified random sampling: definition of strata, advantage of stratification, principles of stratification, estimation of population total and mean variance and standard error of its estimates,

allocation of samples: (i) equal (ii) proportional (iii) Neyman (optimum), derivation of the variance for proportional and optimum allocation

6.2 Gain in precision due to stratification: proportional and optimum in comparison with SRS

6.3 Systematic sampling (linear): technique of selecting systematic sample, merits and demerits, estimation of population total, population mean and its sampling variance

6.4 Techniques of cluster sampling, multistage sampling, multiphase sampling, double sampling

6.5 Comparison of multistage and multiphase sampling

6.6 Non sampling error: Source and type

6.7 Non sampling bias, non sampling errors

Book recommended:

1. V. Rajaraman: programming in Fortran 77, prentice Hall of India, New Delhi
2. C. Xavier: Numerical method in Fortran 77, Wiley Eastern, New Delhi
3. SC Malic: Mathematical Analysis, Wiley Eastern, New Delhi
4. HL Royden: Real Analysis, Prentice Hall, New Delhi
5. Walter Rudin: Principle of Mathematical analysis, McGraw Hill
6. BS Vatsam: Theory of Matrices, Wiley Eastern, New Delhi
7. B.M. Singh: Measure, Probability and Stochastic process, South Asian Publsners, New Delhi
8. P.B Bhattacharya, SK Jain and SR Nagpal: First Course in Linear Algebra, Wiley Eastern, New Delhi
9. Mathur, Rajiv: Learning Excel-97 for windows step by step, Galgotia
10. Mathur, Rajiv: Learning window-98 step by step, Galgotia
11. Goon, Gupta and Dasgupta: Fundamentals of Staristics, Vol 1 and 2, The world Press pvt, Ltd, Kolkata
12. SC Gupta and V,K Kapoor: Fundamentals of Applied Statistics, Sultan Chand and Sons, New Delhi
13. S.C Gupta and V.K Kapoor: Fundamentals of Mathematical Statistics, Sultan Cand and Sons
14. Das and Giri: Design and analysis of experiments, Wiley Eastern, New Delhi
15. Cox and Cochran: Experimental Design, Asia Publishing House, New Delhi

16. A,S Hedayat and B.K Sinha: Design and Inference in finite population sampling
17. W. Cochran: Sampling Technique, Wiley Eastern, New Delhi
18. P.V Sukhatme: Sample survey methods and its applications, ISAS, New Delhi
19. Daroga Singh and FS Chaudhary: Theory and Analysis of sample survey design, Wiley Eastern, New Delhi

B.A/B. Sc III
Semester VI
Statistics (Pass)
Paper-V (Theory) STA: P601

Full Mark: 75

Pass Marks: 25

Approximate lectures: 90

Unit 1 : Sampling distribution

- 1.1 Derivation of t, F, X^2
- 1.2 Theorems of X^2 distribution
- 1.3 Relation between t, F and X^2

Unit 2: Standard Quality Control

- 2.1 Introduction meaning and purpose of SQC, tools of SQC, 3 sigma control limits.
- 2.2. Process control: construction, uses and interpretation of control charts for –
mean, range, fraction defective, number of defectives and number of defects per unit (fixed and variable sample size)
- 2.3. Product control: Description of Rectifying sampling Inspection Plan, consumer and producer's risk explanation of the terms AQL, LTPD, ASN, ATI, AOC, AOQL, (Interpretation only).
- 2.4. Operation of single and double sampling inspection plan (including flow charts)

Unit 3: Correlation

- 3.1: Multiple and partial correlation (for three variables), their Co-efficient and properties, residual and its properties, variance of residuals.
- 3.2: Multiple and partial correlation co-efficient in terms of total correlation coefficient s for 3 variables.
- 3.3: Intra class correlation coefficient (derivation) and its limits.
- 3.4: Correlation ratio (derivation) and its properties.

Unit 4: Operation Research (O.R)

- 4.1: Origin and development of OR, importance and scope of OR.
- 4.2: Models of OR – Iconic, analogue and mathematical models.
- 4.3: Elements of LPP, formulation of LPP.
- 4.4: Solution of LPP by graphical method (for 2 variables).
- 4.5: Solution of LPP by simplex method.

Unit 5: Psychological and Educational Statistics (PES)

- 5.1: Introduction, comparison and combination of exams and ranks.
- 5.2: Normalised scale.
- 5.3: Mental measurements –IC (Construction and standardization of test). Simon Binet scale.
- 5.4: Methods for the estimation of test, reliability and validity, Spearman's two factor theory.

Unit 6: Indian Official Statistics (IOS)

- 6.1: Statistical system in India, CSO, NSSO, Office of the registrar General, Directorate General of Commercial Intelligence and Statistics, directorate of Economics and Statistics. Labour Bureau, Army Statistical Organisation (features of the organizations and name of their publications only)
- 6.2: Discussion on the official statistics of India related to census, agriculture and industries,
 - 6.2.1 Census types of census and type adopted by India organization of census, types of data included in the schedule of last census.
 - 6.2.2 Agricultural Statistics –Land utilization statistics, total area, classification of area under crop, area irrigated, crops irrigated, crop production statistics forecast crops, non forecast and plantation crops.
 - 6.2.3 Industrial statistics- Statistics relating to organized and unorganized sectors.

6.3: Study of official publications and journals of North Eastern Council (NEC) and Basic Statistics of NEC.

Practical, Semester VI

Paper VI

Full mark: 25

Pass Mark: 10

Sl. No. Topic	No. of experiments
1. Construction of Control charts -----	5
2. LPP by Graphical Methods-----	2
3. LPP by Simplex Method -----	2
4. Scale (T- Score & P.C Graph) -----	2
5. Multiple and Partial Correlation-----	2
6. Intra class correlation coefficient and correlation ratio -----	2.

Instructions:

i) To solve 2 expt. Out of 3 experiment

ii) Each expt. Carries 9 marks

iii) Note book carries 4 marks

iv) Viva Voce 3 marks

Books recommended:

1. Goon Gupta and Das Gupta: Fundamentals of Statistics, Vol. I & II. The World Press Pt.Ltd. Kolkata.
2. J.N Kapoor & HC Saxena: Fundamentals of Mathematical Statistics.
3. S.C Gupta and VK Kapoor: Fundamentals of Applied Statistics, Sultan Chan and Sons. New Delhi
4. Scarborough JB: numerical Mathematical Analysis,Oxford and IBS.
5. Gupta and Malik : Calculus of Finite Difference and Numerical analysis Krishna Prakashan Mandir , Meerut.
6. Kanti Swarup, PK Gupta, Man Mohan, Operation Research, Sultan Chan and Sons , New Delhi.
7. VK Kapoor, Operatio research , Sultan Chan and sons, New Delhi.
8. Kalyan Kr. Mukherjee, Numerical Analysis, New Central Book Agency, Kolkata.
9. JP Guilford & B Frucher: Fundamental of Statistics in Psychology and Education, Mc Graw Hill.
10. Hogg R.V and Craig R.G : Introduction to Mathematical Statistics, Mac Millan Publishing Co.,New York.
11. Miller and Fruend : Modern Elementary Statistics.
- 12 .Snedecor and Cochran:Statistical Methods, Oxford and IBH Publishers.
13. HA Taha: Operation research an introduction ,Prentice Hall of India.

Table for use:

1. Fisher RA: Statistical Tables for Biological, Agricultural and Medical Research, Oliver Boy
- 2.Pearson K. tables for Statistical and Biometrician, Part I and II , Cambridge University Press.
- 3.Ptyde, J: Chamber's seven figure Logarithmic of Number upto 10000, W and R Chamber Ltd.

THE SEMETER-WISE COURSE STRUCTURE FOR UNDERGRADUATE COURSE

B.Sc. In Physical Education (Hons.), Health Education and Sports MANIPUR UNIVERSITY, CANCHIPUR

Semester -I

MIL/General English

Paper 1- PHE101- Physical Education (Principles and Foundation of Physical Education) 75+25=100Marks

Paper 2- HE102- Health Education (General Study of Health Education) 75+25=100Marks

Paper 3- SP103- Sports (4 games - Athletics, Table Tennis, Football and Yoga) 50+50=100Marks

Semester -II

MIL/General English

Paper 1- PHE201- Physical Education (Fundamentals of Anatomy in Physical Education) 75+25=100Marks

Paper 2- HE202- Health Education (Community and Environmental Health) 75+25=100Marks

Paper 3- SP203 Sports (4 games - Softball, Lawn Tennis, Wrestling and Badminton) 50+50=100Marks

Semester -III

Regional Development (Northeast) RD(NE)

Paper 1- PHE301- Physical Education (Psychology and Sociology in Physical Education) 75+25=100Marks

Paper 2- HE302 - Health Education (Fundamentals of Food and Nutrition) 75+25=100Marks

Paper 3- SP303 - Sports (4 games - Gymnastics, Volleyball, Hockey and Handball) 50+50=100Marks

Semester -IV

Environmental Studies

Paper 1- PHE401 - Physical Education (Methods of teaching in Physical Education) 75+25=100Marks

Paper 2- HE402 - Health Education (Fundamentals of Sports Medicine) 75+25=100Marks

Paper 3- SP403- Sports (4 games - Kabaddi, Weightlifting, Judo and Sepak-Tekraw) 50+50=100Marks

Semester -V (Hons. in Physical Education)

Hons.1- PHE(H)501 - Physiology of Exercise in Physical Education 100Marks

Hons.2- PHE(H)502 - Kinesiology and Bio-mechanics in Physical Education 100 Marks

Hons.3- PHE(H)503 - Practical 100 Marks

Semester -VI (Hons. in Physical Education)

Hons.1- PHE(H)601 - Test, measurement and evaluation in Physical Education 100Marks

Hons.2- PHE(H)602 - Fundamentals of Scientific Training in Physical Education and sports 100Marks

Hons.3- PHE(H)603 - Practical 100Marks

**SEMESTER-WISE SYLLABUS FOR B.Sc.
Physical Education, Health Education & Sports
MANIPUR UNIVERSITY**

SEMESTER- I

Paper- 1

PHE101- Physical Education

**Principles and Foundation of Physical Education
(THEORY)**

Full Marks: 75

Unit- I

15 Marks

- 1.1. Meaning and Definition of Education and Physical Education
- 1.2. Scope of Physical Education.
- 1.3. Aim and objectives of Physical Education
- 1.4. Misconception of Physical Education.
- 1.5. Relationship of Physical Education with General Education
- 1.6. Physical Education as Art and Science.

Unit- II

15 Marks

- 2.1. Introduction and aspects of Philosophy
- 2.2. Nature and principles based on Philosophy and science
- 2.3. Significance of Philosophy in Physical Education
- 2.4. Philosophy of Physical Education
- 2.5. Principles of Physical Education
- 2.6. Needs of Philosophy in Physical Education.

Unit- III

15 Marks

- 3.1. Biological foundation of Physical Education
- 3.2. Activity - as the basis of life,
- 3.3. Growth and development,
- 3.4. Effect of Heredity and Environment in growth and development,
- 3.5. Individual differences,
- 3.6. Body types and Exercise as a daily necessity.

Unit- IV

15 Marks

- 4.1. Sports Associations,
- 4.2. Sports Awards in India- Rajiv Gandhi Khel Ratna, Dronacharya Award, Arjuna Award
- 4.3. Indian Olympic Association (IOA) -Objectives and functions,
- 4.4. Leading Institutions- LNUPE, HVPM, YMCA, SAI
- 4.5. Youth welfare programme - N.C.C., N.S.S. , Scouting & Guiding, Youths, Hostel, Youth festival and Nehru Yuvak Kendras.

Unit- V

15 Marks

- 5.1. Ancient Olympic Movement
- 5.2. Modern Olympic Games,
- 5.3. Commonwealth Games
- 5.4. Asian Games - aims and objectives.

PHE101 (PRACTICAL)**25 Marks**

- | | | |
|----|---|----------|
| 1. | Fundamental drills and marching. | 5 Marks |
| 2. | Free hand exercises /Callisthenic Exercises | 5 Marks |
| 3. | Two days Study tour / Field work / Camping/Tracking | 15 Marks |
- (Students are required to submit a report of the Study Tour/Field Work/Camping/Tracking).

Reference Books

1. Buchar Charles A., Foundation of Physical Education, St. Louis the C.V. Mosby Company, London.
2. Kamlesh and Sangral, Principles and History of Physical Education, Prakash and Brothers, Ludhiana.
3. Wakharkar D.G., Manual of Physical Education in India, Pearl Publication Pvt. Ltd., Bombay.
4. Eraj Ahmed Khan, History of Physical Education, Venus Publishers Patna.
5. M.L. Kamlesh & M.S. Sangral, Principles and History of Physical Education, Ludhiana, Prakash Bothers.
6. Vidhya Ratna Taneja, Educational thought and Practice, New Delhi: Sterling Publisher Pvt. Ltd.
7. Krishna Murthy V. and Ram Parammeswara, Educational Dimension of Physical Education, New Delhi, Sterling Publishers.
8. Nixon Engine D. Couson V. An Introduction of Physical Education, Philadelphia, W.B. Lamders Company, London.
9. Singh Ajmer and Gangopadhyay S.R., Edited trends and Practices in Physical Education in India, Friends Publications, New Delhi.
10. Gangopadhyay SR (Edited), Physical Education Today and Tomorrow, Delhi Friends Publication.
11. Singh, A. et.al., Modern Text Book of Physical Education, Health and Sports, Kalyani Publisher.

Paper- 2
HE102- Heath Education
General Study of Health Education
(THEORY)

Full Marks: 75

Unit- I **15 Marks**

- 1.1. Meaning and Definition of Health and Health Education
- 1.2. Need, scope, aim and objectives of Health Education
- 1.3. Principles of Health Education , means and methods of Health Education,
- 1.4. Characteristics of Health Education.

Unit- II **15 Marks**

- 2.1. Meaning, definition and characteristics of physical, mental, social and emotional health
- 2.2. Meaning and definition of Hygiene
- 2.3. Needs and importance of hygiene
- 2.4. Personal hygiene.

Unit- III **15 Marks**

- 3.1. Meaning and definition of Safety Education
- 3.2. Needs and Importance of Safety Education
- 3.3. Principles of Safety Education
- 3.4. Safety in respect of residence, play field, equipment and dresses.
- 3.5. Safety on Road, Camps, Picnics, Tours, Fire, Flood, Hurricane, Thunder, Lightening and air-raids.

Unit- IV **15 Marks**

- 4.1. Meaning, definition and importance of Rehabilitation.
- 4.2. Rehabilitation measure for beneficial effects.
- 4.3. Disciplines of Rehabilitation- Physical Medicine (Physiotherapy), Occupational Therapy, Speech Therapy.

Unit- V **15 Marks**

- 5.1. Meaning and Definition of Massage
- 5.2. Types of massage
- 5.3. Effects and uses of various types of massage- stroking, pressure, percussion and shaking

HE102 (PRACTICAL)

- | | |
|---|---------------------|
| 1. Demonstration of the Traffic Signals | 25 Marks |
| 2. Demonstration of types of Massage | 5 Marks |
| 3. Two days visit to a Community/Primary Health Centre.
(To collect the data on the organization, functioning and administration of the centre, and various preventive measures of common diseases). | 5 Marks
15 Marks |

Reference Books

1. J.E. Park and K.E. Park, Preventive and Social Medicine, Medical College, Jabalpur.
2. Prof. B C Rai, Health Education and Hygiene, Prakashan Kendra, Railway Crossing , Sitapur Road, Lucknow.
3. Dr. S.K. Mangal, Health and Physical Education, Prakash Bros., Educational Publishers, 546, Book Market, Ludhiana.

Paper- 3
SP103- Games & Sports
Track & Field, Football, Table Tennis and Yoga
(THEORY)

Marks: 50

Unit –I

10 Marks

- 1.1. History of the game/sports.
- 1.2. Organization (Working Federation)

Unit –II

10 Marks

- 2.1. Various systems of the play
- 2.2. Rules and their interpretation
- 2.3. Equipment and Play field

Unit –III

10 Marks

- 3.1. Application of Scientific Principles for the improvement of skills
- 3.2. Trainings for the development of performance of the games/sports.

Unit –IV

10 Marks

- 4.1. Physiology of Warm-up
- 4.2. General and Specific Warm-up.

Unit –V

10 Marks

- 5.1. Meaning and Definition of Officiating and Coaching
- 5.2. Duties of good Coach, qualities and qualification of a Coach,
- 5.3. Methods of Officiating.

SP103 (PRACTICAL)

Marks: 50

- I. Track & Field**
- II. Football**
- III. Table Tennis**
- IV. Yoga**

15 Marks

15 Marks

10 Marks

10 Marks

I. TRACK & FIELD

15 Marks

1. Track Events

- 1.1. Track event
- 1.2. Starting techniques - Standing start, Crouch start and its variations. Proper use of Blocks.
- 1.3. Finishing techniques – Run Through, Forward Lunging, and Shoulder Shrug.
- 1.4. Relays - Various patterns of Baton Exchange and understanding of Relay Zones; Types of Relay event.
- 1.5. Hurdles - Approach, Clearance over the Hurdle and Recovery.
- 1.6. Short distance, Middle distance and Long distance running events.
- 1.7. Steeplechase - Approach, clearance, recovery walking technique.

2. Field Events

- 2.1. Long Jump - Approach run, take off, flight in the air and landing ; Type- Hang Style, Hitch Kick/Cycling/Walking in the air.
- 2.2. Triple Jump - Approach run, take off, flight in the air and landing.

- 2.3. High Jump - Approach run, take off, clearance over the Bar and landing; Types- Scissor cut, Straddle roll/Western Roll, Fosbury Flop.
- 2.4. Pole vault - Hand Grip and Pole carry, Approach run, pole plant, Take-off, Bar clearance and landing.
- 2.5. Javelin - Grip, Carry, Approach Run, Release and Reverse.
- 2.6. Shot put - Grip, Stance, Glide, Release and Reverse; Types- Orthodox, Peri O' Brien, Disco-put.
- 2. 7. Discus throw - Grip, Stance, Release and Reverse; Types- Orthodox, Disco style.
- 2. 8. Hammer throw - Grip, Turning, Release and Reverse.

II. FOOTBALL

15 Marks

1. Fundamental Skills.

- 1.1 Kicking-
 - 1.1.1 Kicking with the inside of the foot
 - 1.1.2 Kicking with the instep of the foot
 - 1.1.3 Kicking with the outer instep of the foot
 - 1.1.4 Lofted Kick
- 1.2 Receiving-
 - 1.2.1 Receiving a rolling ball- with the inside, outside, sole and instep
 - 1.2.2 Receiving an aerial ball- with the inside, outside, sole, instep, thigh chest and head.
- 1.3 Dribbling-
 - 1.3.1 With the instep of the foot
 - 1.3.2 With the inside of the foot
 - 1.3.3 With the outer instep of the foot
- 1.4 Heading-
 - 1.4.1 From standing
 - 1.4.2 From running
 - 1.4.3 From jumping
- 1.5 Throw-in-
 - 1.5.1 Standing
 - 1.5.2 Running
- 1.6 Feinting-
 - 1.6.1 With the lower limb
 - 1.6.2 With the upper part of the body
- 1.7 Tackling-
 - 1.7.1 Simple tackling
 - 1.7.2 Slide tackling
- 1.8 Goal Keeping-
 - 1.8.1 Collection of balls
 - 1.8.2 Ball clearance- Kicking, throwing and deflecting

2. Advanced Skills

- 2.1 Kicking
 - 2.1.1 Chip.
 - 2.1.2 In-swing and out-swing.
 - 2.1.3 Volley (low drive, back volley and scissors volley).
 - 2.1.4 Half Volley.

- 2.3 Dribbling-
 - 2.3.1 Controlled dribbling.
 - 2.3.2 Fast dribbling.
 - 2.3.3 Straight dribbling.
 - 2.3.4 Zig-Zag dribbling.

- 2.4 Heading-
 - 2.4.1 Running and jumping.
 - 2.4.2 Heading for long clearance.
 - 2.4.3 Downward heading.

- 3. Small sided games/ Corrective games
- 4. Functional training
- 5. Elementary Formation and systems of play.

III. TABLE TENNIS

10 Marks

1. Fundamental Skills.

- 1.1 The grip-
 - 1.1.1 The Tennis grip (forehand grip and backhand grip)
 - 1.1.2 Penholder grip.
- 1.2 Service-
 - 1.2.1 Forehand (Forward and backward spins).
 - 1.2.2 Back hand (Forward and backward spins).
 - 1.2.3 Side spin.
 - 1.2.4 High Toss.
- 1.3 Strokes (From both forehand and backhand).
 - 1.3.1 Push.
 - 1.3.2 Chop.
 - 1.3.3 Drive (with top spin).
 - 1.3.4 Half volley.
 - 1.3.5 Smash.
 - 1.3.6 Drop-shot.
 - 1.3.7 Balloon.
 - 1.3.8 Flick shot.
 - 1.3.9 Loop drive.
- 1.4 Stance and Ready position, and foot work.

2. Tactics – Defensive, attacking in singles, doubles and mixed doubles.

IV YOGA

10 Marks

1. Asanas-

- 1.1. **Meditative-** Sukhasana, Swastikasana, Padamasana, Vajrasana and Siddhasana.
- 1.2. **Relaxative-** Makarasana, Shavasana,
- 1.3. **Cultural-** Bhujangasana, Ardha-Shalabhasana, Dhanurasana, Naukasana, Padhastana, Halasana, Matsyasana, Vakrasana, Chakrasana, Ardha-Chandrasana, Tadasana, Utkatasana, Vrikshasana, Parvatasana.

2. Pranayama- Anuloma-Viloma and Ujjai (both without Kumbhak)

- 2.1. Bandha- Jalandhar, Uddiyan, Moola
- 2.2. Mudra- Viparitarani.

3. Kriya- Kapalabhati, Dhuti and Neti.

Reference Books:

1. Dybon, Geoffrey, G.H., The Mechanics of Athletics, University of London Press Ltd. London.
2. Doderty, J. Memmeth, Modern Track and Field, Englewood Cliffs: N.J. Prentice Hall, Inc.
3. Mohan, V.M. Athletics for Beginners, Metropolitan Books Ltd. New Delhi.
4. Robinson, Johnson James and Hirschni, Modern Techniques of Track and Field, Henry Kimpton Publishers, London.
5. Larche, Harry E. Techniques of Football Coaching, A.S. Barners and Company, London.
6. Lonziak Conard, Understanding Soccer Tactics, Faber and Faber, London.
7. Sklorz Martin, Sport Table Tennis, Yorkshire : E.P. Ltd. Cast Ardsley, Wakefield.
8. Myers Harold. Table Tennis, Lea & Fabiger Ltd. 3, Queen Square, London.
9. Iyengar, KS, Light on Yoga, George Allon and Unwrn Ltd. London.
10. Kuvalayananda Swamy, Yoga Asanas, Popular Prakashan Pub., Bombay.

SEMESTER- II**Paper- 1****PHE201- Physical Education****Fundamentals of Anatomy & Physiology in Physical Education**
(THEORY)**Full Marks: 75****Unit- I****15 Marks**

- 1.1. Meaning and definition of Anatomy and Physiology
- 1.2. Concept of Anatomy and Physiology
- 1.3. Importance of Anatomy and Physiology in Physical Education

Unit –II**15 Marks**

- 2.1. Definition of cells, tissues, organs and systems
- 2.2. Microscopic structure of cells
- 2.3. Functions of cells, tissues, organs and systems.

Unit- III**15 Marks**

- 3.1. Skeleton and Muscular System
- 3.2. General features of bone and types of bones and its functions.
Joints - Definition and classification of Joints.
- 3.3. Types, structure and functions of muscles.

Unit- IV**15 Marks**

- 4.1. Cardio - Vascular and Respiratory System
- 4.2. Structure of heart and major blood vessels in the different parts of the body.
- 4.3. Cardiac cycle, blood pressure, Cardiac output and stroke volume.
Structure and function of lungs, mechanism of respiration.

Unit – V**15 Marks**

- 5.1. Gastro-intestinal system (digestive system), Excretory system, Endocrine system, Reproductive system, Sensory organs
- 5.2. Structure and functions of digestive system and Excretory system,
- 5.3. Structure and functions of Endocrine system, function of liver and absorption of foods.

PHE201 (PRACTICAL)**25 Marks**

1. a) Study of heart and breath sound by means of stethoscope
b) Study of radial pulse 5 Marks
2. Measurement of blood pressure 5 Marks
3. Measurement of breath holding capacity: 10 Marks
 - a) Negative breath holding capacity
 - b) Positive breath holding capacity
4. Measurement of Body Mass Index (BMI) 5 Marks

Reference Books

1. Pearce Evelyn C, Anatomy & Physiology for the Nurses, Lea & Febiger, Kolkata, Oxford University Press, Delhi, Bombay, Madras.
2. Dr. Ratan Vidya, Handbook of Human Physiology, Jaypee Brothers Medical Publisher, Delhi.
3. Gyton A.C., Functions of Human Body, Saunders Company, London.
4. Bourne, Geoffery H., The Structure and Function of Muscles, Academic Press, London.
5. James C. Clouch, Fundamental Human Anatomy, Lea & Febiger, Philadelphia.
6. Mathew, D.K. and Fox E.L., Physiological Basis of Physical Education and Athletics, Philadelphia: W.B. Saunders Company.
7. St. John's Ambulance, First-Aid, By Red-Cross Society of India.

Paper -2
HE202- Health Education
Community and Environmental Health
(THEORY)

Full Marks: 75

Unit- I **15 Marks**

- 1.1. Meaning, definition and importance of Community Health
- 1.2. Different levels of Health Services - Basic Health Service, Primary Health Service, Primary Health Centre.
- 1.3. Diseases: communicable and non-communicable diseases.
- 1.4. Mode of transmission of communicable diseases.
- 1.5. Prevention of - Malaria, Diptheria, Cholera, Diarrhoea, Dysentery, Tuberculosis and HIV (AIDS).

Unit- II **15 Marks**

- 2.1. Meaning, definition and importance of environmental health
- 2.2. Environmental health condition in rural, urban and industrial areas.
- 2.3. Living Environment- home and neighborhood
- 2.4. Community services - Transportations, market and waste disposal.
- 2.5. Water – sources, purification and importance of water.

Unit- III **15 Marks**

- 3.1. Meaning, definition and types of pollution
- 3.2. Harmful effects of - water pollution, noise pollution, air pollution
- 3.3. Important measures of pollution control
- 3.4. Meaning and definition of Radiation
- 3.5. Sources of radiation- natural and man-made radiation.

Unit- IV **15 Marks**

- 4.1. School Health Service- Importance and aspects of school health service
- 4.2. School health programme
- 4.3. Medical examination services in school
- 4.4. Immunization - Meaning and types of immunization.
- 4.5. Mid-day meal - Meaning and importance of mid-day meal in school.

Unit- V **15 Marks**

- 5.1. Health awareness programmes of College Youths
- 5.2. Students participation in health awareness programmes
- 5.3. Health problems of college youths
- 5.4. Use of intoxicated substances -tobacco, alcohol, drugs etc., their harmful effects and preventive measures
- 5.5. Mental health problems and its causes.

HE 202 (PRACTICAL)

25 Marks

- | | | |
|----|---|----------|
| 1. | Project Work - Health survey to a specific area for 4 days. | 15 Marks |
| 2. | Health service camp in school /college campus
(Marks will be awarded by the supervisors concerned on the basis of the performance, sincerity, discipline, skills of camping etc.). | 10 Marks |

Reference Books

1. Preventive and Social Medicine - J.E. Park and K.E. Park , Medical College, Jabalpur.
2. Health Education and Hygiene - Prof. B C Rai - Prakashan Kendra - Railway Crossing Sitapur Road, Lucknow.
3. Health and Physical Education - Dr. S.K. Mangal , Prakash Bros., Educational Publishers , 546 Book Market, Ludhiana.

Paper- 3
SP203- Games & Sports
Badminton, Lawn Tennis, Wrestling and Soft Ball
(THEORY)

Marks: 50**Unit –I****10 Marks**

- 1.1. History of the game/sports.
- 1.2. Organization (Working Federation)

Unit –II**10 Marks**

- 2.1. Various systems of the play
- 2.2. Rules and their interpretation
- 2.3. Equipment and Play field

Unit –III**10 Marks**

- 3.1. Application of Scientific Principles for the improvement of skills.
- 3.2. Training for the development of performance of the games/sports.

Unit –IV**10 Marks**

- 4.1. Physiology of Warm-up
- 4.2. General and Specific Warm-up.

Unit –V**10 Marks**

- 5.1. Meaning and Definition of Officiating and Coaching
- 5.2. Duties of good Coach, qualities and qualification of a Coach,
- 5.3. Methods of Officiating.

SP203 (PRACTICAL)**Marks: 50**

I.	Badminton	15 Marks
II.	Lawn Tennis	15 Marks
III.	Wrestling	10 Marks
IV.	Soft Ball	10 Marks

I. BADMINTON**15 Marks****1. Fundamental Skills**

- 1.1 Racket parts, racket grips, shuttle grips.
- 1.2 The basic stances.
- 1.3 The basic strokes.
 - 1.3.1 Serves.
 - 1.3.2 Forehand-overhead and under arm.
 - 1.3.3 Back hand-overhead and underarm.
 - 1.3.4 Drills and Lead up games.
 - 1.3.5 Types of games-singles, doubles, including mixed doubles.

2. Tactics – Defensive, attacking in singles, doubles and mixed doubles.

II. LAWN TENNIS

15 Marks

1. Fundamental Skills

- 1.1 Grips-
 - 1.1.1 Eastern Forehand grip.
 - 1.1.2 Eastern Backhand grip.
 - 1.1.3 Western grip.
 - 1.1.4 Continental grip.
 - 1.1.5 Chopper grip.
- 2.2 Stance and Footwork.
- 1.3 Basic Ground strokes-
 - 1.3.1 Forehand drive.
 - 1.3.2 Backhand drive.
- 1.4 Basic service.
- 1.5 Basic Volley.
- 1.6 Over-head Volley.
- 1.7 Chop

2. Tactics – Defensive, attacking in singles, doubles and mixed doubles.

III. WRESTLING

10 Marks

1. Fundamental Skills

- 1.1 Learning and demonstrating fundamental skills involving drills and lead up games, if any, therein (Catch as can style).
 - 1.1.1 Take downs : leg tackles, arm drag.
 - 1.1.2 Counters for take downs : Cross face, whizzer series.
 - 1.1.3 Escapes from under : Sitout-turn in triped.
 - 1.1.4 Counters for escapes from under : Basic control, back drop, counters for stand up.
 - 1.1.5 Pinning combination : Nelson series, (Half Nelson, Half Nelson and bar arm) leg lift series, leg cradle series, Reverse double bar arm, chicken wing and half nelson.
 - 1.1.6 Escapes from pinning : Wing lock series, Double arm lock roll, bridge.
 - 1.1.7 Standing Wrestling : Head under arm series whizzer series.
 - 1.1.8 Referees positions.

2. Tactics – Defensive, attacking.

IV. SOFT BALL

10 Marks

1. Fundamental Skills

- 1.1. Players Position
- 1.2. Pitching
- 1.3. The Catches
- 1.4. Batting Position
- 1.5. Hitting
 - 1.5.1. Set-up
 - 1.5.2. Power Position

- 1.5.3 Approach
- 1.5.4. Release
- 1.5.5. Follow through
- 1.6. Group Tactics
- 1.7. Defensive & Offensive
- 1.8. Lit up Games

Reference Books

1. Doway, J.C. Better Badminton for All, Pelham Books Ltd, Great Britain.
2. David Park, Better Badminton Learn in Yourself Book, Orient Paper Books, London.
3. Brown E, Better Badminton, Lea & Fabiger, London.
4. Hawton, Mary, How to Play Winning Tennis, Eookthrift, One west 39th Street, New York.
5. Eighton Jim, Inside Tennis Techniques of Winning, Prentice Hall Inc. Englewood Cliffs, New Jersey.
6. Dubey. C.H. A Wrestling Guide, 201 Rampura, Sauger (M.P.).
7. U.S. Naval Institute, Wrestling, Arnapolis Manyala, USA.

SEMESTER III**Paper- 1****PHE301 - Physical Education****Psychology and Sociology in Physical Education**
(THEORY)**Full Marks: 75****Unit-I****15 Marks**

- 1.1. Meaning, definition and nature of Psychology and Sports Psychology
- 1.2. Scope of Psychology in Physical Education.
- 1.3. Learning - meaning and definition of Learning
- 1.4. Principles of learning, factors affecting learning and transfer of training
- 1.5. Motor learning- meaning, definition, stages and development

Unit-II**15 Marks**

- 2.1. Personality – Meaning, definition and types of personality
- 2.2. Importance of personality in Physical Education and sports
- 2.3. Emotion – Meaning, definition and role of emotion in Physical Education and sports
- 2.4. Motivation – Meaning, definition and role of motivation in Physical education and sports

Unit-III**15 Marks**

- 3.1. Meaning, definition and nature of Sociology and Sports Sociology.
- 3.2. Importance and scope of Sociology in Physical education and Sports
- 3.3. Society, Community, Association, Institutions, Customs
- 3.4. Man as a Social Animal.

Unit-IV**15 Marks**

- 4.1. Social institutions and socialization
- 4.2. Social significance of sports
- 4.3. Sports as an Institutionalizing agency
- 4.4. Physical Education and Sports as a Social phenomenon

Unit-V**15 Marks**

- 5.1. Importance of Sports Psychology for Physical Educationists, coaches and players
- 5.2. Socio-psychological aspects of sports - the social group, development of group mind through sports.
- 5.3. Sports for better International understanding, co-operation and group cohesion in Sports team.
- 5.4. Relationship between family and sport participation

PHE301 (PRACTICAL)**25 Marks**

1. Practical performance of:

5+5+5 = 15 Marks

- a) Perception
- b) Concentration
- c) Memory

2. Measurement of:

5+5= 10 Marks

- a) Breack's sociometric test of status.
- b) Cowell's personal distance scale

Reference Books

1. Kamlesh ML, Psychology in Physical Education and Sports, Metropolitan Book Co(P) Ltd. New Delhi.
2. Suinn R.N., Psychology in Sports, Surjit Singh Publication, Delhi.
3. Puni AT, Sports Psychology, NIS, Chandigarh.
4. Kana JS, Psychological aspects of Physical Education & Sports, Rout Leage, Kejanpaul, London.
5. Bhatia and Bhatia, Educational Psychology.
8. Lyer, Mac, at.el. Society, Mc Millan & Co., London.
9. Ogburu William F. and Mimkaff Meyer F.H., Book of Sociology, Eurasia Publishing House Ltd. New Delhi.

Paper-2
HE302- Health Education
Fundamentals of Food and Nutrition
(THEORY)

Full Mark: 75

Unit-I **15 Marks**

- 1.1. Meaning and definition of food and nutrition
- 1.2. Types of Food
- 1.3. Importance of food and nutrition
- 1.4. Principles of nutrition

Unit-II **15 Marks**

- 2.1. Carbohydrate and fat, and their sources
- 2.2. Simple carbohydrates, complex carbohydrates and dietary fiber and their importance
- 2.3. Metabolizing carbohydrates - High insulin levels, low blood sugar, and obesity.
- 2.4. Importance and varieties of fat - visible fat and invisible fat.

Unit-III **15 Marks**

- 3.1. Protein and its sources
- 3.2. Importance and functions of protein
- 3.3. Components of protein - essential and nonessential amino acids
- 3.4. Importance of water causes of loss of water from the body.

Unit-IV **15 Marks**

- 4.1. Vitamins and its sources
- 4.2. Importance and needs of Vitamins
- 4.3. Varieties of vitamins and their food sources
- 4.4. Free Radicals and Antioxidants, importance of antioxidants.

Unit-V **15 Marks**

- 5.1. Minerals, importance of Minerals
- 5.2. Varieties of minerals and food sources of minerals
- 5.3. Balance Diet - Meaning and importance of balanced diet
- 5.4. Balance diet for different age groups.

HE302 (PRACTICAL)

25 Marks

- | | | |
|----|--|----------|
| 1. | Identification of food sources of different vitamins and minerals. | 5 Marks |
| 2. | Group discussion on the diseases caused by food habit. | 15 Marks |
| 3. | Preparation of balanced diet chart. | 5 Marks |

Reference Books

1. Preventive and Social Medicine - J.E. Park and K.E. Park , Medical College, Jabalpur.
2. Essentials of Exercise Physiology - Larry G. Shaver - Surjeet Publication, Post Box No. 2157, 7- K , Kolhapur Road, Kamlanagar, Delhi.
3. Nutrition for a longer life - Robert Crayhon, M.S Magna Publishing Company Ltd. Mumbai.

Paper- 3
SP303- Games & Sports
Gymnastics, Volleyball, Hockey and Handball
(THEORY)

Marks: 50**Unit –I****10 Marks**

- 1.1. History of the game/sports.
- 1.2. Organization (Working Federation)

Unit –II**10 Marks**

- 2.1. Various systems of the play
- 2.2. Rules and their interpretation
- 2.3. Equipment and Play field

Unit –III**10 Marks**

- 3.1. Application of Scientific Principles for the improvement of skills.
- 3.2. Training for the development of performance of the games/sports.

Unit –IV**10 Marks**

- 4.1. Physiology of Warm-up
- 4.2. General and Specific Warm-up.

Unit –V**10 Marks**

- 5.1. Meaning and Definition of Officiating and Coaching
- 5.2. Duties of good Coach, qualities and qualification of a Coach,
- 5.3. Methods of Officiating.

SP303 (PRACTICAL)**Marks: 50**

- I. Gymnastics**
- II. Volleyball**
- III. Hockey**
- IV. Handball**

15 Marks**15 Marks****10 Marks****10 Marks****I. GYMNASTICS****15 Marks****1. Fundamental Skills:**

- 1.1. Floor Exercise (boys and girls)-
 - 1.1.1. Forward Roll.
 - 1.1.2. Backward Roll.
 - 1.1.3. Sideward Roll.
 - 1.1.4. Cart Wheel.
 - 1.1.5. Handstand and forward roll.
 - 1.1.6. Backward roll to hand stand.
 - 1.1.7. Diving forward roll.
 - 1.1.8. Side split.
 - 1.1.9. Head stand.
 - 1.1.10. Different kinds of scale.
 - 1.1.11. Diving roll from beat board.
 - 1.1.12. Round off.

1.1.13. Jumps-leap, scissors leap.

1.2. Balancing Beam (girls)-

- 1.2.1. Walking and running on the beam.
- 1.2.2. Turning movement on the beam.
- 1.2.3. Cat jump.
- 1.2.4. Dancing steps and movements.
- 1.2.5. Mount (1/4 turn to cross sitting).
- 1.2.6. Dismount (jump from the end of the beam with legs straddle in the air).
- 1.2.7. Straddle mount.
- 1.2.8. Forward roll on the bench and beam.

1.3. Parallel Bar (boys)-

- 1.3.1. Mount from one bar.
- 1.3.2. Straddle walking on parallel bar.
- 1.3.3. Single and double step walk.
- 1.3.4. Perfect swing.
- 1.3.5. Shoulder stand on one bar and roll forward.
- 1.3.6. Roll side
- 1.3.7. Shoulder stand.
- 1.3.8. Front on back vault to the side (dismount).

1.4. Vaulting Horse (boys and girls)-

- 1.4.1. Approach run and jump from the board.
- 1.4.2. Cat vault.
- 1.4.3. Squat vault.
- 1.4.4. Straddle vault.
- 1.4.5. Side vault.

1.5. Rhythmic activities (girls)-

- 1.5.1. Basic skills or five elements of three selected apparatus.
- 1.5.2. Choreography with music.
- 1.5.3. Basic turns, jumps, leap with music.

2. Code of points:

- 2.1. Evaluation
- 2.2. Duties of judges.
- 2.3. Responsibilities of gymnasts.
- 2.4. Measurement of apparatuses.

II. VOLLEYBALL

15 Marks

1. Fundamental Skills.

- 1.1 Player's stance- Receiving the ball & passing to the team mates.
 - 1.1.1 The Volley (Over head pass)
 - 1.1.2 The Dig (Under hand pass)
- 1.2 Service-
 - 1.2.1 Under Arm Service.
 - 1.2.2 Side Arm Service.
 - 1.2.3 Tennis Service.
 - 1.2.4 Round Arm Service.

- 1.3 Spike-
 - 1.3.1 Straight Arm Spike.
 - 1.3.2 Round Arm Spike.

- 1.4 Block-
 - 1.4.1 Single Block.
 - 1.4.2 Double Block
 - 1.4.3 Triple Block

2. Advanced Skills-

- 2.1 Pass-
 - 2.1.1. Back Pass.
 - 2.1.2 .Back Roll Volley.
 - 2.1.3 .Back Roll Dig.
 - 2.1.4 .Jump and Pass.
 - 2.1.5. Side Roll Dig.
- 2.2. Dive-
 - 2.2.1. Dive combined with dig (Two handed).
 - 2.2.2. Dive combined with dig (One handed).
- 2.3 Lead up Games-
 - 2.3.1 Three Volleys (These can be combined with service)
 - 2.3.2 Three Digs (Receiving service using dig and setting and placing using volleying action).

III. HOCKEY

10 Marks

1. Fundamental Skills

- 1.1 Grip.
- 1.2 Skills-
 - 1.2.1 Rolling the ball.
 - 1.2.2 Dribbling.
 - 1.2.3 Push.
 - 1.2.4 Stopping.
 - 1.2.5 Hit.
 - 1.2.6 Flick.
 - 1.2.7 Scoop.
- 1.3 Passing – Forward pass, square pass, triangular pass.
- 1.4 Drills and lead up game related with skill taught.

2. Advance Skill

- 2.1 Reverse hit, hitting on the wrong foot.
- 2.2 Stopping the ball on the right, left side and stopping the ball in the air.
- 2.3 Pushing on the wrong foot.
- 2.4 Reverse flick.
- 2.5 Dodging (through the legs, right and left.)
- 2.6 Tackling-front, right, left.
- 2.7 Passing-Through pass, diagonal pass, return pass.
- 2.8 Common bully.

3. Positional play in attack and defense.

4. Drills and lead up games.

IV. HANDBALL

10 Marks

1. Fundamental Skills

- 1.1 Running, Catching the ball with two hands, Catching at chest height, Catching the high ball and catching the low ball.
- 1.2 Passing and Throwing : One handed shoulder pass, two handed chest pass the long throw.
- 1.3 Dribbling (Running with the ball)
- 1.4 Shooting:
 - 1.4.1 The standing throw shot.
 - 1.4.2 The side throw shot.
 - 1.4.3 The jump shot.
 - 1.4.4 The reverse shot.
 - 1.4.5 The fall shot
 - 1.4.6 Goal Keeping :
Basic stance, hand and feet movement.

2. Positional play in attack and defense.

3. Drills and lead up games.

Reference Books

1. Sturmt, Nik. Competitive Gymnastics, Stonlly Paul and Company Ltd. London:
2. De Carle, Tom. Hand Book of Progressive Gymnastics. Englewood Cliffs: N.J. Prentice Hall.
3. Lokon, Newton, C. and Williougby, Rodert, J. Complete Book of Gymnastics. Englewood Cliffs, N.J. Prentice Hall.
4. Dhanraj, V., Hubert, Volleyball for Men and Women, Y.M.C.A. Publishing House, Calcutta.
5. Nicholls Keith, Modern Volleyball for Teachers, Coach and Player, Lepus Book House, London.
6. Siyamaker, Thomas and Brown, Virgine H., Power Volleyball , Saunders Company, London.
7. Sotir and Nicolas, Winning Volleyball, Stanley Paul, London.
8. Flint, Rachael H., Women's Hockey, Pelham Books Ltd. London.
9. Milford, D.S., Hockey Practice and Tactics, Edward Arnold and Company, London.
10. Singh. Gian and Wallia Kuku, Learn Hockey This Way, International Hockey Institutes, New Delhi.
11. Rowland B.J., Handball, A Complete Guide, Faber and Faber Ltd. 24 Ronsel square, London.
12. Mand, Charles L., Handball Fundamentals, Charles E. Merril Company, Columbus, Cinio.

SEMESTER -IV**Paper - 1****PHE401 -Physical Education****Methods in Physical Education & Sports**
(THEORY)**Full Mark: 75****Unit- I****15 marks**

- 1.1. Meaning and scope of teaching methods in Physical Education ,
- 1.2. Principles of teaching, factors which influenced methods of teaching
- 1.3. Types of Methods - Lecture method, Command method, Project method, Discussion method, Demonstration and imitation method.

Unit- II**15 marks**

- 2.1. Class management - Principles of class management, Steps in class management.
- 2.2. Procedure of teaching in Physical Activity - Team Games, Division Team Games,
- 2.3. Principles related to the teaching of team games.

Unit- III**15 marks**

- 3.1. Individual Sports - Calisthenics, Gymnastics, Rhythmics, Combative
- 3.2. Principles related to the teaching of Individual Sports.
- 3.3. Lesson planning – Preparation, principles, types, Characteristics, construction, and kinds of lesson plan.

Unit- IV**15 marks**

- 4.1. Competition : Types of competition, drawing of fixture
- 4.2. Leadership: Qualities of a good leader, types of leadership, Teacher's leadership, Student's leadership.
- 4.3. Supervision and its types in Physical Education.

Unit- V**15 marks**

- 5.1. Intramural & Extramural competition - Objectives, method of organising Intramural and Extramural competition
- 5.2. Sports Meet - Types of sports meet, organizing of sports meet.
- 5.3. Classification of Students - Benefits of students' classification.

PHE401 (PRACTICAL)**25 Marks**

1. Teaching ability test –
Preparation of lesson plan :
a) General lesson plan (5 lessons for general activities)
b) Specific lesson plan (5 lessons for games and sports)
2. Organization of Intramural Competitions.

10 Marks**15 Marks****Reference Books**

1. Kamlesh & Sangral, Methods in Physical Education, Prakash Brothers, Ludhiana.
2. Bhatia and Bhatia, The Principles and Methods of Teaching, Doaba House, New Delhi.

4. Kochar, S.K., Methods & Techniques of Teaching, Sterling Publishers Pvt. Ltd, Julundas.
5. Kozman, Cassidy and Jackson, Methods in Physical Education, W.B. Saunders company, Philadelphia and London.
6. Bucher, Chasles A., Methods And Materials In Physical Education and Recreation The C.V. Mosloy company, U.S.A.

Paper -2
HE402- Health Education
Fundamentals of Sports Medicine
(THEORY)

Full Mark: 75

Unit- I **15 Marks**

- 1.1. Meaning, definition and importance of sports medicine
- 1.2. Meaning and definition of drug
- 1.3. Drugs, drug abuse and drug dependence
- 1.4. Ergogenic Aids in Exercise and sports performance - Amphetamines, Anabolic steroids, alcohol, alkaline, blood doping, caffeine.

Unit- II **15 Marks**

- 2.1. Diet and performance - Carbohydrate, carbohydrate loading, fat and protein
- 2.2. Common sports injuries and their First Aid treatments -
 - a) Fracture - types of fracture and their sign and symptoms
 - b) Sprain and strain injuries
 - c) Dislocation of joints

Unit- III **15 Marks**

- 3.1. Meaning, definition and classification of Wounds
- 3.2. Hemorrhage and its causes
- 3.3. Control of hemorrhage by direct and indirect pressure
- 3.4. Meaning, definition and different types of sports injuries

Unit- IV **15 Marks**

- 4.1. Transportation of different injured person
- 4.2. Meaning and definition of Artificial respiration
- 4.3. Methods of artificial respiration - Holger - Nielson Method, Schaefer's Method

Unit- V **15 Marks**

- 5.1. Meaning and definition of Dressing and bandages
- 5.2. Importance of dressing and bandages
- 5.3. Application of bandages to different injuries.
- 5.4. Types of knots of bandages - Triangular bandage, Roller bandage and their knots.

HE401 (PRACTICAL)

25 Marks

1. Demonstration of application of different types of bandages and their knots. 5 Marks
2. Demonstration of different methods of transport of injured person. 5 Marks
3. Demonstration of artificial respiration. 5 Marks
4. Demonstration of control of haemorrhage by direct and indirect pressure. 10 Marks

Reference Books

1. St. John Ambulance Association (India) Publication, First Aid to the Injured, Red Cross Road, New Delhi.
2. J.E. Park and K.E. Park , Preventive and Social Medicine, Medical College, Jabalpur.
3. Larry G. Shaver, Essentials of Exercise Physiology, Surjeet Publication, Post Box No. 2157, 7- K , Kolhapur Road, Kamlanagar, Delhi.

4. Morris B. Mellion, Sports Injuries and Athletic Problems, Surjeet Publication, Post Box No. 2157, 7- K , Kolhapur Road, Kamlanagar, Delhi.
5. Bourne, Geoffery H., The Structure and Function of Muscles, Academic Press, London.
6. Guybon, Arthur C., Text book of Medical Physiology, W.B. Saunder Company, Philadelphia.

Paper- 3
SP403- Games & Sports
Kabaddi, Weightlifting, Judo and Sepak-Takraw
(THEORY)

Marks: 50

Unit –I

10 Marks

- 1.1. History of the game/sports.
- 1.2. Organization (Working Federation)

Unit –II

10 Marks

- 2.1. Various systems of the play
- 2.2. Rules and their interpretation
- 2.3. Equipment and Play field

Unit –III

10 Marks

- 3.1. Application of Scientific Principles for the improvement of skills.
- 3.2. Training for the development of performance of the games/sports.

Unit –IV

10 Marks

- 4.1. Physiology of Warm-up
- 4.2. General and Specific Warm-up.

Unit –V

10 Marks

- 5.1. Meaning and Definition of Officiating and Coaching
- 5.2. Duties of good Coach, qualities and qualification of a Coach,
- 5.3. Methods of Officiating.

SP403 (PRACTICAL)

Marks: 50

I.	Kabaddi	15 Marks
II.	Weightlifting	15 Marks
III.	Judo	10 Marks
IV.	Sepak Takraw	10 Marks

I. KABADDI

15 Marks

1. Fundamental Skills

- 1.1 Skills in raiding-
 - 1.1.1 Touching with hand.
 - 1.1.2 Various kicks.
 - 1.1.3 Crossing of Baulk line.
 - 1.1.4 Crossing of Bonus line.
 - 1.1.5 Luring the opponent to Catch.
 - 1.1.6 Pursuing.
- 1.2 Skills of holding the raider-
 - 1.2.1 Various formations.
 - 1.2.2 Catching from particular position.
 - 1.2.3 Different catches.
 - 1.2.3 Luring the raider to take particular position so as to facilitate catching.
 - 1.2.5 Chain formation and techniques.

- 1.3 Additional skills in raiding-
 - 1.3.1. Bringing the Antis in to particular position.
 - 1.3.2 Escaping from various holds.
 - 1.3.3 Techniques of escaping from chain formation.
 - 1.3.4. Combined formations in offence.
 - 1.3.5. Combined formations in defense.

2. Various lead up games.

II. WEIGHT LIFTING

15 Marks

1. Fundamentals of Techniques

- 1.1 Stages of two hand class
- 1.2 Stages of two hands jerk from chest.
- 1.3 Stages of two hands snatch
- 1.4 Two hands clean in half squat
- 1.5 Two hands clean in deep squat
- 1.6 Two hands clean in split squat.
- 1.7 Two hands half jerk from chest
- 1.8 Complete jerk from chest
- 1.9 Snatch with split style
- 1.10 Snatch with squat style.

2. Exercises

- 2.1 Isotonic Exercises
- 2.2 Isometric Exercises
- 2.3 Exercises for co-ordination, strength, Endurance, Speed, flexibility and agility.
- 2.4 Exercises with Wall-bars and vaulting box.
- 2.5 Exercises with pulleys.
- 2.5 Exercises with multiple machines.

III. JUDO

10 Marks

1. Fundamental Skills.

- 1.1 Rej (salutation),
 - 1.1.1 Ritsurei (salutation in standing position).
 - 1.1.2 Zarai (salutation in the sitting position).
- 1.2 How to wear Judo Costume.
- 1.3 Kumi Kata (Methods of holding judo costume).
- 1.4 Shisei (Posture in Judo).
- 1.5 Kuzushi (Act of disturbing the opponent posture).
- 1.6 Tsukuri and kake (Preparatory action for attack,)
- 1.7 Ukemi (Break fall).
 - 1.7.1 Urhiro Ukemi-(Rear break fall).
 - 1.7.2 Yoko Ukemi (Side break fall).
 - 1.7.3 Mae Ukemi (Front break fall).
 - 1.7.4 Mae mawari Ukemi (Front rolling break fall).
- 1.8 Shin Tai (Advance or Retreat foot Movement).
 - 1.8.1 Suri-ashi (Gliding foot).
 - 1.8.2 Tsugi-ashi (Following foot steps).
 - 1.8.3 Ayumi-ashi (Walking steps).

- 1.9 Tai Sabaki (Management of the body).
- 1.10 Nage-waze (Throwing Techniques).
 - 1.10.1 Hiza Guruma (Knee wheel).
 - 1.10.2 Sesae Tsurikomi-ashi (Drawing ankle throw).
 - 1.10.3 De-ashi hari (Advance foot sweep).
 - 1.10.4 O Goshi (Major Loin).
 - 1.10.5 Seoi. nage (Shoulder throw) – Ippon scionage and Morote Scionag.
- 1.11 Katama-waze (Grappling Techniques).
 - 1.11.1 Kesa-gatame (Scaff hold).
 - 1.11.2 Kata-gatma (Shoulder hold).
 - 1.11.3 Kami-shiho gatama (Locking of upper four quarters).
 - 1.11.4 Method of escaping from each hold.

2. Lead-up games

- 2.1 Break fall relay (maximum number of falls from standing position in one minute duration).
- 2.2 Mae- mawriukemi relay (maximum number of falls in one minute duration).
- 2.3 Maximum number of shoulder throw in one minute.
- 2.4 Maximum number of obstacles jumped while doing mae- mawriukemi.

3. Methods of Escaping from all above listed grappling techniques.

IV. SEPAK-TAKRAW

10 Marks

1. Fundamentals Skills.

- 1.1 Kicks-
Inside kick, knee/thigh kick, toe kick, outside kick, heading, cross jump kick, back flip, shoulder kick.
- 1.2 Spike-
Roll spike/summersault kick, scissor kick/sun-back kick, side scissor kick, front scissor kick and sole kick.
- 1.3 Block-
Back, leg, head
- 1.4 Service-
Spin service, top spin, side spin, floating, half swing, throw the ball by front player to the back player (Tekong).
- 1.5 Trapping-
Chest, head, thigh, inside of the foot, instep of the foot.

2. Play the ball with different parts of the body.

Reference Books

- 1. Rao, C. V., Kabaddi, Patiala, N.I.S. Publications.
- 2. Reddy, B. A., Scientific Kabaddi, Raman's Printing Press, Madras.
- 3. Katyal P.N., Manual of Weight Lifting, Green Printing Press, Ambala Cant.
- 4. Krikley, George W, Modern Weight Lifting, Feber Popular Books, London.
- 5. Murray, Jim and Karpovich, Peter V., Weight Training in Athletics, Englewood Cliffs, M.J. Prentice Hall
- 6. Feldenkrais M., Higher Judo, General Work, Fredrick Warne and Co., Ltd. London and New York, .
- 7. Smith Robart W., Judo, its Story, Practice Charles E. Tuttle Company of Rutlond, Vermoni Tokoyo and Japan.

SEMESTER -V**Honours -1****PHE501 - Physical Education****Exercise Physiology in Physical Education**
(THEORY)**Full Marks: 100****Unit- I****20 Marks**

- 1.1. Meaning, Nature and scope of Exercise Physiology
- 1.2. Effect of Exercise on various system of the body
 - a) Heart and exercise
 - b) Respiration and exercise
 - c) Exercise and metabolism

Unit- II**20 Marks**

- 2.1. Effect of Exercise on skeletal muscles:
 - a) Gross and microscopic structure and types of muscle fiber
 - b) Structure of myofibril and contractile mechanism (sliding filament theory).
- 2.1. Effect of Exercise on the property of voluntary muscles :
 - a) Extensibility and elasticity
 - b) Irritability (excitability)
 - c) Contractility
 - d) Muscle tone

Unit- III**20 Marks**

- 3.1. Changes in muscle during Exercise:
 - a) Chemical changes.
 - b) Thermal changes.
 - c) Electrical changes.
 - d) Mechanical changes.
- 3.2. Physiology of muscular movement:
 - a) Muscle twitch and its myogram.
 - b) Temperature effects upon muscle contraction.
 - c) All or none law.
 - d) Electrical phenomena and electromyography
 - e) Mechanical factors of muscular activity.

Unit- IV**20 Marks**

- 4.1. Nervous control of muscular movement :
 - a) Basic structures and functions of the nerve.
 - b) The nerve impulse, the neuromuscular junction, muscle sense organ, Proprioceptors, The muscle spindle, Golgi Tendon Organs, Joint receptors, Voluntary control of motor function.
- 4.1. The reflex arc and Involuntary movement - intransegmental and suprasegmental reflexes.

Unit- V**20 Marks**

- 5.1. Energy for muscular work :
Introduction, definition of energy, Biological energy cycle, Adenosine Triphosphate (ATP), Sources of ATP, Aerobic and anaerobic systems during rest and exercise.

- 5.2. Measurement of energy , Work and power - Direct and Indirect measurement of energy, Oxygen consumption, Respiratory exchange ratio (R) - Carbohydrate, fat and protien.
- 5.3. a) Anaerobic sources of Energy - Anaerobic Metabolism, Anaerobic Glycolysis (Lactic acid system).
- b) Aerobic sources of Energy - Aerobic metabolism, the krebs cycle, the electron transfer system.

References Books

1. Larry G. Shaver, Essential of Exercise Physiology, Surjit Publication Kolhapur Road, Kamalanagar, Delhi.
2. Herbert A . de. Vries, Physiology of Exercise for Physical Education and Athletics, Staples Press, London.
3. Edward L. Fox, Richard W. Bowers, The Physiological basis of Physical Education and Athletics , Merle L. Foss, Web C. Brown Publishers, Dubuque, IOWA.
4. Pearce, E.C., Anatomy and Physiology for Nurses, Faber Ltd. London.
5. Penot, J.W., Anatomy for Students and Teachers of Physical Education, Edward Arnold and Co. London.
8. Maxhouse and Miller, Physiology of Exercise, The C.V. Mosby Company, St. Louis.
9. Karpovich and Sinuer, Physiology of Muscular Activity, W.B. Saunders Company, London.
10. Mathew, D.K. and Fox, E.L., Physiological basis of Physical Education and Athletics, W.B. Saunders Co., Philadelphia.

Honours -2
PHE502 - Physical Education
Kinesiology and Bio-mechanics in Physical Education
(THEORY)

Full Marks: 100

- | | | |
|------------------|---|-----------------|
| Unit- I | | 20 Marks |
| | 1.1. Introduction, meaning, aim and objectives of Kinesiology in Physical Education. | |
| | 1.2. Scope and needs of Kinesiology in Physical Education. | |
| | 1.3. Fundamental concepts - Centre of gravity, line of gravity, planes and axis of the motion. | |
| | 1.4. Fundamentals of starting position of movements, terminology of fundamental movements around the joints. | |
| Unit- II | | 20 Marks |
| | 2.1. Analysis of fundamental movements :
Walking, Running, Jumping and Throwing. | |
| | 2.2. Direction and angle of pull and its significance. | |
| | 2.3. Structure of Motor Actions - Structure of cyclic and a cyclic motor action and movement combinations | |
| | 2.4. Fundamentals of relationship for different phases of motor action. | |
| | 2.5. Motor movements - Movement rhythm, movement coupling, movement flow, and movement precision. | |
| Unit- III | | 20 Marks |
| | 4.1. Introduction, meaning, aim and objectives and importance of Bio-mechanics in Physical Education. | |
| | 4.2. Motion - Laws of motion, types of motion, | |
| | 4.3. Projectile motion and their importance in games and sports. | |
| Unit- IV | | 20 Marks |
| | 4.1. Linear and angular Kinematics - Speed, velocity, acceleration, uniformly accelerated motion, relationship between linear and angular motion. | |
| | 4.2. Linear and Angular kinematics - Mass, force, work, power, energy, momentum, friction, movement of inertia. | |
| | 4.3. Conservation of momentum, transfer of momentum. | |
| Unit- V | | 20 Marks |
| | 5.1. Lever : Types of lever and their applications | |
| | 5.2. Equilibrium and stability: types and principles | |
| | 5.2. Bio-mechanical principles - Principles of initial force, principles of optimum path of acceleration, principle of conservation of momentum and principles of counter action. | |

Reference Book

1. Katharine F. Wells, Kinesiology - Scientific Basis Of Human Motion, Kathryn Luttgens, Saunders College, Philadelphia.
2. Dunn, Scientific Principles of Coaching Prentice Hall, Inc. New Jersey.
3. Miller and Nelson, Bio-Mechanics of Sports, Log and Fahier, Philadelphia.
4. Legan and Mckinney, Anatomic Kinesiology , Inc. Brown Company.

5. May and Daij, The Anatomical and Mechanical Basis of Human Motion, Prentice Hall, Inc. New York.
6. Broer, M.R., Efficiency of Human Movement, W.B. Saunders Co., Philadelphia.
7. Bunn, John W., Scientific Principles of Coaching, Engle Wood Cliffs, N.J. Prentice Hall Inc.
8. Duvall, E.N., Kinesiology, Engle Wood Cliffs, N.J. Prentice Hall Inc.
9. Rasch and Burke, Kinesiology and Applied Anatomy Lea and Fibger, Philadelphia.
10. Scott, M. G., Analysis of Human Motion, New York.

Honours -3
PHE503 - Physical Education
(PRACTICAL)

Full Marks: 100

Unit- I

20 Marks

- 1.1. To study the knee joint reflex action
- 1.2. To study the electrical apparatus used for stimulating excitable tissue and recording muscular contraction.
- 1.3. To draw the simple muscle curve.

Unit- II

20 Marks

- 2.1. To demonstrate the effect of repeated stimuli.
- 2.2. To demonstrate the effect of fatigue on simple muscle nerve preparation.
- 2.3. To demonstrate the effect of load on muscle contraction.
- 2.4. To demonstrate the effect of temperature on simple muscle nerve preparation.
- 2.5. To demonstrate the complete and incomplete tetanus.

Unit- III

20 Marks

- 3.1. Measurement of kinesthetic perception :
 - a) The shuffle broad distance perception test
 - b) Kinesthetic obstacle test.

Unit- IV

20 Marks

- 4.1. Identification of bone:
 - a) Scapula - Coastal and dorsal side
 - b) Anterior and posterior of humerous, radius, ulna, femur, tibia and fibula.
- 4.2. Identification of muscle - Biceps, triceps, deltoid, femoris and gastrocnemius muscle.

Unit- V

20 Marks

- 5.1. Demonstration of liver - First class, Second class and Third class liver.
- 5.2. Demonstration of a cyclic and cyclic motor movements and their combination.

SEMESTER -VI**Honours -1****PHE601 - Physical Education****Test, Measurement and Evaluation in Physical Education
(THEORY)****Full Marks: 100****Unit- I****20 Marks**

- 1.1. Introduction - Test, Measurement and Evaluation in Physical education.
- 1.2. Importance of Test, Measurement and Evaluation in Physical Education.
- 1.3. Principles of Test, Measurement and Evaluation

Unit- II**20 Marks**

- 2.1. Technical Standards / Criteria for selecting a test :
 - Validity
 - Reliability
 - Objectivity
 - Precision
 - Norms
- 2.2. Concepts and Components of:
 - General motor ability
 - Motor Educability
 - Motor fitness

Unit- III**20 Marks**

- 3.1. Basic Statistics:
Meaning, Definition, Characteristics and Importance of statistics in Physical Education
- 3.2. Measures of central tendency - Mean, Median, Mode
- 3.3. Measures of variability, Range, Standard Deviation, Quartile Deviation.

Unit- IV**20 Marks**

- 4.1. Correlation:
Meaning of correlation, computing correlation, Interpretation of coefficients of correlation.
- 4.2. Functions of measurement :
Status, Comparison, Criteria of test, Validity of test, Economy of test.

Unit- V**20 Marks**

- 5.1. Basic application of computer :
Meaning, types, characteristics and importance of computer,
- 5.2. Software, hardware, operating system, MS Words, MS Excel, PowerPoint, Internet and its importance,
- 5.3. Websites, web browser, search engine.

Reference Books

1. Baumartnes, T.A. and A.S. Jackson, Measurement for Evaluation in Physical Education and Exercise Science, Wm. C. Brown publishers, University of Horesten, U.S.A.
2. Bosco, J.S. W.F. Gustafson, Measurement and Evaluation in Physical Education, Fitness and sport, Practie Hall, INC, Englwood Cliffs, New Jersey, U.S.A.

3. Claste, H.H., and D.H. Claske, Application of Measurement to Physical Education, Practice Hal INC., Englewood Cliff, New Jersey, U.S.A.
4. Hasted, D.N. and A.C. Lacy, Measurement and Evaluation in contemporary Physical Education. Gorsuch Scasisbrick, Scottsdale, AZ, U.S.A.
5. Johnson, B.L. and J.K. Nelson, Practical Measurement for Evaluation in Physical Education, 3rd Ed. Subject Publications, Delhi.
6. Kansal D.K., Test and Measurement in Sports and Physical Education, DVS Publications, New Delhi.
7. Mathews, D.K, Measurement in Physical Education, 4th Ed. W.B. Saunders Company, Philadelphia, U.S.A.
8. Phillips, D.A. and J.E. Harnak, Measurement and Evaluation in Physical Education, Wiley, New York, U.S.A.

Honours -2
PHE602 - Physical Education
Fundamentals of Scientific Training in Physical Education & Sports
(THEORY) Full Marks: 100

Unit- I **20 Marks**

- 1.1. Aim, task, characteristics and principles of sports training.
- 1.2. Important features of training load - Intensity, Density, Duration and Frequency.

Unit- II **20 Marks**

- 2.1. Principles of training load, relationship between load and adaptation, condition of adaptation.
- 2.2. Judgment of load - Objectives and subjective means of judgment of load, over load, cause of over load,
- 2.3. Symptoms of overload and tackling of overload.

Unit- III **20 Marks**

- 3.1. Development of Motor Components:
 - a) Strength - Forms of strength, strength training means & methods.
 - b) Endurance - Forms of endurance, training means and methods of endurance.
 - c) Speed - Form of speed, speed training, training means and methods of speed.
 - d) Flexibility - Form of flexibility, methods of development of flexibility.
 - e) Coordinative ability - Form of coordinative ability, methods of development of coordinative ability.

Unit- IV **20 Marks**

- 4.1. Techniques -
Aim and characteristics of technique, techniques in sports, stages of technical development, causes and correction of faults.
- 4.2. Tactics -
Tactics, Principles of Tactical preparation, methods of tactical development.
- 4.5. Planning for competition - Main, build up competition, competition frequency

Unit- V **20 Marks**

- 5.1. Training Plans - Long term and short term plans,
- 5.2. Periodization (Single, double and triple) Cyclic process of training,
- 5.3. Psychological aspects of short term and long term training process in sports.
- 5.4. Motor development and its implication in relation to different sex and groups.

Reference Books

1. Dick W. Frank, Sports Training Principles, 4th ed. A & C Black Ltd., London.
2. Harre, D., Principles of Sports Training, Sport Veulag, Berlin.
3. Singh, Hardayal, Science of Sports Training, DVS Publications, New Delhi.
4. Uppal, A.K., Principles of Sports Training, Friends Publication, New Delhi.

Honours - 3
PHE603 - Physical Education
(PRACTICAL)

Full Marks: 100

Unit- I

20 Marks

1.1. Measurement of Flexibility :

- a) Modified Sit-and-Reach Test.
- b) Bridge-up Test
- c) Trunk-and-Neck Extension Test
- d) Front-to-Rear Split Test
- e) Shoulder-and-Wrist Elevation Test

1.2. Measurement of strength :

- a) Leg strength test
- b) Back strength test
- c) Hand grip strength test

Unit- II

20 Marks

2.1. Measurement of muscular endurance:

- a) Flexed - Arm Hang Chin-up Test
- b) Half-Squat Jump Test
- c) Push-Up Test
- d) Sit-up test

2.2. Measurement of cardio-vascular and lungs capacity:

- a) Twelve minute and nine minute Run-walk Test
- b) LSU Step Test
- c) Harvard step test
- d) Vital Capacity

Unit- III

20 Marks

3.1. Measurement of motor performance-I

- i) Measurement of power
 - a) Standing Broad or long jump.
 - b) Two-Hand Medicine ball put
 - c) Arm pull-up test
- ii) Measurement of Agility :
 - a) Side Step Test
 - b) Shuttle Run Test
 - c) Illinois Agility Test

Unit- IV

20 Marks

1.1. Measurement of motor performance-II

- i) Measurement of Balance
 - a) Stork Stand Test
 - b) Bass Stick Test
 - c) Nelson Balance Beam Test
- ii) Measurement of Reaction time :
 - a) The Nelson Hand Reaction Test
 - b) The Nelson Foot Reaction Test
 - c) The Nelson Speed of Hand Movement Test

- iii) Measurement of Speed :
 - a) 30 m., 40 m. , 50 m. sprint
 - b) 5 sec., 6 sec., 8 sec. run
 - c) 20 m. shuttle run (one time)

Unit- V**20 Marks**

5.1. Sports Skill Test :

- a) Johnson Basketball Ability test
- b) McDonald Soccer Test
- c) Brady Volleyball Test
- d) Lock Hart and McPherson Badminton Test
- e) Harban's Hockey Test

Reference Books

1. Baumartnes, T.A. and A.S. Jackson, Measurement for Evaluation in Physical Education and Exercise Science, Wm. C. Brown publishers, University of Horesten, U.S.A.
2. Bosco, J.S. W.F. Gustafson, Measurement and Evaluation in Physical Education, Fitness and sport, Practie Hall, INC, Englwood Cliffs, New Jersy, U.S.A.
3. Claste, H.H., and D.H. Claske, Application of Measurement to Physical Education, Practice Hal INC., Englewood Cliff, New Jersey, U.S.A.
4. Hasted, D.N. and A.C. Lacy, Measurement and Evaluation in contemporary Physical Education. Gorsuch Scasisbrick, Scottsdale, AZ, U.S.A.
5. Johnson, B.L. and J.K. Nelson, Practical Measurement for Evaluation in Physical Education, 3rd Ed. Subject Publications, Delhi.
6. Kansal D.K., Test and Measurement in Sports and Physical Education, DVS Publications, New Delhi.
7. Mathews, D.K, Measurement in Physical Education, 4th Ed. W.B. Sauders Company, Philadelphia, U.S.A.
8. Phillips, D.A. and J.E. Harnak, Measurement and Evaluation in Physical Education, Wiley, New York, U.S.A.

Syllabus for Undergraduate Programme

Bachelor of Arts in Philosophy



Manipur University, Canchipur
Imphal-795003

Undergraduate Course (BA)

Philosophy
FIRST SEMESTER
Elective Paper/E1-101
GREEK PHILOSOPHY

Full Marks : 100

Approx. Lect.: 90

- Unit I:** The Ionics: Thales – Theory of Reality : The Pythagoreans: Number Theory and Ethics; The Eleatics: Parmenides – Sense and Reason, Ontology. 20 – Marks
15 – Lectures
- Unit II:** Heracleitus: Change and Permanence; The Atomists: Democritus – Theory of Particles; The Sophists: Protagoras – Theory of knowledge. 20 – Marks
12 – Lectures
- Unit III:** Socrates: The Socratic Problem, The Socratic Method. 10 – Marks
5 – Lectures
- Unit IV:** Plato: Theory of Knowledge, Theory of Ideas, Doctrine of Immortality, Ethics. 25 – Marks
28 – Lectures
- Unit V:** Aristotle: Theory of Categories, Criticism of Platonic Theory of Ideas, Metaphysics, The Four Causes. 25 – Marks
30 – Lectures

Text Books:

1. W.T. Stace – *A Critical History of Greek Philosophy*
2. Frank Thilly – *A History of Philosophy*

Reference Books:

1. Frederick Copleston – *A History of Philosophy*, Vol. 1 Part I and Part II.
2. Leonard Nelson – *Socrates Method and Critical Philosophy*.
3. Karl Popper – *The Pre-Socratics*

Undergraduate Course (BA)
Philosophy
SECOND SEMESTER
Elective Paper/E1-202
INDIAN PHILOSOPHY 1

Full Marks – 100
Approx. Lect. – 90

Unit I: Meaning and scope of India philosophy; Heterodox and Orthodox Schools; The common characters of India schools; Pessimism and Dogmatism in India Philosophy.	20 – Marks 15 – Lectures
Unit II: Carvaka: Theory of knowledge, Materialisms, Ethics.	15 – Marks 10 – Lectures
Unit III: Jainism: Concept of Reality, theory of judgment (Syadvada), Ethics.	25 – Marks 25 – Lectures
Unit IV: Buddhism: The four Noble truths, the Eightfold Noble Path (astangikamarga). The Theory of conditional Existence of Things (Pratityasamutpada), The theory of Non-existence of soul (anatmavada)	25 – Marks 25 – Lectures
Unit V: Schools of Buddhism: Madhyamika: Sunyavada; Yogacara; Vijnanavada; Sautrantica; and Vaibhasika: The process of Knowing the World (Bahyanumeyavada and Bahyapratyaksavada)	25 – Marks 30 – Lectures

Text Books:

1. S.C Chatterjee and D.M Dutta- An Introduction to Indian Philosophy.
2. M. Hiriyanna- Outlines of Indian Philosophy.

Reference Books:

1. S. Radhakrishnan- Indian Philosophy, Vol I & II
2. S. Dasgupta- History of Indian Philosophy.
3. C.D Sharma- A Critical Survey of Indian Philosophy.

Undergraduate Course (BA)
Philosophy
THIRD SEMESTER
Elective Paper/E1-303
LOGIC

Full Marks – 100
Approx. Lect. – 90

Unit I: Logic as the study of arguments:

Arguments: The nature of logical argument; Premises and Conclusions;
Conclusion indicators and Premise indicators; Diagram for argument; Diagram
for single argument; Diagram for simple complex arguments; Truth and Validity.

15 – Marks
10 – Lectures

Unit II: Sentences and Propositions:

Word and Sentences; Letter and Word; Token and Type; Sentence Token and
Sentence Type; Kinds of Sentence; Sentence and Meaning of Sentence; Proposition:
Distinction between a Proposition and a Sentence; Truth value of a Proposition; Kinds
of Proposition; Simple and Compound Proposition – Conjunctive, Disjunctive,
Implicative and Negative Proposition; Analysis of And, Either Or, If Then, Not;
Singular Proposition; General proposition; Quantifiers: All, Some; AEIO Proposition;
Terms and their distribution in AEIO.

15 – Marks
20 – Lectures

Unit III: Formal Concept:

Form and Matter; Form of a Proposition; Variable; Propositional Variable; Function;
Propositional Function; Formal Function; Truth Function: Conjunctive, Disjunctive,
Alternative, Implicative, Negative; Paradoxes of Material Implication; Bi-conditional;
Material Equivalence; Logical Equivalence; Truth Table: Argument Form;
Tautologies, Contradictories and Contingencies; Truth Table Method of Proving the
Validity of Arguments.

25 – Marks
20 – Lectures

Unit IV: The Method of Deduction:

Elementary valid argument forms; Formal Proof of Validity; The Rule of Conditional
Proof; The Rule of Indirect Proof; Proof of Tautologies; Proving Invalidity.

25 – Marks
15 – Lectures

Unit V: Syllogism:

Aristotlean Syllogism; Standard Form Categorical Syllogism; The Rules or Axioms of Validity; General Theorems of the Syllogism; The Figures and Moods of the Syllogism; The Special Theorems and Valid Moods of the First, Second, Third and Fourth Figures. The Reduction of Syllogism; The Antilogism or Inconsistent Triad; Fallacies of Syllogism; Venn Diagram Proofs of Validity or Invalidity; Enthymems; Sortes.

20 – Marks

25 – Lectures

Text Books:

1. Irving M Copi and Carl Cohen – *An Introduction to Logic*.
2. Morris R. Cohen and Ernest Nagel – *An Introduction to Logic and Scientific method*.

Reference Books:

1. Irving M Copi – *Symbolic Logic*.
2. Paul Tidman and Howard Kahne – *Logic and Philosophy; A Modern Introduction*.

Undergraduate Course (BA)

Philosophy

FOURTH SEMESTER

Elective Paper/E1-404

MORAL PHILOSOPHY

Full Marks – 100

Approx. Lect. – 90

Unit I: Nature and Scope of Ethics; Relation of Ethics to Religion, Politics and Law; Normative Ethics and Metathics.

15 – Marks

10 – Lectures

Unit II: Moral and Non-moral Actions; The Nature of moral judgment; The Object of moral judgment; Moral obligations

15 – Marks

10 – Lectures

Unit III: Theories of Moral Standard: Naturalistic and non-naturalistic ethics; Hedonism; Utilitarianism; Intuitionism.

20 – Marks

20 – Lectures

Unit IV: The Moral Law as a Law Reason; Kant's ethical theory; The Concept of Nishkama Karma; The Standard as Perfection; My Station and its Duties.

25 – Marks

25 – Lectures

Unit V: Value of Life: Suicide and Euthanasia; Theories of Punishment: Capital Punishment; Expression of Dissent; Terrorism; Moral attitude to the environment and animals.

25 – Marks

25 – Lectures

Text Books:

1. J.N. Sinha – A Manual of Ethics.
2. William Lillie – An Introduction to Ethics.
3. Peter Singer – Practical Ethics.

Reference Books:

1. J.S. Mackenzie – A Manual of Ethics
2. William Frankena – Ethics.
3. S. Lokendrajit Singh – On Who is A Terrorist published in the International Journal of World Affairs.

Undergraduate Course (BA)
Philosophy
FIFTH SEMESTER
Honors /H - 505
HISTORY OF WESTERN PHILOSOPHY 1

Full Marks – 100
Approx. Lect. – 90

Unit I:	Scholasticism; Its characteristics and stages	10 – Marks 10 – Lectures
Unit II:	St. Augustine: Theory of Knowledge and Theology. Thomas Aquinas: Philosophy and Theology; Theory of Knowledge.	10 – Marks 10 – Lectures
Unit III:	Descartes: Method and Criticism of Knowledge: The Principle – cogito ergo sum; Existence of the External World; Relation between Mind and Body; The Theory of Innate Ideas.	30 – Marks 25– Lectures
Unit IV:	Spinoza: Substance, Attributes and Modes; Theory of Knowledge.	25 – Marks 20– Lectures
Unit V:	Leibnitz: The Doctrine of Monads; Theory of Knowledge; The Pre-established Harmony.	25 – Marks 25 – Lectures

Text Books:

1. Frank Thilly – A History of Philosophy.
2. Y. Masih – A Critical History of Western Philosophy

Reference Books:

1. Richard Fulckenberg – History of Modern Philosophy.
2. Frederick Copleston – A History of Philosophy
3. Bertrand Russell – History of Western Philosophy.

Undergraduate Course (BA)
Philosophy
FIFTH SEMESTER
Honors Paper /H - 506
HISTORY OF WESTERN PHILOSOPHY II

Full Marks – 100
Approx. Lect. – 90

- Unit I:** Locke; Criticism of Innate Ideas, Origin of Knowledge, Nature and Validity of Knowledge, The Limits of Knowledge. 20 – Marks
15 – Lectures
- Unit II:** Berkeley: Rejection of Abstract Ideas, Theory of Knowledge, The Doctrine of esse est percipi. 20 – Marks
15 – Lectures
- Unit III:** Hume: Origin of Knowledge; Relation of Ideas and Matters of Facts; Relation of Cause and Effect; Knowledge of the External World. 30 – Marks
30 – Lectures
- Unit IV:** Kant: The Problem of Knowledge, The Distinction between Analytic and Synthetics Judgement, The Distinction between a priori and empirical knowledge; A priori synthetic judgement; The Theory of Sense Perception; The Theory of the Understanding; Phenomena and Noumena. 30 – Marks
30 – Lectures
- Unit V:** Hegel: The Problem of Philosophy, The Dialectical Method. 15 – Marks
15 – Lectures

Text Books:

1. Frank Thilly – A History of Philosophy.
2. Y. Masih – A Critical History of Western Philosophy

Reference Books:

1. Richard Fulckenberg – History of Modern Philosophy.
2. Frederick Copleston – A History of Philosophy
3. Bertrand Russell – History of Western Philosophy.

Undergraduate Course (BA)
Philosophy
FIFTH SEMESTER
Honors Paper /H - 507
CONTEMPORARY WESTERN PHILOSOPHY

Full Marks – 100

Approx. Lect. – 90

Unit I: Historical background and development of philosophical Analysis:

Linguistic turns: Ideal language and Ordinary language debate; Early realism; Logical atomism; Logical positivism; Ordinary language philosophy. 20 – Marks

10 – Lectures

Unit II: Method of Philosophical Analysis:

Moore: Concept of language and philosophy; Analysis of language; Common sense approach. Russell: Concept of language and philosophy: Analysis of language; Application of logic in philosophy. 20 – Marks

15 – Lectures

Unit III: Theories of meaning :

Frege's Reference theory of meaning; Russell's Denotative theory of meaning; Wittgenstein's Picture theory of meaning; Verification theory of meaning of Logical Positivists. 30 – Marks

25 – Lectures

Unit IV: Logical Positivism:

Concept of philosophy; The task of philosophy; The Verification Principle; The Elimination of metaphysics. 10 – Marks

15 – Lectures

Unit V: Existentialist Movements:

The Main feature of existentialism; Theistic and Atheistic existentialism; Existence precedes essence; Sartre's Philosophy of Being and Concept of freedom

20 – Marks

20 – Lectures

Text Books:

1. B.R Gross – Analytic Philosophy.
2. A.J. Ajer, et al. – Revolution in Philosophy, London, 1956.
3. A.C. Grayling – An Introduction to Philosophical Logic, Oxford, 1997. (Chapter)

Reference Books:

1. G. J. Warnock – English Philosophy since 1900, OUP, London, 1958
2. Simon Critchley – Continental Philosophy, OUP, Delhi, 2001
3. J. O. Urmson – Philosophical Analysis, Oxford, 1956.
4. Thomas Flynn – Existentialism, OUP, Delhi, 2006.

5. M.K. Bhadra – A Critical Survey of Phenomenology and Existentialism, ICPR, Delhi, 1990

Undergraduate Course (BA)

Philosophy

SIXTH SEMESTER

Honors Paper /H - 608

INDIAN PHILOSOPHY II

Full Marks – 100

Approx. Lect. – 90

Unit I: Nyaya:

Nature of Knowledge (Prama), Sources of valid Knowledge (Pramanas) – Perception (Pratyaksa), Inference (Anumana), Comparison (Upaamana), and Testimony (Sabda).

20 – Marks

15 – Lectures

Unit II: Vaisesika:

Categories (Padarthas), Theory of the Creation and Destruction of the world.

20 – Marks

20 – Lectures

Unit III: Sankhya – Yoga:

The Sankhya Theory of Causation, Evolution, Purusa and Prakrti; The Yoga Psychology and Eightfold Means of Yoga.

20 – Marks

20– Lectures

Unit IV: Mimamsa

Theory of Knowledge and The Philosophy of Ritualistic Actions; The Conception of Duty (Dharma).

15 – Marks

15– Lectures

Unit V: Vedanta:

Brahman, Isvara, Atman, Jiva, Jagat, Maya, Avidya, Adhyasa and Moksa with special reference to the Monism of Sankara (Advaita) and the Qualified Monism of Ramanuja (Visistadvaita)

25 – Marks

20 – Lectures

Text Books:

1. S. C. Chatterjee and D.M. Dutta – An Introduction to Indian Philosophy.

Reference Books:

1. S.C. Chatterjee – Nyaya Theory of Knowledge.
2. D.M. Dutta – Six Ways of Knowing.
3. Cowell(English Translation) – Udayana'sKusumanjali.
4. S.N. Dasgupta – History of Indian Philosophy.

5. Keith, A.B – Karma Mimamsa.
6. S. Radhakrishnan – Indian Philosophy, Vol. I and II.

Undergraduate Course (BA)

Philosophy

SIXTH SEMESTER

Honors Paper /H - 609

PHILOSOPHY OF RELIGION

Full Marks – 100

Approx. Lect. – 90

Unit I: The Nature and Scope of the Philosophy of Religion; Distinction between Natural and Revealed Religion; Origin and Development of Religion: Anthropological, Psychological and Historical theories.

25 – Marks

25 – Lectures

Unit II: Nature and Attributes of God; Personality of God; God and the Absolute; Proofs for the Existence of God – Ontological, Cosmological, Teleological and Moral.

25 – Marks

25 – Lectures

Unit III: God and His relation to the World and Man – Deism, Pantheism and Theism.

15 – Marks

10– Lectures

Unit IV: The Problem of Evil; Freedom and Immortality of the Self; Destiny of Man.

20 – Marks

20– Lectures

Unit V: Substitutes for Religion – Materialism, Marxism and Freudianism.

15 – Marks

10 – Lectures

Text Books:

1. D.M. Edward – Philosophy of Religion.
2. John Hick – Philosophy of Religion.
3. Y Masih – Philosophy of Religion.

Reference Books:

1. John Caird – Philosophy of Religion.

Undergraduate Course (BA)
Philosophy
SIXTH SEMESTER
Honors Paper /H - 610
POLITICAL PHILOSOPHY

Full Marks – 100
Approx. Lect. – 90

Unit I: Greek Political Philosophy: Plato and Aristotle

Plato's Ideal Republic as a theoretical construct; Plato's theory of human nature; Theory of Justice; Plato's concept of Philosopher King and his reasons for the Rule of Philosopher King; Plato's Theory of Education.

Aristotle's Theory of State, Justice, Citizenship, Government and Revolution.

20 – Marks

20 – Lectures

Unit II: Political Philosophy: Hobbes, Locke and Rousseau.

Human Nature; The Social Contract; The General Will; Society and Government.

20 – Marks

15 – Lectures

Unit III: Political Philosophy of John Stuart Mill.

Mill's Theory of the Growth of Civil Society; Mill's Defense of Individual Freedom; Mill's Defense of Freedom of Expression; Self and Other Regarding Acts; Public and Private Morality.

15 – Marks

15– Lectures

Unit IV: The Political Philosophy of Karl Marx:

Marx's Concept of Man, Nature and Technology; Marx's Concept of Economic Structure; Forces of Production and Relation of Production; The Notion of Contradiction between the Forces of Production and Relation of Production; The Base and the Superstructure Model; Theory of Alienation; The Revolution and the Class Struggle

15 – Marks

15– Lectures

Unit V: Justice: Rawls' Theory of Justice:

The Role of Justice; The Subject of Justice; The Main Idea of the Theory of Justice; The Original Position and Justification. The Distinction between Utilitarian and the Contractarian Theory of Justice

Text Books:

1. **Ebenstein** – Greek Political Thinkers.
2. Ernest Barker – Political Thought of Plato and Aristotle.
3. G.H. Sabine – A History of Political Thought.
4. J.S. Mill – On Liberty.
5. John Rawls – A Theory of Justice.
6. John Me Murthy – The Structure of Marx's World View.

Reference Books:

1. Plato – The Republic.
2. Aristotle – Politics.
3. Hobbes – Leviathan.
4. Locke – An Essay Concerning the True Original, Extent and End of Civil Government.
5. Rousseau – The Social Contract.
6. Mill – Utilitarianism.
7. Marx – Early Writings.
Capital Vol. I
Capital Vol. II
Capital Vol. III
Capital Vol. IV
8. Harld J. Laski (ed) – The Communist Manifesto
9. AmartyaSen – The Ideas of Justice.

Syllabus for Undergraduate Programme

Bachelor of Science in Physics



Manipur University, Canchipur

Imphal-795003

BSc Physics
Syllabus Semester I

PHY – 101: MECHANICS

75 marks

Fundamentals of Dynamics

Dynamics of a single particle, Dynamics of a system of particles, Center of mass, Conservation of momentum of variable mass system, Motion of rocker, Work-energy theorem, Potential energy diagram, Stable and unstable equilibrium, Conservative and non-conservative forces, Force as gradient of potential energy.

10

marks

Rotational Dynamics

Angular momentum of a particle and system of particles, Torque, Conservation of angular momentum, Rotation about a fixed axis, Moment of inertia, its calculation for rectangular, spherical and cylindrical bodies; Kinetic energy of rotation.

15

marks

Gravitation and Central Force Motion

Law of gravitation, Inertial and gravitational mass and their equivalence, potential energy and field due to spherical shell and solid sphere, Self-energy, Motion of a particle under central force field, Angular momentum conservation, one body problem, two body problem and its reduction to one body problem and its solution. The energy equation and energy diagram.

15 marks

Oscillatory motion

Motion of simple and compound pendulum, Loaded spring, energy considerations, time average of energy, Damped harmonic oscillator, Resonance of a highly damped system, Free oscillations of system with one degree of freedom, Linearity and superpositions of particle, superposition of (i) two and (ii) N colinear harmonic oscillations, beats.

15 marks

Special theory of relativity

Michelson-Morley experiment and its outcome, Postulates of special theory of relativity, Lorentz transformations Simultaneity and order of events, Lorentz contraction and time dilation, relativistic transformation of velocity, frequency and wave number, Velocity dependence of mass and equivalence of mass and energy, Relativistic Doppler effect, Relativistic kinematics, Transformation and energy and momentum.

20 marks

Suggested books:

1. An introduction to mechanics by Daniel Kleppner, Robert J Kolenkow (McGraw- Hill, 1973)
2. Berkeley Physics Course Vol 1 Mechanics: Charles Kittel, Walter Knight, Malvin
3. Ruderman, Carl Helmholtz, Burton Moyer (Tata McGraw-Hill, 2007)
4. Mechanics: D S Mathur (S. Chand & Company Limited, 2000)
5. The Physics of wave and oscillations: N K Bajaj (Tata McGraw-Hill, 1988)
6. Berkeley Physics Course Vol 3 Waves: Franks Crawford (Tata McGraw-Hill, 2007)

Laboratory:

1. Determination of 'g' by using a compound pendulum (bar with holes)
2. Determination of moment of inertia of a body by using a torsion pendulum
3. Determination of frequency of a tuning fork by means of a sonometer
4. Determination of 'g' by Kater's pendulum
5. Determination of surface tension of a given liquid by capillary rise method and verification of Jurin's law
6. Determination of coefficient of viscosity of water by Poiseuille's method
7. Verification of Stock's law and determination of coefficient of viscosity of a liquid
8. Determination of Young's modulus by Searle's method
9. Determination of rigidity modulus by statical method

Semester II

PHY-202: THERMAL PHYSICS AND OPTICS

75 Marks

Thermodynamics

First and Second laws of thermodynamics, Carnot theorem, Thermodynamic scale of temperature, Entropy, Entropy of a mixture, Third law of thermodynamics, Thermodynamic potential: Enthalpy Gibbs and Helmholtz functions, First and second order phase transitions, Chemical potential, Maxwell's relations and their applications, Clausius- Clapeyron's equation, Ehrenfest's equation, Joule-Thomson effect and its theory, Magnetic cooling by adiabatic demagnetization, approach to absolute zero.

15 marks

Kinetic theory of Gases and Radiation

Derivation of Maxwell's law of distribution of velocities, Mean free path, Transport phenomena, viscosity, conduction, diffusion and Brownian motion, Equation of state for ideal gases, Equation of state for real gases, Deviation from ideal gas equation, the virial equation, Derivation of Van-der-Waal's equation, Critical constants and law of corresponding states, Blackbody radiation, Wien's displacement law, Rayleigh-Jeans' law and ultraviolet catastrophe, derivation of Plank's radiation law 20 marks

Interference and Diffraction:

Interference in thin films, Fringes of equal thickness and equal inclination, Theory of Newton's rings, Michelson's interferometer and Fabry-Perot interferometer, Difference between interference and diffraction, Theory of plane diffraction grating, Resolving power and dispersive power of a plane diffraction grating, Fresnel's integrals, Cornu's spiral, Fresnel diffraction pattern at a straight edge

20

marks

Polarization

Polarization by reflection, double refraction. Wave surface as uniaxial crystal, production and detection of elliptically and circularly polarized light, Babinet's compensation theory and uses, optical activity and polarimeter.

20

marks

Elements of Quantum Optics:

Stimulated emission, population inversion, mechanism of population inversion, spontaneous and stimulated inversion, Einstein's coefficients, Threshold condition for laser action, He-Ne laser, Ruby laser, application of lasers, Elements of second harmonic generation.

10

marks

Suggested Books:

1. A treatise on heat: including kinetic theory of gases, thermodynamics and recent.
2. Advances in statistical thermodynamics: Meghnad Saha, B.N. Srivastava (Indian Press, 1958)
3. Heat and thermodynamics: an intermediate textbook; Mark Waldo Zemansky, Richard Dittman (McGraw-Hill, 1981)
4. Thermodynamics, kinetic theory, and statistical thermodynamics: Francis W. Sears & Gerhard L. Salinger. (Narosa, 1986)
5. Fundamentals of optics: Francis Arthur Jenkins and Harvey Elliott White (McGraw-Hill, 1976)
6. Optics: Ajoy Ghatak (Tata Mc Graw Hill, 2008)
7. A Textbook of Light: B Ghosh and K. G. Mazumdar. (5th Edition) Sreedhar Publishers, Kolkata.
8. Thermal Physics-P K Chakrabarti, New Central Book Agency 2006, Kolkata.

LABORATORY:

25

marks

1. To construct a thermocouple with the elements supplied and to determine the melting point of the given substance and the thermoelectric power.
2. Determination of J by Callendar and Barne's method.
3. Determination of coefficient of linear expansion of a metallic rod by optical

lever method.

4. Verification of Newton,s law of cooling.
5. Determination of apparent expansion of a liquid by weight thermometer method.

6. Determination of frequency of a tuning fork by Melde,s method.
7. Determination of thermal conductivity of a metallic rod by Searle,s method.
8. Determination of the refractive index of the give liquid with help of a plane mirror convex lens and a spherometer.
9. Determination of the refractive index of a given liquid by travelling microscope method.

Semester - III

PHY --303: ELECTRICTY AND MAGNETISM

75 marks

Vector and scalar fields

Fields-scalar and vector,examples, directional derivative and gradient of a vector field, flux and divergence of a vector field, circulation and curl of a vector field, algebra of the del operator and Laplacian operator, Gauss's theorem, Stoke's theorem and Green theorem.

15 marks

Electric field

Electric field and electric lines, Gauss,s Law and applications, electrostatics of conductor, Electric potential, multipole moments and multipole expansion, force ,torque and energy of a dipole in an external electric field, Poisson,s and Laplace,s equations, uniqueness theorem, solution to Laplace,s equations in spherical coordinates, zonal harmonics, conducting sphere in uniform electric field Electrostatic energy,system of point charges, system of continuous charge distribution, spherically symmetric charge distributions,charged capacitors Dielectric properties of matter, polarization, electric field caused by polarized matter, Gauss's law in a dielectric, boundary conditions on E and D, capacitors filled with dielectric, dielectric sphere in a uniform electric field, Clausius-Mosseti equation

20

marks

Magnetic Field

Magnetic field, magnetic force between currents and definition of B, divergence and curl of B, Ampere's circuital law, magnetic scalar and vector potentials, calculation of B for a straight wire, a circular loop and a solenoid, field of a dipole, force, torque and energy of a dipole in an external field, magnetic moment, Lorentz force, magnetic field energy Magnetic properties of matter, magnetization, magnetic field caused by magnetized matter, field equation in a magnetized matter, Ampere's law in a magnetized matter, boundary conditions on B and H, magnetic cell, magnetic circuits, hysteresis and B-H curve

20 marks

Electromagnetic induction

Electromagnetic induction, Faraday's law of induction, curl E, self and mutual inductance, reciprocity theorem, energy stored in a coil

Alternating current and transient phenomena, A C circuit, mean value of current and voltage, skin effect, power factor, A C in L-R, C-R, L-C-R circuits, series and parallel resonance, transient growth and decay of currents in L-R, C-R, L-C-R circuits, oscillatory discharge

Maxwell's equations, the equations and their physical meanings and the respective laws, equation of continuity, wave equation for E and B, plane wave solutions, transverse nature of electromagnetic wave, flow of electromagnetic power and the pointing theorem

20 marks

Suggested books:

1. Introduction to electrodynamics: David J. Griffiths, 3rd edition (Benjamin Cummings, 1998).
2. Elements of electromagnetics: Mathew N O Sadiku (Oxford university press)
3. Electricity and magnetism: Edward M. Purcell (McGraw Education), 1980)
4. Electricity and magnetism: D C Tayal (Himalaya Publishing house, 1988)
5. Electricity and Magnetism: D Chattopadhyay and P Rakshit

Laboratory:

1. Determination of the horizontal component of earth's magnetic field and the magnetic moment of the magnet with the help of a deflection magnetometer
2. Determination of self-inductance by Rayleigh's method
3. Determination of frequency of A C mains with the help of sonometer
4. Determination of capacitance by de Sauty's bridge
5. Determination of refractive index of a prism by using a sonometer
6. Determination of capacitance by using ballistic galvanometer
7. Determination of ECE of copper
8. To convert the given galvanometer into an ammeter and calibrate it with the help of copper voltameter

Semester IV

PHY – 404: ATOMIC AND NUCLEAR PHYSICS

75 marks

Mass Spectrograph and x-ray

Atomic masses; Bainbridge and Aston mass spectrograph, X-Rays: Continuous and characteristic x-rays; Mosley's law; absorption of x-ray and absorption spectra, x-ray diffraction and Bragg's law; measurement of x-ray wave length.

10

marks

Atomic Spectra

Hydrogen spectrum, Bohr's theory, Sommerfeld's modification of Bohr's theory and relativistic correction, vector model of atom, electron spin, Pauli's exclusion principle,

periodic table of element; spin-orbit interaction – fine structure of hydrogen, spectra of alkali elements selection rules, L-S and J-J coupling schemes; Zeeman effect. **20 marks**

Radioactivity

Law of radioactive decay and half-life, radioactive series; theory of successive transformations; secular and transient equilibrium; Carbon dating, artificial radioactivity; radioisotopes and their uses; radiation hazards; theory of alpha decay; beta decay and neutrino hypothesis; gamma decay. **10 marks**

Particle accelerator: Linear accelerator, Cyclotron; Betatron; Synchrotron

Nuclear detector: Proportional counter, GM counter, Cloud chamber, Bubble chamber, scintillation counter, Nuclear emulsion **10 marks**

Nuclei and their properties: Rutherford's theory of alpha particle scattering and its experimental verification; Charge mass, size, constituents, spin and parity of nuclei; nuclear stability and binding energy; nuclear moments- electric dipole moment, electric quadrupole moment and magnetic moment, nuclear forces. **5 marks**

Nuclear models: Liquid drop model, semi-empirical mass formula and its applications, shell model. **10 marks**

Nuclear reactions: Q-value of a reaction; kinematics of nuclear reactions; types of nuclear reactions; cross sections of nuclear reactions; nuclear fission- elementary theory of nuclear fission, energy and mass distribution of fission fragments, fission neutrons, four factor formula, nuclear reactor and its types, breeder reactor; nuclear fusion reaction in the sun; controlled nuclear fusion. **10 marks**

Books suggested:

1. Atomic and Nuclear Physics: Gopalakrishnan (McMillan)
2. Concept of Modern physics: A Beiser
3. Concept of Nuclear Physics: Bernard L Cohen
4. Nuclear Physics: S N Ghosal
5. Nuclear Physics: D C Tayal

Laboratory:

1. To draw the (i-D) curve for a prism using a spectrometer and to find the minimum deviation using sodium light

2. To draw (i-D) curve for a prism using a spectrometer and to find the refractive index of the prism using sodium light (angle of the given prism)

3. Determination of radius of curvature of a convex lens using by Newton's ring method
4. Determination of dispersive power of a prism for sodium light using a spectrometer
5. Determination of width of a single slit of from a diffraction pattern and verification of the value by means of a travelling microscope
6. Determination of wavelength of sodium light using a plane transmission grating
7. Determination of internal resistance of a cell using a potentiometer
8. To measure current in an external circuit with the help of a potentiometer
9. Calibration of an ammeter with the help of a potentiometer

Semester V

PHY -505: ELECTRONICS marks

100

Basic circuit analysis

Circuit models, Kirchoff's law, single equation loop, node pair circuit, voltage and current divider rules, principle of superposition, Thevenin and Norton's theorem, two-port analysis of and electrical network

10

marks

Semiconductor diodes

p-n junction diodes, I-V characteristics, application in the rectifiers, clippers and limiters, Zener diode and its applications

10

marks

Bi-junction polar transistors (BJT)

p-n-p and n-p-n structures, active and saturation region, characteristics of BJT, common-emitter input and output characteristics, z and h parameter, common-base configuration, output characteristics, two-port analysis of a transistor using z and h parameter, load line concept, emitter follower, biasing method, stability factor, low frequency model

Derivation of current gain, input resistance, voltage gain and output resistance of CB, CE amplifier configuration (for small signals) and the CE configuration with an emitter resistor (also for small signals), bypassing of the emitter resistor with a bypass capacitor.

30 marks

Field effect transistor (FET)

Classification of various type of FETS, constructional detail of junction field-effect transistor, drain characteristics of JFET, biasing of JFET, operating region, pinch-off voltage, idea of metal-oxide-semiconductor-field-effect-transistor (MOSFET).

10

marks Amplifier

Resistance-capacitance and transformer couple amplifier, power amplifier-class A,

B, AB and C operations, Concept of negative and positive feedback, representation of a single loop negative feedback amplifier, transfer gain with feedback, merits and demerits of

negative feedback, Differential amplifier, principle of operational amplifier, transfer characteristics, offset parameter, differential gain, CMR, inverting and non-inverting operational amplifier, operational amplifier adder, differentiator, integration, applications of operational amplifiers. **25**

marks

Oscillator

Wave-form generation: Barkhausen criterion. RC oscillator, Wien Bridge oscillator, phase shift oscillator **5**

marks

Digital circuits

Binary system, Boolean algebra, NOR, NAND gates, half and full adders, minimization of Boolean expressions using K- map **10**

marks

Suggested books:

1. Digital principles and applications: Donald P. Leach & Albert Paul Malvino, (Glencoe, 1995)
2. Electronic Principles: Albert Paul Malvino (Tata McGraw Hill)
3. Basic electronics and linear circuits: N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta (Tata McGraw Hill, 2006)
4. Integrated electronics: Milliman and Halkias
5. Electronics: D Chattopadhyay and P. C. Rakshit

PHY -506: MATHEMATICAL PHYSICS

100 marks

Complex variables and functions of a complex variable

Complex numbers and their graphical representation, modulus and argument of a complex number, function of a complex variable, continuity and derivative, Cauchy-Reimann condition, analytic functions, integration of a function of a complex variable, Cauchy's theorem, Cauchy's integral formula, Tylor's series for an analytic function, Laurent series, singularities and their classification, residue and the residue theorem, evaluation of definite integrals **35**

marks

Special functions

Gamma functions, recurrence relations, Beta function and recurrence relations, relation between gamma and beta function

Legendre, Hermite and Laguerre polynomials and associated Legendre functions, differential equations and series solutions, generating functions, recurrence relations, orthogonality relations

Bessel differential equation, generating function, recurrence relation, zeroes of the Bessel function, orthogonality relation, series expansion of a function in terms of a complete set of orthogonal functions **30**

marks

Partial differential equations

Vibration of stretched string, derivation of the equation and its solution under various initial conditions, vibration of rectangular and circular membranes, heat conduction; derivation of the equation, solution for the temperature in a finite rod, semi infinite rod, the classical wave equation and the Laplace equation

20

marks

Fourier Series

Orthogonality of the sine and cosine functions, Fourier series of a function, Fourier series expansion of a periodic function, Parseval's theorem, sine and cosine series

15 marks

Suggested Books

1. Advanced Engineering Mathematics by Erwin Kreyszing
2. Mathematical methods for Physicists by G. Arfken and Weber
3. Mathematical Physics by A K Ghatak, I Goyal and Chu
4. Applied Mathematics for Engineers and Physicists by L A Pipes and L R Harvell
5. Complex variables (Schaum Series): M Spiegel

PHY – 507 (P): Laboratory

100 marks

1. To draw the characteristics of a transistor in the CE and CB configurations
2. To draw the resonance curve of series and parallel LCR circuit and to determine the Q- factor
3. Determination of the constant of a ballistic galvanometer by using a standard capacitor
4. To construct two input OR and AND logic gates using p-n junction transistors and to verify their truth table
5. To study the performance of NOT circuit using transistors
6. To draw the characteristics of a Zener diode and to study its use as a voltage regulator
7. To study solid state half-wave and full-wave rectifiers and to determine the ripple factor and percentage of regulation and different types of filters
8. To plot the frequency response of an R-C coupled amplifier (i) without feedback and (ii) with negative feedback and to determine the bandwidth in each case
9. Determination of self-inductance by Anderson's method
10. Determination of mutual inductance by using a Ballistic Galvanometer and to draw the M.O. curve
11. Determination of the band gap of a p-n junction diode (germanium)

Semester VI

PHY – 608: QUANTUM MECHANICS

100 marks

Origin of the Quantum theory

Blackbody-radiation spectrum and Plank's hypothesis, Einstein's idea and the photoelectric effect, Compton effect, Frank-Hertz experiment

Stability of the atom, Bohr's postulate of angular momentum quantization and the Bohr atom model, Bohr-Sommerfeld quantization rule

De-Broglie wave and wave particle duality, Davison Germer experiment, electron diffraction and neutron diffraction

Development of Quantum mechanics: Wave behavior of matter, two slit experiment with electron (thought experiment), Superposition, description in terms of probability and need for probability amplitude, wave packet, Heisenberg's uncertainty principle (thought experiment and application), Bohr's complimentary principle, Bohr's correspondence principle.

30

marks

Basic Postulates and formalism

Schrodinger equation, wave function as probability amplitude and dynamical variables as operators, probability conservation and normalization of wave function, conditions for physical acceptance of wave function, equation of continuity (differential probability conservation)

Eigenvalue and eigenfunction of a dynamical variable, Hermiticity and reality of the eigenvalues, physical meaning of eigenvalues of a dynamical variable, superposition of wave functions and the expectation postulate, expectation value and Ehrenfest's theorem, the commutator and the quantum analogue of the classical equation of the motion, constants of the motion.

The fundamental commutator, commutator algebra, precise definition of uncertainty and the uncertainty relation (statement).

30

marks

Stationary state and energy eigenstates

Stationary states, time independent Schrodinger equation, the stationary state wave functions, free particle and plane wave

Particle in a one-dimensional box

Energy eigen value and eigen functions, graphical illustrations, nodes as the energy quantum number, calculation of expectation values, qualitative estimation of the ground state energy from the uncertainty principle.

Linear harmonic oscillator

Solution of the Schrodinger equation for energy eigenvalues and eigenfunctions, calculation of expectation values and matrix elements, parity of eigenfunctions, the virial theorem.

One dimensional potential barrier

One dimensional finite potential step, stationary solutions, reflection and transmission coefficients, phenomenon of barrier penetration.

Hydrogen atom

Solution for the energy spectrum and eigenfunctions, the quantum number l , n , m , degeneracy, expectation values, the virial theorem.

40

marks

Suggested Books:

1. Quantum Mechanics: B H Bransden and C J Joachain (Pearson, 2008)
2. Quantum Mechanics: E Merzbacher, (John Wiley & sons, Inc 1997)
3. Quantum Mechanics J. L. Powell & B. Crasemann (Addison-Wesley Pubs. Co., 1965)
4. Quantum Mechanics: Theory and Applications: A Ghatak & S. Loknathan 5th Edition, Macmillan India., 2004)

PHY – 609: PHYSICS OF MATERIALS

100 Marks

Crystal Structure

Crystalline and amorphous materials, lattice and unit cell, lattice translational vectors, lattice with a basis – central and noncentral unit cell, reciprocal lattice, Bravais lattice types, Brillouin zones of sc, bcc, fcc lattices, X-ray diffraction: Bragg's law, X-ray scattering, atomic structure factor and geometric structure factor

20 marks

Electrical properties of materials

Free electron model and its limitation, elementary band theory: Bloch theorem, Kronig Penney model, effective mass, concept of hole, band gaps, classification of solids, intrinsic and extrinsic semiconductors, p-type and n-type semiconductors, conductivity of semiconductors, concentration of charge carriers, Fermi level and its temperature dependence, classical hall effect

20

marks

Magnetic properties of Materials

Types of magnetic materials, classical theory of diamagnetism and Paramagnetism, quantum mechanical treatment of paramagnetism, Curie law, Weiss theory of ferromagnetism, magnetic domain, soft and hard magnetic materials

20 marks

Lattice dynamics

Lattice vibrations, monoatomic and diatomic lattice vibrations, acoustic and optic modes Einstein theory of specific heat, Density of states, Debye's theory of specific heat

15 marks

Physics of low dimension

Density of states in low dimension, different types of nanomaterials, blue shifting, quantum wells, wires and application of nanoscience

10

marks

Suggested Books

1. Solid state Physics -A J Dekkar
2. Introduction to Solid State Physics – C Kittel
3. Solid State Physics – A R Verma and O N Srivastava
4. Introduction to Nanoscience - Poole et al
5. Solid state Physics – Keer

PHY – 610: Laboratory

100 marks

1. Determination of wavelength of monochromatic light source by using Fresnel's biprism
2. To draw the ($\mu - \lambda$) curve for the material of a prism by using spectrometer and verification of dispersion formula
3. To draw the ($\mu - \lambda$) curve for the material of a prism by using spectrometer and to determine the wavelength of the given source
4. To draw the ($D - \lambda$) curve for a given spectrometer and hence to determine the wavelength of the unknown source
5. Determination of the grating constant by using sodium light and hence to determine the wavelength of the unknown radiation
6. To calibrate a polarimeter and to determine the concentration of a given solution
7. Determination of electronic charge by Millikan's experiment
8. To study the hydrogen spectrum and to determine the Rydberg's constant with the given grating and spectrometer
9. Determination of e/m of electron by Thomson's method
10. To study the B-H curve and hysteresis loss by anchor ring method
11. To determine Planck's constant by using a photocell

Suggested Books:

1. A Handbook of Advanced Practical Physics: C R Dasgupta
2. Advanced Practical Physics: K G Mazumdar
3. Practical Physics: D Chattopadhyay and P C Rakshit
4. A textbook of Advanced Practical Physics: S K Ghosh

Manipur University
 Structure of Undergraduate
 B.Sc. Environmental Science (Elective) and (Honours)
 under Semester system

Elective

Total Marks: 400

Duration: 2 Years

Examination	Theory	Practical	Total
1 st Semester	75	25	100
2 nd Semester	75	25	100
3 rd Semester	75	25	100
4 th Semester	75	25	100
Total	300	100	400

Honours

Total Marks: 600

Duration: 1 Year

Examination	Theory	Practical	Total
5 th Semester	200	100	300
6 th Semester	200	100	300
Total	400	200	600

Scheme of Academic Programme

Based on the assumption that there will be 180 working days in a year or 90 working days in a Semester and there will be 6-days teaching in a week, the expected working days for effective teaching are 15 weeks per Semester.

The Schedule for Environmental Science teaching:

Examination	Theory	Practical	Total
1 st Semester	6 Hrs/Week 90 Hrs/Sem	3 Hrs/Week 45 Hrs/Sem	9 Hrs/Week 135 Hrs/Sem
2 nd Semester	do	do	do
3 rd Semester	do	do	do
4 th Semester	do	do	do
5 th Semester	16 Hrs/Week 250 Hrs/Sem	9 Hrs/Week 135 Hrs/Sem	25 Hrs/Week 385 Hrs/Sem
6 th Semester	do	do	do

SEMESTER I
ENV -101
Fundamentals of Environmental Sciences

Full Marks - 75
90 Hrs/Sem

UNIT-I: Definition, Scope and Importance of Environmental Science	20 Marks
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Definition; multidisciplinary nature of Environmental Science; scope and importance. Earth, Man and environment. Micro and mega environment, natural and man-made environment; Social environment; Environmental economics; Environmental ethics; Physico-chemical and biological factors in the Environment.

UNIT-II: Ecological Concepts	15 Marks
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Concept of ecology; Concept of ecosystems, their structure and function; Components of an ecosystem; Energy flow through ecosystem; Food chain and food web; Ecological pyramids; Ecological niche; Edge effects; Ecotone; Keystone species; Carrying capacity; Liebig's law of minimum; Shelford's law of tolerance. Ecosystems – fresh water, marine, estuarine and terrestrial.

UNIT-III: Natural Environment and its Components	20 Marks
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Atmosphere, lithosphere, hydrosphere and biosphere, their structure and composition. Bio-geochemical cycles – carbon, nitrogen, oxygen, phosphorous, sulphur and hydrological cycle. surface and ground water pollution.

UNIT- IV: Environmental Adaptation	20 Marks
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Environmental adaptations: Animals – cursorial adaptation, fossorial adaptation, arboreal adaptation, volant adaptation, aquatic adaptation, desert adaptation. Plants – hydrophytes, mesophytes, xerophytes and halophytes.

Practical

Full Marks 25
45 Hrs/Sem

Preparation, plotting and collection studies:

Preparation of Environmental Diary

Collection and identification of local flora and fauna

Study of the following experiments:

Vegetative analysis of different ambient habitats – frequency, density and abundance

Measurement of temperature-(air, water, soil), relative humidity and rainfall

SEMESTER II
ENV -202
Natural Resource Management

Full Marks 75
90 Hrs/Sem

UNIT-I : Natural Resource Conservation	15 Marks
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Natural resources – Preservation and conservation; values of natural resources – intrinsic and extrinsic
Renewable and non renewable resources, Wildlife conservation; Biodiversity – definition, types, importance
and value, threats to biodiversity, endangered, endemic species, species extinction. *In-situ* and *ex-situ*
conservation, Genetic erosion, biodiversity conservation and agenda 21, IUCN Red Data Books, Bio
geographical regions of India.

UNIT-II : Forest Resources	20 Marks
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Forest – Importance of forests, forest resources - timber and forest produce. Major types of forests in India –
alpine, temperate, tropical, sub tropical, deciduous, evergreen forests. Mangroves ecosystems of India. Over
exploitation of forest, deforestation, shifting cultivation. Forest management and conservation.

UNIT-III : Land and Mineral Resources	20 Marks
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Land resources in India, overuse and abuse of land, concept of land use and land cover. Major types of soils in
India, soil profile, structure, texture and properties of soil, soil fertility; Weathering and formation of soil, Soil
erosion and control measures. Important minerals of India, ores, Exploration of mineral from the sea;
consequences of overexploitation of mineral resources, conservation of mineral resources.

UNIT-IV : Water Resources	20 Marks
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Water resources on the earth, consumption and uses of water, Inland and offshore water resources.
Freshwater – surface and groundwater. Causes of wastage and depletion of water resources. Management
and conservation of water resources; Rainwater harvesting. Watershed management.

Practical

Full Marks 25
45 Hrs/Sem

Preparation, plotting and identification:

Identification of mineral resources and rocks; Plotting of important natural resources, climate
and protected areas

Study of the following experiments:

Determination of water transparency; Biomass estimation in aquatic and terrestrial ecosystem;
Vegetation studies by line, quadrates and belt transect methods and their analysis

Field study:

Environmental assessment of particular local spots by conducting field visits

SEMESTER III
ENV -303
Environmental Pollution and Control Technology – Air and Water

Full Marks - 75
90 Hrs/ Sem

UNIT-I : Air Pollution	20 Marks
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Types and sources of pollution; ambient and indoor; Primary and secondary pollutants; Oxidative and reductive smogs. Air pollution meteorology– pressure, temperature, precipitation, humidity, radiation and wind; Thermodynamics of atmosphere; turbulence, Plume behaviour, Gaussian plume model. Influences of inversion, mixing height and wind roses on air pollution; Vehicular pollution. Problems of fly ash; Effects of air pollution on human health, animals and plants. Bhopal gas tragedy.

UNIT-II : Air Pollution Monitoring and Mitigation	20 Marks
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Air pollution sampling and monitoring, Air quality standards. National Ambient Air Quality Monitoring (NAAQM). Air quality control – cyclones, ESP, bag filters, scrubbers, catalytic converters, emission standards – Euro and Bharat; unleaded petrol; Use of alternative fuels – CNG, ethanol, gasohol. Concept of green belts in pollution control.

UNIT-III : Water Pollution	15 Marks
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Types, sources and consequences of water pollution; Surface and ground water pollution, Thermal pollution. Types of solids in water and their impact on water quality, Marine pollution and its control, ocean oil spills. Ganga Action Plan. Eutrophication, Biomagnification.

UNIT-IV: Water Pollution Monitoring and Mitigation	20 Marks
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Water quality parameter, sampling and pollution monitoring; Physico-chemical and bacteriological analysis of water quality; Waste water treatment processes; stabilization pond, aerated lagoon, activated sludge process, trickling filter, anaerobic treatment. Industrial wastewater treatment – dairy, textile, tannery, paper and pulp.

Practical

Full Marks 25
45 Hrs/Sem

Analysis of air pollutants:

Sulphur dioxide (SO₂); Nitrogen dioxide (NO₂); Suspended Particulate Matters (SPM); Respirable Suspended Particulate Matters (RSPM) and Dust fall

Analysis of water:

Temperature; Turbidity; pH; Biological Oxygen Demand (BOD); Conductivity and Total Dissolve Solids (TDS); Dissolve O₂ (DO); Chloride content and salinity; Hardness; Alkalinity; Calcium, Magnesium, Sodium and Potassium content.

SEMESTER IV
ENV -404
Environmental Pollution and Control Technology – Soil and Noise

Full Marks - 75
90 Hrs/Sem

UNIT-I : Soil Pollution	20 Marks
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Soil pollution – Sources, types and consequences of soil pollution. Soil micro organisms and their functions. Physico-chemical and bacteriological sampling and analysis of soil quality. Soil pollution control. Soil pollution due to overuse of synthetic fertilizers and pesticides. Saline, alkaline and acidic soils.

UNIT-II : Soil Pollution Monitoring and Mitigation	20 Marks
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Soil sampling and monitoring; Concept of organic farming – compost, vermi-composting, VAM; zero tillage agriculture; Soil microorganisms and their functions, degradation of different insecticides, fungicides and weedicides in soil.

UNIT-III : Noise Pollution and Monitoring	15 Marks
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Noise pollution – Sources of noise pollution, measurement of noise, noise exposure levels and standards. Noise control and abatement measures. Impact of noise on human health, noise induce diseases. Noise sampling methods.

UNIT-IV : Solid Wastes Management	20 Marks
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Concept of waste management, waste minimization, Wastes as resource; waste to energy, concept of R², recycling of wastes, treatment of biomedical and hazardous wastes; Waste characterization, biodegradable and non-biodegradable, Solid waste management – collection, transportation and disposal; open dumping, sanitary landfills, incineration, composting. Effects of improper waste disposal, problems of leachates.

Practical

**Full Marks: 25
45 Hrs/Sem**

Analysis of soil:

Moisture content; Temperature; Bulk density; Texture; pH; Conductivity; Chloride; Alkalinity;
Organic carbon; Available phosphorous; Available phosphate; Total nitrogen; Nitrate and Sodium

Analysis of Noise pollution

Analysis of Air Pollution

Field study: Environmental assessment of particular local spots by conducting field visits

SEMESTER V
ENV (H)-505
Restoration Ecology, Sustainable Development and Instrumentation

Full Marks: 100
125 Hrs/Sem

UNIT-I : Bioremediation-I	12 Marks
Bioremediation – need and scope, constraints and advantages, types of bioremediation, bio-augmentation for bioremediation, removal of pollutants – nitrogen and phosphorous, removal of oil and grease, removal of toxic chemicals from industrial wastes, biological gas treatment systems.	
UNIT-II : Bioremediation-II	12 Marks
Bioremediation of contaminated sites on land and water, phytoremediation – recovery of heavy metals from soil, treatment of municipal wastewater and industrial wastes. xenobiotic.	
UNIT-III : Restoration Ecology	14 Marks
Environmental degradation – causes and consequences, restoration of degraded ecosystems – forestlands, mined areas, shifting cultivated areas, wetlands, eutrophication and restoration of Indian lakes, wastelands – causes of wasteland formation, reclamation of wasteland, restoration of agricultural lands – acid, saline, saline alkali, alkali and water logged soils and their reclamation.	
UNIT-IV : Environmental Biotechnology	14 Marks
Biotechnological approach of environmental pollution abatement – biodegradation of pollutants, pesticides, bio-mining, biological indicators, biotechnological for environmental friendly energy sources – biomass, biogas, bio-ethanol, bio-hydrogen, biotechnology for pollution free agriculture – biofertilizers, compost, biopesticides, role of biotechnology in conservation of species.	
UNIT-V : Sustainable Development	12 Marks
Definition, concept of sustainability, important fundamentals concerning sustainable development; sustainable worldviews, carrying capacity, eco-feminism, environmental ethics – issues and possible solutions.	
UNIT-VI : Demography	12 Marks
Population, elements of demography – rates, crude, specific and standardized, a complete life table and its construction, models for population growth, population explosion; impact of human population growth on environment, environmental effects of urbanization.	
UNIT-VII : Principles of Analytical Methods	12 Marks
Titrimetry, gravimetry, colourimetry, spectrophotometry, chromatography, microscopy, flame photometry, general awareness of computers, computer application in environmental studies.	
UNIT-VIII : Remote sensing and GIS	12 Marks
Principles of remote sensing, active and passive remote sensing, platform and air-borne sensors, types of sensors, application of remote sensing and GIS in environmental sciences, GPS.	

SEMESTER V
ENV (H) -506
Environmental Management, Legislation and Biostatistics

Full Marks: 100
125 Hrs/ Sem

UNIT-I :Environmental Management	24 Marks
Fundamentals of environmental management, environmental management system, ISO-14000 series, preparation of environmental management plan, eco-labelling, eco-mark, the patents and intellectual property right, bio-piracy, carbon-foot print, trading, credit and sequestration, prospects and trends of eco-tourism.	
UNIT-II : Disaster Management	14 Marks
Disaster management – definition and types of natural catastrophes – earthquakes, floods, cyclones, landslides, tsunami, and disease epidemics, pre-disaster and post-disaster management, resettlement and rehabilitation of people, its problem and concerns with reference to big dams and frequently occurring disasters in India.	
UNIT-III : Environmental Assessment	12 Marks
Environmental impact assessment (EIA): concept of EIA, various methods of EIA and their relative advantages, EIA as a management tool, environmental audit, case studies of mega- developmental projects.	
UNIT-IV :Environmental Planning	12 Marks
Environmental economics – cost benefit analysis, concepts of environmental planning, urban and rural planning, demographic consideration, development indices.	
UNIT-V :Environmental Legislation-I	12 Marks
Environmental provisions in the constitution of India – need for environmental legislation, existing environmental legislations; Factories Act 1948, Motor vehicle Act 1988, Wild Life Protection Act 1972, Forest (Conservation) Act 1980, Public Liability Insurance Act, 1991.	
UNIT-VI :Environmental Legislation-II	12 Marks
Anti Pollution Acts and Amendments – Water Act 1974, Air Act, 1981 and the Environmental Protection Act 1986, Hazardous Wastes (Management and Handling) Rules 1989,	
UNIT-VII :Environmental Biostatistics	12 Marks
Importance and scope of statistical method and experimentation, mean, median, mode, variance, correlation, regression, multiple regression and correlation, elements of probability theory – random experiments, sample space, random events, classical and frequency theory of probability, sum and product laws of probability, random variables and probability distributions, binomial, poisson and normal distribution and its application.	
UNIT-VIII :Sampling and Designs	12 Marks
Sampling – random and non-random, tests of significance – T-test, F-test, Chi-square (χ^2) test and their applications, analysis of variance – one way and two way, designs of experiment – CRD, RBD and LSO.	

I. Analysis of solid wastes:

Waste characterization, dry matter analysis, decomposition analysis, pH, conductivity, organic matter, total nitrogen, phosphorous, potassium, sodium and chloride

II. Analysis of waste water:

Temperature, turbidity, pH, biological oxygen demand (BOD), conductivity and total dissolve solids (TDS), dissolve O₂ (DO), chloride content, fluoride content, salinity, hardness, alkalinity, calcium, magnesium, potassium and sodium content.

III. Bio statistical Analysis:

Calculation of mean, variance and standard deviation
Comparison of variation using co-efficient of variation

Testing the significance of:

Difference between the two sample means, correlation coefficient, independent of attributes, difference between and several means with the same data at a time.

IV. GIS: map registration, digitisation, database query management, data output.

V. Survey work: Survey on any environmental aspects

SEMESTER VI
ENV (H) - 609
Energy, Environmental health and safety

Full Marks: 100
125 Hrs/Sem

UNIT-I : Energy Resources: Fossil fuels	12 Marks
Fossil fuels – classification, composition, physico-chemical characteristics and energy content of coal, petroleum, tar sands, oil shale, synfuels and natural gas, consequences of rapid consumption of fossil fuels, emission from fossil fuel combustion.	
UNIT-II : Energy Resources: Alternative Energy	14 Marks
Hydroelectric power, tidal, wind, geothermal energy, solar energy, biomass energy, producer gas and biogas, energy plantation, biodiesel, ethanol, gasohol, nuclear energy, energy from agricultural wastes, energy from urban municipal and industrial wastes, hydrogen energy, fuel cells, OTEC, energy and environmental pollutions.	
UNIT-III : Environmental Health	12 Marks
Definition of environmental health, historical perspective, human environment and health status in urban and rural India, water and sanitation situation in urban and rural context, WHO and other bodies and their role in public health projects development, public awareness of sanitation and hygiene issues, current developments in the subject, environmental hazards.	
UNIT-IV : Epidemiology	14 Marks
Water borne diseases, soil borne disease, food borne diseases, food additives, air borne disease, measures to prevent and control of spread of infectious diseases, brief life histories of common vectors and mechanism of transmission of disease, AIDs and its control measures.	
UNIT-V : Occupational Health Hazards	12 Marks
Occupational health hazards – silicosis, asbestosis, byssinosis, anthracosis, bagassosis, occupational dermatoses, control of the occupational environment.	
UNIT-VI : Environmental Toxicology-I	12 Marks
Environmental toxicology – toxicants, routes of exposure, exposure assessment, absorption and translocation of toxicants, biomagnifications, biochemical aspects of arsenic, biological half life, dose response relationship, threshold dose, acute and chronic toxicity, LC ₅₀ , LD ₅₀ .	
UNIT-VII : Environmental Toxicology-II	12 Marks
Radiation sources in the environments – natural and man-made, biological effects of radiation, pesticides – classification, physical, chemical, mechanical and biological control of insects, integrated pest management (IPM), heavy metals – health effects of lead, cadmium and mercury, carcinogenic compounds and their effects.	
UNIT-VIII : Environmental Health Management	12 Marks
Principles of environmental control, environmental quality, eradication programmes and their efficacy. environmental risk assessment, treatment of drinking water, advanced treatment methods – demineralisation, ultra filtration, reverse osmosis, colour and odour removal by active carbon, iron removal, electro dialysis, nano materials, health aspects of housing.	

SEMESTER VI
ENV (H) - 610
Environmental Problems and Priorities

Full Marks: 100
125 Hrs/Sem

UNIT-I : Environmental Biology	12 Marks
Origin of life, Gaia hypothesis, concept of species, population and community, diversity of plants and animals life, principles of classification, growth forms and life forms, characters – analytical, quantitative, qualitative and synthesis, structure and function of communities, ecological succession.	
UNIT-II : Environmental Chemistry	14 Marks
Chemistry of various organic and inorganic compounds, chemistry of water, concept of DO, BOD, COD, pH, chemical speciation, acid base reaction, solubility products, unsaturated and saturated hydrocarbons, radio nuclides, surfactants – cationic, anionic, non-ionic detergents, synthetic polymers – PVC.	
UNIT-III : Global Environmental Issues-I	12 Marks
Greenhouse effect – causes and consequences of global warming, climate change, stratospheric ozone depletion – causes and consequences.	
UNIT-IV : Global Environmental Issues-II	12 Marks
El-Nino, acid rain, global accumulation of nuclear wastes, water crisis – conservation of water, desertification and its control.	
UNIT-V : National and Local Environmental Problems	14 Marks
Major environmental problems in India – population explosion, restoration of Indian lakes, erratic nature of Indian monsoon, local environmental problems – environmental effects of jhum cultivation, rapid urbanization, deforestation, changing land use pattern, dams in Manipur and Northeast India – Tipaimukh, degradation of wetlands – important rivers, community ponds and lakes, landslides.	
UNIT-VI : Environmental Protection-I	12 Marks
Global and national environmental organisations and agencies – CITES, UNEP, MAB, IUCN, WWF, WHO, FAO, EPA., environmental movements in India – Chipko, Appiko, Silent valley project, Narmada bachao andalon, Sardar sarovar project, Tehri dam project conflict.	
UNIT-VII : Environmental Protection-II	12 Marks
International treaties, conventions and protocols – Convention on biological diversity (CBD), CITES, Earth Summit, world summit for sustainable development, Kyoto protocol, Montreal protocol	
UNIT-VIII : Environmental Education and Awareness	12 Marks
Environmental educational programmes – objectives, guiding principles, formal and non-formal, environmental education in India, role of NGOs and mass media in environmental conservation.	

I. Studies on environmental adaptation:

Cryptobiotic, fossorial, arboreal, volant, aquatic, desert.

II. Analysis of sediment (Lake/River/Pond):

Moisture content, temperature, bulk density, texture, pH, conductivity, chloride, alkalinity, organic carbon, available phosphorous, available phosphate, total nitrogen, nitrate, potassium and sodium

III. Microbial studies:

Bacteriological examination of water – the coliform and MPN test, membrane filter techniques to detect faecal coliform bacteria in water, mounting and staining of bacteria, soil microbial studies – standard plate count.

IV. Study of the following experiments:

Detection of common adulterant in turmeric powder, milk, edible vegetable oils. Determination of leaf area index (LAI)

V. Project Work

A project work carrying twenty five marks will be allotted to each student. Submission of a report on the project is compulsory.

RECOMMENDED BOOKS/REFERENCES

SEMESTER I & II

BOOKS/REFERENCES:

- Altman, I. and Stokols, D. (Eds.) *Handbook of Environmental Psychology*, Wiley, New York.
- Ambasht, R. S. and Ambasht, N. K. *Plant Ecology*, Vanarasi.
- Arora, S. *Fundamentals of Environmental Biology*, Kalyani Publishers, New Delhi.
- Asthana, D. K. and Asthana, M. *Environmental Problems and Solutions*, S. Chand and Company, New Delhi.
- Baum, A., Singer, J. E., and Valins, S. *Advances in Environmental Psychology*, Lawrence Erlbaum Associates, New Jersey.
- Bera, A. K. *Environmental Concept*, New Central Book Agency(P) Ltd. Calcutta.
- De, A. K. *Environmental Chemistry*, Wiley Eastern Ltd., New Delhi.
- Kormondy, E. J. *Concepts of Ecology*, Prentice-Hall of India Private Ltd. New Delhi.
- Levin, H. L. *The Earth through time*. Saunder College Publishing, Philadelphia. New York.
- Miller, A. A. *Climatology*, Methuen and Co. Ltd. London.
- Misra, K. C. *Manual of Plant Ecology*, Oxford and IBH Publishing Co. Private Ltd., New Delhi.
- Palwinder, S. *Socio-Cultural correlates of Environmental Pollution*. Anmol Publication, New Delhi.
- Petterson. *Introduction to Metreology*, McGraw-Hill Book Company Inc., London.
- Rastogi, V. B. and Jayaraj, M. S. *Animal Ecology and distribution of animals*, Kedar Ram Nath, Meerut.
- Santara, S. C. *Environmental Science*, NCBA Private Ltd. Calcutta.
- Savindra Singh. *Climatology*, Prayag Pustak Bhavan, Allahabad.
- Sharma, B. K. and Kaur, H. *Environmental Chemistry*, Goel Publishing House, Meerut.
- Sharma, P. D. *Ecology and Environment*, Rastogi Publication, Meerut.
- Shrivastava, M. B. *Introduction to forestry*, Vikas Publishing House Private Ltd. New Delhi.
- Turk, J. and Turk, A. *Environmental Sciences*, Saunder College Publishing, Philadelphia.
- Vyas, L. N. and Garg, R. K. *Wetland conservation*, Agro Botanical Publishers, Bikaner, Rajasthan.
- Savindra Singh. *Environmental Geography*, Prayag Pustak Bhavan, Allahabad

RECOMMENDED BOOKS/REFERENCES

SEMESTER III & IV

BOOKS/REFERENCES:

- APHA. *Standard Methods for Analysis of water and wastewater.*
- Asthana, D. K. and Asthana, M. *Environmental Problems and Solutions*, S. Chand and Company, New Delhi.
- Banerji, S. K. *Environmental Chemistry*, Prentice-Hall of India Private Ltd., New Delhi
- Chatwal and Anand. *Instrumental Methods of Analysis.*
- Hussey, N. W. and Scopes, N. *Biological Pest Control, the glasshouse Experience.* Blandford Press, Poole.
- Kannan, K. *Fundamentals of Environmental Pollution*, S. Chand and Company Ltd., New Delhi.
- Katyal, T. and Satake, M. *Environmental Pollution*, Anmol Publication Private Ltd., New Delhi.
- Kudesia, V. P. and Tiwari, T. N. *Noise Pollution and its control*, Pragati Prakashan, Meerut.
- Kudesia, V. P. *Environmental Chemistry*, Pragati Prakashan, Meerut.
- Kut, D. and Hare, G. *Waste recycling for Energy Conservation.* John Wiley and Sons, New York.
- Lenihan, J. and Fletcher, W. W. *The Built Environment.* Blackie, London.
- Louma, S. N. *Introduction to Environmental Issues.* Mc-Millan Publishing Company, New York.
- Mahajan, S. P. *Pollution Control in Process Industries.* Tata Mc-GrawHill Publishing Company Ltd. New Delhi
- Masters, G. M. *Introduction to Environmental Engineering and Science*, Prentice Hall of India Private Ltd. New Delhi.
- Murugesan, M. and Balasubramanian, P. *Environmental Engineering*, Pratheeba Publishers, Coimbatore.
- Pahwinder, S. *Socio-Cultural correlates of Environmental Pollution.* Anmol Publication, New Delhi.
- Rai, M. M. *Principles of Soil Science*, Mac Millan India Ltd. New Delhi.
- Rao, C. S. *Environmental Pollution Control Engineering.* Wiley Eastern Ltd. New Delhi.
- Rao, M. N. and Rao, H. V. N. *Air pollution*, Tata Mc-GrawHill Publishing Company Ltd. New Delhi.
- Santara, S. C. *Environmental Science*, NCBA Private Ltd. Calcutta.
- Sharma, B. K. and Kaur, H. *Environmental Chemistry*, Goel Publishing House, Meerut.
- Trivedy, R. K. and Goel, P. K. *Chemicals and Biological Methods for water pollution studies.*
- Trivedy, R. K. and Goel, P. K. *Current Pollution Researches in India.* Environmental Publication. Karat.
- Turk, J. and Turk, A. *Environmental Sciences*, Saunder College Publishing, Philadelphia.
- Vyas, L. N. and Garg, R. K. *Wetland conservation*, Agro Botanical Pub

RECOMMENDED BOOKS/REFERENCES

SEMESTER V & VI

BOOKS/REFERENCES:

- Bernhardsen, T. *Geographic Information System: An introduction*.
- Biswas, D. *Environmental Management*, Excel Books, New Delhi.
- Chaudhuri, B. D. N. *Introduction to Environmental Management*. Interprint, New Delhi.
- Chowhan, T. S. *Remote Sensing for Natural Resources Management*.
- Chrisman, N. *Exploring G.I.S.*
- Hussey, N. W. and Scopes, N. *Biological Pest Control, the glasshouse Experience*. Blandford Press, Poole.
- Jensen, R. *Remote Sensing of the Environment*
- Joshi, P. C. *Biodiversity and Conservation*.
- Karpagam, M. *Environmental Economics*, Sterling Publishers Private Ltd. New Delhi.
- Kumar, A. *Environmental Contamination and Bio-reclamation*.
- Louna, S. N. *Introduction to Environmental Issues*. Mc-Millan Publishing Company, New York.
- Mohanty, S. K. *Environment and pollution laws*, Universal Law publishing Co. Pvt. Ltd.
- Newman, M. C. and Unger, M. A. *Fundamentals of Ecotoxicology*. Virginia Institute of Marine Science, Gloucester Point, SA.
- Pandey, B. N. *Biodiversity Conservation, Environmental Pollution and Ecology*, Ekta Book Distributors, New Delhi.
- Pandey, B. W. *Natural Resource Management*.
- Sagwal, S. S. *Forest Ecology of India*.
- Satendra, I. F. S. *Disaster Management in hills*.
- Sharma, P. D. *Ecology and Environment*, Rastogi Publication, Meerut.
- Singh, R. B. *Disaster Management*.
- Solomon Raju, A. J. *A text book of Ecotourism, Ecorestoration and Sustainable Development*. New Central Book Agency (P) Ltd. Kolkata.
- Tiwari, B. K., Barik, S. K. and Tripathi, R. S. *Sacred Forest of Meghalaya - Biological and Cultural Diversity*, Regional Centre, National Afforestation and Eco-development Board, NEHU, Shillong.
- Trivedi, P. C. *Biodiversity Conservation*.
- Trivedi, P. R. and Gurdeep Raj. *Environmental Management of Freshwater Ecology*. Akashdeep Publishing House, New Delhi.
- Trivedi, P. R. *Environmental Impact Assessment*.
- Trivedi, P. R. *Natural Resources Conservation*.
- The Environment(Protection) Act, 1986*, Universal Law publication .
- Vyas, L. N. and Garg, R. K. *Wetland conservation*, Agro Botanical Publishers, Bikaner, Rajasthan.
- Wadhwa, B. L. *Law Relating to Intellectual Property*, Universal Law Publishing Co. New Delhi.
- Bartee, T. C. *Digital Computer Fundamentals*, Mc-Graw Hill International Edition.
- Chatwal and Anand. *Instrumental Methods of Analysis*.
- Datta, A. K. *Basic Biostatistics and its application*, NCBA Private Ltd. Calcutta.
- Elias M Awad. *System Analysis and Design*, Golgotia Publications Private Ltd. New Delhi.
- Khan, I. A. and Khanum, A. *Fundamentals of Biostatistics*. Ukaaz Publications. Hyderabad.
- Satguru, P. *Fundamentals of Biostatistics*, Emkay Publication, New Delhi.
- Trivedi, R. K. and Goel, P. K. *Current Pollution Researches in India*. Environmental Publication. Karat
- Odum, E. P. *Fundamentals of Ecology*, WB Saunders Co., Philadelphia, USA.
- Fulekar, M. H. *Environmental Biotechnology*, Oxford & IBH Publishing Co. Private Ltd., New Delhi.
- De, A. K. *Environmental Chemistry*. New Age International Publishers, New Delhi.
- Ambasht, R. S. and Ambasht, N. K. *Plant Ecology*, Vanarasi.
- Arora, S. *Fundamentals of Environmental Biology*, Kalyani Publishers, New Delhi.
- Asthana, D. K. and Asthana, M. *Environmental Problems and Solutions*, S. Chand and Company, New Delhi.
- Banerji, S. K. *Environmental Chemistry*, Prentice-Hall of India Private Ltd., New Delhi.
- Kormondy, E. J. *Concepts of Ecology*, Prentice-Hall of India Private Ltd. New Delhi.
- Misra, K. C. *Manual of Plant Ecology*, Oxford and IBH Publishing Co. Private Ltd., New Delhi.
- Santara, S. C. *Environmental Science*, NCBA Private Ltd. Calcutta.

Sharma, B. K. and Kaur, H. *Environmental Chemistry*, Goel Publishing House, Meerut.

Sharma, P. D. *Ecology and Environment*, Rastogi Publication, Meerut.

Mukherjee, P. K. *A Text Book of Geology*, World Press Private Ltd. Calcutta.

Omkar. *Concepts of Toxicology*, Vishal Publishing Co. Jalandhar.

Purdom, P. W. *Environmental Health*. Academic Press, New York.

Khoshoo, T. N. *Environmental concerns and Strategies*, Ashish Publishing House, New Delhi.

Asthana, D. K. and Asthana, M. *Environmental Problems and Solutions*, S. Chand and Company, New Delhi.

Louma. S. N. *Introduction to Environmental Issues*. Mc-Millan Publishing Company, New York.

MANIPUR UNIVERSITY
CANCHIPUR: IMPHAL

Syllabus for BA/BSc (General) Environmental Science

SEMESTER V
ENV – 505 (Elective)

Full Marks - 75
90 Hrs/Sem

ENVIRONMENTAL MANAGEMENT, BIOSTATISTICS AND INSTRUMENTATION

UNIT – I: Environmental Management, Planning and Impact Assessment 15 Marks

Fundamental of Environmental management, Environmental management system, Preparation of Environmental management Plan, Concept of environmental planning, rural and urban planning, demographic consideration, concept of Environmental impact assessment, various methods of EIA and their relative studies of mega-developmental projects.

UNIT – II: Biostatistics 20 Marks

Diagrammatic Representation of Data : Line Diagram, Bar diagram, Pie chart; Graphical Representation of Data: Histogram, Frequency Polygon, Ogive; Sampling Techniques: Random and Non-random sampling Methods; Measures of Central Tendency; Mean, Median, Mode; Measure of dispersion: Range, Standard Deviation and co-efficient of variation; correlation; Test of Significance: Null hypothesis - Alternative hypothesis, Errors in Testing hypothesis – Level of Significance- Students' t' Test.

UNIT – III: Bioremediation 15 Marks

Concept and scope of Bioremediation, type of Bioremediation, Bioremediation of Xenobiotic Pollutants. Bioremediation: Contaminated Soils, Water, Marine oil slick. Reclamation of wasteland, agricultural lands- saline, waterlogged, restoration of wetlands, shifting cultivated areas.

UNIT – IV: Environmental Legislation 10 Marks

Need for environmental legislation, Salient feature of existing environmental legislations. Water Act, 1974, Air Act, 1981, Environmental Protection Act, 1986. Wild Life Protection Act 1972, Provision of Indian constitution of Article 48A and 51A.

UNIT – V: Instrumentation, Remote sensing and GIS 15 Marks

Titrimetry, Colorimetry, Spectrophotometry, Flame photometry, Chromatography, Principles of remote sensing, active and passive remote sensing, application of remote sensing and GIS

PRACTICAL

Full Marks 25
45 Hrs/Sem

1. Analysis of Solid waste and waste water – Waste characterization, dry matter moisture content analysis, decomposition analysis of Solid waste; chloride, Residual chlorine and alkalinity of waste water.
2. Estimation of COD – Dichromate Refluxion method
3. Bio-statistical analysis- Calculation of mean, variance and standard deviation, Testing the significance of difference between the two sample mean, correlation coefficient.
4. GPS study

SEMESTER VI
ENV – 506 (Elective)

Full Marks - 75
- 90 Hrs/Sem

ENERGY RESOURCES, ENVIRONMENTAL HEALTH AND ENVIRONMENTAL ISSUES

UNIT – I: Energy resources – Fossil fuel.

15 Marks

- Classification, compositions. Characteristics and energy content of coal. Petroleum and natural gas. Consequences of rapid consumption of fossil fuels. Alternative energy: Hydro-electricity, wind tidal, Geothermal, biogas, nuclear energy, solar energy.

UNIT – II: Environmental Health Hazards

15 Marks

Definition of environmental health and hazard water borne diseases, soil borne diseases, food borne diseases, air borne diseases, control of spread of infectious diseases, AIDS and its control measures, WHO and other bodies and their role in public health project development. Epidemiological issues (e.g. Goitre, Fluorosis, Arsenicosis etc.)

UNIT – III: Environmental Toxicology

15 Marks

Environmental toxicants, routes of exposure, absorption and translocation of toxicants; acute and chronic toxicity, Radiation and its biological effects, classification of pesticides, Integrated pest management, Effects of some important heavy metals viz lead, cadmium and mercury.

UNIT – IV: Global Environmental Issues.

15 Marks

- Causes and consequences of global warming and climate change ozone depletion, acid rain, deforestation, desertification etc.

UNIT – V: Major Environmental problems in India, causes and effects.

15 Marks

Population explosion, urbanization, Industrialization. Deforestation, Tehri Dam conflicts. Chipko and Appiko movement. Local environmental problems- Tisamukh dam, degradation of wetlands and important rivers, community pond and landslides.

PRACTICAL

25 MARKS

45 hrs/ Sem

1. Wind direction, Speed and wind rose.
2. Estimation of heavy metal concentration in waters (Fe, Cr, Cu & Zn)
3. Toxicity test – observation & examination – Evaluation of data.
4. Microbiological examination of water – the coliform and MPN test, mounting and staining of bacteria, Soil microbial studies- Standard Plate count,
5. Detection of common adulterant in turmeric powder, milk, edible vegetable, estimation of Iodine content in common salt.

SEMESTER V

ENV -505

Environmental management Biostatistics and Instrumentation

BOOKS/REFERENCES:

- Bernhardsen, T. *Geographic Information System: An introduction*.
- Daswari, D. *Environmental Management*, Excel Books, New Delhi.
- Chaudhuri, B. D. N. *Introduction to Environmental Management*. Interprint, New Delhi.
- Chouhan, T. N. *Remote Sensing for Natural Resources Management*.
- Christman, N. *Exploring GIS*.
- Hussey, N. W. and Scopes, N. *Biological Pest Control, the glasshouse Experience*. Blandford Press, Poole.
- Jensen, *Remote Sensing of the Environment*.
- Joshi, P. C. *Biodiversity and Conservation*.
- Karpagam, M. *Environmental Economics*, Sterling Publishers Private Ltd. New Delhi.
- Kumar, A. *Environmental Contamination and Bio-reclamation*.
- Louma, S. N. *Introduction to Environmental Issues*. Mc-Millan Publishing Company, New York.
- Mohanty, S. K. *Environment and pollution laws*, Universal Law publishing Co. Pvt. Ltd.
- Newman, M. C. and Unger, M. A. *Fundamentals of Ecotoxicology*. Virginia Institute of Marine Science, Gloucester Point, USA.
- Pandey, B. N. *Biodiversity Conservation, Environmental Pollution and Ecology*, Ekta Book Distributors, New Delhi.
- Pandey, B. W. *Natural Resource Management*.
- Sagwal, S. S. *Forest Ecology of India*.
- Satendran, I. P. S. *Disaster Management in hills*.
- Sharma, P. D. *Ecology and Environment*, Rastogi Publication, Meerut.
- Singh, R. B. *Disaster Management*.
- Solomon Raju, A. J. *A text book of Ecotourism, Ecorestoration and Sustainable Development*. New Central Book Agency (P) Ltd. Kolkata.
- Tiwari, B. K., Barik, S. K. and Tripathi, R. S. *Sacred Forest of Meghalaya - Biological and Cultural Diversity*, Regional Centre, National Afforestation and Eco-development Board, NEHU, Shillong.
- Trivedi, P. C. *Biodiversity Conservation*.
- Trivedi, P. R. and Gurdeep Raj. *Environmental Management of Freshwater Ecology*. Akashdeep Publishing House, New Delhi.
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- Vyas, L. N. and Garg, R. K. *Wetland conservation*, Agro Botanical Publishers, Bikaner, Rajasthan.
- Wadhwa, B. L. *Law Relating to Intellectual Property*, Universal Law Publishing Co. New Delhi.
- Bartee, T. C. *Digital Computer Fundamentals*, Mc-Graw Hill International Edition.
- Chatwal and Anand. *Instrumental Methods of Analysis*.
- Datta, A. K. *Basic Biostatistics and its application*, NCBA Private Ltd. Calcutta.
- Ellis M Awad. *System Analysis and Design*, Glogotia Publications Private Ltd. New Delhi.
- Khan, I. A. and Khanum, A. *Fundamentals of Biostatistics*. Ukaaz Publications. Hyderabad.
- Satguru, P. *Fundamentals of Biostatistics*, Emkay Publication, New Delhi.
- Trivedy, R. K. and Goel, P. K. *Current Pollution Researches in India*. Environmental Publication. Karat

SEMESTER VI
ENV -506

Energy Resources, Environmental health and issues

BOOKS/REFERENCES:

- Odum, E. P. *Fundamentals of Ecology*, WB Saunders, Co., Philadelphia, USA
- Fulekar, M. H. *Environmental Biotechnology*, Oxford & IBH Publishing Co. Private Ltd., New Delhi
- De, A. K. *Environmental Chemistry* New Age International Publishers, New Delhi.
- Ambashi, R. S. and Ambashi, N. K. *Plant Ecology*, Varanasi.
- Arora, S. *Fundamentals of Environmental Biology*, Kalyani Publishers, New Delhi.
- Asthana, D. K. and Asthana, M. *Environmental Problems and Solutions*, S. Chand and Company, New Delhi
- Banerji, S. K. *Environmental Chemistry*, Prentice-Hall of India Private Ltd., New Delhi
- Kormondy, E. J. *Concepts of Ecology*, Prentice-Hall of India Private Ltd. New Delhi
- Misra, K. C. *Manual of Plant Ecology*, Oxford and IBH Publishing Co. Private Ltd., New Delhi
- Santara, S. C. *Environmental Science*, NCBA Private Ltd. Calcutta.
- Sharma, B. K. and Kaur, H. *Environmental Chemistry*, Goel Publishing House, Meerut.
- Sharma, P. D. *Ecology and Environment*, Rastogi Publication, Meerut.
- Mukherjee, P. K. *A Text Book of Geology*, World Press Private Ltd. Calcutta
- Omkar. *Concepts of Toxicology*, Vishal Publishing Co. Jalandhar.
- Purdum, P. W. *Environmental Health*. Academic Press, New York.
- Khoshoo, T. N. *Environmental concerns and Strategies*, Ashish Publishing House, New Delhi
- Asthana, D. K. and Asthana, M. *Environmental Problems and Solutions*, S. Chand and Company, New Delhi
- Louma, S. N. *Introduction to Environmental Issues*. Mc-Millan Publishing Company, New York.

DEPARTMENT OF ZOOLOGY
PRAVABATI COLLEGE,
MAYANG IMPHAL-795132



SYLLABUS FOR B.SC. ZOOLOGY
MANIPUR UNIVERSITY, CANCHIPUR-795003
MANIPUR
2022

**ZOO-101: PRINCIPLES OF CLASSIFICATION, ZOOGEOGRAPHY &
PALEOZOOLOGY**

**75 Marks
100 lectures**

PRINCIPLES OF CLASSIFICATION

UNIT1. Classification 20 lectures 15marks

Classification of animals–historical account. Species concept. Taxonomy and systematic, Taxonomic hierarchy.

Unit 2. Code and approaches in Taxonomy 30 lectures 20 marks

International Code of zoological Nomenclature. Concepts of chemotaxonomy and numerical taxonomy. Approaches in taxonomy: morphometric and cytological techniques. Basic concept of molecular techniques in taxonomy.

ZOOLGEOGRAPHY & PALAEOZOOLOGY

Unit 3. Zoogeography 25 lectures 20 marks

Zoogeographical regions of the world with characteristic fauna. Marine realm and characteristics. Barriers –types and significance; Continental drift. Discontinuous distribution.

Unit 4. Palaeozoology 25 lectures 20 marks

Fossils and fossilization, types of fossils; trace fossils and living fossils. Dating of fossils, significance of fossils. Geological time scale and associated fauna.

RECOMMENDED BOOKS

Darlington, P.J. The Zoogeography: The geographical distribution of animal .Wiley publication, NEW York.

Hobbs, C.L. Zoogeography . Ayer co pub; Reprint Edition.

Illies, J .1974 .Introduction to zoogeography .Macmillan .

International commission for zoological Nomenclature(ICZN). 1999 . International code of zoological Nomenclature. Nature History Museum Cromwell Road, London S W 7 5BD- UK (AVAILABLE ONLINE FREE: W .W.W .iczn.org).

Kapoor, v.c Theory and practice of Animal Taxonomy Oxford –IBH publishing co., N Delhi ,Mumbai & Kolkata .

Mayer , E. Principles of systematic zoology . Mc-Graw Hill publication, New Delhi.

Simpson , G.C. Principles of Animal Taxonomy. Oxford –IBH publishing co, New Delhi.

Tiwari, S.Readings in Indian zoogeography (vol.1) Today & Tomorrow printers & Publishers.

**ZOO-101P: PRACTICALS ON PRINCIPLES OF CLASSIFICATION,
ZOOGEOGRAPHY & PALAEOZOOLOGY**

25 Marks

Taxonomic procedures

10marks

Collection of specimens, recording of : locality, co-ordinates, altitude, river basin, lake ,mountain range etc., method of catch, local name, description of characters, particularly colour in fresh.

Labelling/tagging of specimens and its correlation with field record book.

Narcotization, Fixation and preservation techniques-wet, dry, slide preparation.

Camera-Lucida drawing of specimens.

Morphometric and meristic characters, data sheets and entry.

Description of a species.

Identification using dichotomous keys.

Zoogeography & Palaeontology

5 marks

Elementary knowledge about origin and evolution of groups of animals in Geological time scale.

Field Collection Trip and Report

5 marks

Viva Voce

5 marks

ZOO-202: FUNCTIONAL ANATOMY OF NON-CHORDATA**75 Marks
100 Lectures****Unit 1. Protozoa, Metazoa and Porifera****25 lectures****20 marks**

Protozoa: Distinguishing characters and classification upon orders.

Structure, locomotion, Osmoregulation, nutrition, reproduction. Life history and pathogenicity of *Entamoeba histolytica*, *Trypanosoma gambiense*, *Plasmodium vivax*, *P. falciparum*. Reproduction in *Paramecium* and nutrition in *Euglena*.

Metazoan : origin of metazoan ,metamerism and symmetry

Porifera: Distinguishing characters and classification upto orders. Canal system, Skeleton
Economic importance of sponges.

Unit 2: Coelenterata, ctenophore, platyhelminthes and nemathelminths**25 lectures****20 marks**

Coelenterate; structural organization and affinities

Platyhelminthes: structural organization in Trematoda, Cestoda . Life cycle and parasitic adaptation in *Fasciola hepatica* and *Taenia solium*.

Nemathelminthes; Distinguishing characters and classification upto orders

Life cycle,pathogenicity and prophylaxis of *Ascaris lumbricoides*

Unit 3. Annelida , Arthropoda , Mollusca and Echinodermata**35 lectures****25 marks**

Annelida; Distinguishing characters and classification upto order, Excretory system, Coelom in Annelida, Trochophore larva-structure and affinities.

Arthropoda ;structural organization in different classes, mouth parts of insects, larval forms of Crustacean and Insecta. Metamorphosis and social life in insects.

Mollusca: Structural organization in Palecypoda ,Gastropoda and Cephalopoda,

Torsion and detorsion in Gastropods , Structure and affinities of Neopilina.

Echinodermata: Structural organization in different classes; water vascular system, Larval forms.

Unit 4. Minor phyla

15 lectures

10 marks

Distinguishing characters and examples of Nemertinea, Rotifera, Acanthocephala, Sipunculida, Echiurida, Bryozoa (Ectoprota), Brachyopoda and Phoronida

RECOMMENDED BOOKS

Anderson, D.T. *Invertebrate Zoology*. Oxford university press .

Brooks, W.K. *Handbook of Invertebrate Zoology*. Kessinger Publishers.

Ekambranath, M. & Ananthakrishnan, TN 2000, *Manual of Zoology*, Part 1 &2.
S.Vishwanathan Printers and Publishers, Chinnai .

Parker, T.J. & Haswell, W.A. *A Text –book of Zoology*, volume 1, McMillan co.

ZOO-202P: PRACTICALS ON FUNCTION ANATOMY OF NON-CHORDATA

25marks

Dissections .

7 marks

Nereis – digestive and nervous systems .

Cockroach- digestive ,reproductive and excretory systems.

Pila – digestive and nervous systems

Study permanent slides

2 marks

Paramecium entire , conjugation Monocystis , Euglena Trypanosoma , L S of sycon , Spongin fibres, Obelia colony, T.S. of Ascaris (male & femal), T.S of Fasciola and Taenia , Cercaria, sporocyst and redia of Fasciola, scolex, mature and gravid segments of Taenia, Mouth parts of Anopheles, Housefly and cockroach ,bed bug (W/M), body louse (W/M) , TS of gill of Pila, T.S. of arm of starfish.

Study of specimens

5 marks

Sycon, Spongilla, Physalia, Porita, Favia, Tubipora, Madrepora, Aurelia, Sea-Anemone, Alcyonium, Taenia, Hetronereis, Aphrodite, Chaetopterus, Sabella Leech, Bonellia, Spider, Limulus, Millipede, Centipede, Crab, Peripatus, Scorpion, Termite, Daphnia, Cyclops, Balanus, Chiton, Dentalium, Pearl Oyester, Limax, Nautilus, Octopus, Sepia Loligo, Solen, Aplysia, Starfish, Antedon, Holothuria, Sea urchin, Brittle star.

Temporary mounts

3 Marks

Spicules and gemmules of sponge, Obelia colony, ovary and spermatheca and septal Nephridia of Earthworm, Parapodis of Nereis. Mouth parts of cockroach, house fly and mosquito. Radula of Pila, Daphnia, Cyclops, Mysis.

Records Books

3 marks

Viva Voce

5 marks

ZOO-303: FUNCTIONAL ANATOMY OF CHORDATA**75 marks
100 lectures****Unit 1. General organization of Chordata 10 lectures 08 marks**

General characters of chordata and classification upto classes.

Structural organization of Hemichordata, Urochordata and Cephalochordata.

Affinities of Amphioxus.

Unit 2. Agnatha and Pisces 15 lectures 10 marks

Petromyzon: external feature, digestive system, respiratory system and reproduction.

Scoliodon: external features; respiratory, circulatory and reproductive systems; brain and cranial nerves.

Air bladder, accessory respiratory organ of fishes. General characters and distribution of Lungfishes

Unit 3. Amphibia and Reptilia 20 lectures 12 marks

Amphibia: origin and evolution, distinctive characters and classification upto living orders with examples, metamorphosis and neoteny.

Reptilia: distinctive characters and classification upto living orders with examples; affinities of Sphenodon; distinction between poisonous and non-poisonous snakes; biting mechanism in snakes; Mesozoic reptiles.

Unit 4. Aves and Mammalia 25 lectures 20 marks

Aves: origin of birds; distinctive characters and classification upto living orders with examples. Pigeon: feathers; digestive, respiratory, circulatory, urino-genital and skeletal system; brain; distinctive characters of Ratitae & Carinatae with examples; general characters of *Archaeopteryx*. Perching mechanism in birds.

Mammal: origin; general characters and classification of Prototheria, Metatheria and Eutheria. Dentition and placentation in mammals.

Rabbit: skeletal, excretory and reproductive systems.

Unit 5. Comparative anatomy**30 lectures****25 Marks**

Integumentary system: integument and its derivatives.

Digestive system: alimentary canals and associated glands.

Circulatory system: heart and aortic arches.

Skeletal system: jaw suspension; visceral arches, vertebral column; limbs and girdles.

Nervous system: brain; cranial nerves; spinal nerves.

Urino-genital system: succession of kidney and evolution of urino-genital ducts.

Endocrine glands: pituitary, thyroid, adrenal, pancreas and gonads.

RECOMMENDED BOOKS

Ekambranath, M. & Ananthakrishnan, T.N. 2000. *Manual of Zoology, (Chordata) Part 1*
& 2. S. Yishwanathan Printers and Publishers, Chennai.

Kent Jr. G.e. 1969. *Comparative Anatomy of the vertebrates*. The C.Y. Mosby Corn. Toppan,
Japan.

Kingsley, J. S. 1962. *Bulletins of Comparative Anatomy*, Central Book Depot, Allahabad.

Parker, T.J. & Haswell, W.A. A Text-book of Zoology, Volume 2, McMillan Co, Bombay,
Calcutta, Madras.

Sedgewicke, A. *A student textbook pfZoology*. Central Book Depot, Allahabad.

Wake, M.H. 1992. *Hyman's Comparartive Vertebrate Anatomy*, 3rd Edn., The University
of ! Chicago Press.

Weichert, e.K. *Anatomy of the Chordates*. McGraw Hill Book Inc., New York.

Weichert, W.e. & Presch, W. 1997. *Elements 0/ Chordate Anatomy*. Tata-McGraw Hill
Publishers Co, Ltd., New Delhi.

Young, J .Z. *The Life 0/ Vertebrates*. Oxford University Press, New York.

ZOO-303P: PRACTICALS ON FUNCTIONAL ANATOMY OF CHORDATA

25 marks

Dissections

6 marks

Scoliodon - afferent and efferent branchial vessels; V, VII, IX and X cranial nerve; internal ear and brain (to be taken out)

Frog or toad - V, VII and X cranial nerves.

Calotes - arterial, venous and urino-genital systems.

Study of specimems

6 marks

Amphioxus, Balanoglossus, Ascidian, Petromyzon, Myxine, Electric ray, Sea horse, Saw fish, Sucker fish, Hammer headed shark, Salamander, Hyla, Hemidactylus, Mabuia, Varanus, Turtle, Tortoise, Chameleon, Draco, Cobra, Viper, sea-snake, Krait, Parrot, Cuckoo, Kite, Myna, Flying fox, Duck-billed Platypus, Echidna.

Study of bones

5 marks

Toad or Frog - skull, lower jaw, pectoral & pelvic girdles, vertebrae

Calotes- skull, lower jaw, pectoral & pelvic girdles, atlas and axis.

Pigeon -lower jaw, cervical vertebrae, rib, pectoral and pelvic girdles and pygostyle.

Rabbit -skull, lower jaw, pectoral and pelvic girdles.

Practical Record

3marks

Viva-Voce

5 marks

ZOO- 404: BIODIVERSITY, ENVIRONMENTAL BIOLOGY, APPLIED ZOOLOGY AND COMPUTER APPLICATION	25 marks
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Unit 1. Biodiversity	30 lectures	20 marks
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Biodiversity: concept; biodiversity hotspots; IUCN Redlist category, Wildlife of India with particular reference to Manipur; methods adopted in wildlife census. Concept of wildlife conservation, implementation, in-situ & ex-situ conservation, captive breeding, biotechnological intervention. Sanctuaries and National parks of India, Ramsar sites.

Unit 2. Environmental Biology	30 lectures	20 marks
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Concept of Ecosystem. Major ecosystems, man made ecosystem and agro-ecosystem. Biotic and abiotic factors. Food chain and energy flow, ecological niche, habitat, biosphere and biome. Ecological succession, Biological cycle: water, oxygen, carbon and nitrogen. Population. General features, natality, mortality, equilibrium density, immigration, emigration, ecological pyramids, sex ratio, dispersal and dispersion; Leidig's law of minimum and Shelford's law of tolerance; concept of limiting factors and life table construction method. Environmental pollution. Types, sources, indicators, causes and control and prevention of pollution. Toxic effects of pesticides and industrial wastes. Biomagnification.

Unit 3. Applied Zoology	20 lectures	20 marks
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Apiculture and Sericulture. Species diversity, life history, rearing methods, diseases and economic utility of bees, tasar worms and mulberry silk worm. Fisheries. Culture and capture fishery. Fishes of commercial value: food and ornamental. Introduction to different pisciculture techniques: extensive and intensive pond fish culture.

Unit 4. Computer Applications

20 lectures

15 marks

Basic concepts of computer: hardware and software, operating systems. Computer application in Biological sciences. Elementary knowledge of Bioinformatics, E- learning, Networking. Programmes used in biostatistics: SPSS, Minitab, phylogenetic study, modelling etc.

RECOMMENDED BOOKS

- Alfred, J.R.B. Das, A.K. & Sanyal, A.K. 1998. *Faunal Diversity in India*. Zoological Survey of India, Kolkata.
- Annanthakrishnan, T.N. 1982. *Bioresources Ecology*. Oxford-IBH Publ Co., Pvt. Ltd. N.Delhi
- Dandin, S.B., Jayaswal, J. & Giridhar. *Handbook of Sericulture Technologies*. Central Silk Board.(Ministry of Textiles, Govt. of India), CSB Complex, BTM Layout, Madivala, Bangalore-560068.
- DOEACC. "*CCC*" *Course on Computer Concepts*. Doeacc Society, Electronics Niketan, 6CGO Complex, New Delhi-110003.
- French, C.S. *Data Processing and Information Technology*. BPB Publication.
- Kormondy, E.J. *Concepts of Ecology*. Patience-Hall, India
- Krebs, C.J. 1972. *Ecology, the experimental analysis of distribution and abundances*. Harper. IntI. Edn., Harper & Row Pub!. London.
- Newman, M.C. *Fundamental of Ecotoxicology*. Lewis Publishers, Washington DC.
- Odum, E.P. *Ecology*. Oxford-IBH Publishing Co., New Delhi, Mumbai & Kolkata.
- Rajararnan, V. *Fundamentals of Computers*. Prentice-Hall, India Ltd., New Delhi.
- www.iucnredlist.org. (Official website of IUCN)

ZOO-404P: PRACTICALS ON BIODIVERSITY, ENVIRONMENTAL BIOLOGY, APPLIED ZOOLOGY AND COMPUTER APPLICATION 25 Marks
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Environmental Biology**8 Marks**

Study of ecosystem of a pond. Identification of biotic and abiotic components.
Recording of turbidity, temperature and pH. Estimation of Oxygen (Winkler's method) and Carbon dioxide (phenolphthalein method) of pond water.
Population study by tagging experiment (to track the movement of animals)- marking, releasing & recapturing method.

Applied Zoology**5 marks**

Study of life history stages of a Honey bee, a Silk moth and a fish. Morphological differences among the different castes of Honey bee.

Wildlife**5 marks**

Visit to Wildlife sanctuary or ZoolNational Park/any other worth visiting site and study of the available animals.

Viva- Voce**7 marks**

ZOOLOGY HONOURS (SEMESTER-V)
ZOO-505: CELL BIOLOGY AND GENETICS

100 marks
120 Lecturers

CELL BIOLOGY

Unit 1. Cellular organization **15 lectures** **15 marks**

Prokaryotic and eukaryotic cells. Intercellular adhesion and interaction. Extra-nuclear organization of cells: concept of unit membrane, active and passive transport.

Unit 2. Cytoplasmic organelles **20 lectures** **15 marks**

Plasma membrane. Structure and function of mitochondria, endoplasmic reticulum, ribosomes, lysosomes, cilia, flagella, cell vacuoles, Golgi body, microbodies.

Unit 3. Nuclear organization **10 lectures** **10 marks**

Nucleus: nuclear envelope, nuclear matrix, nucleolus, chromosomes, chromatids, karyotyping, supernumerary chromosomes, chromatin- euchromatin and heterochromatin

Unit 4 Cell regulatory mechanism **15 lectures** **15 marks**

Cell cycle, mitotic and meiotic cell division, regulation of cell division. DNA replication; Molecular expression of gene action: Protein synthesis and its regulation, Lac Operon and Tryptophan Operon model

GENETICS

Unit 5. Genetics. **35 lectures** **35 marks**

History of Genetics, Mendelian inheritance patterns: quantitative inheritance, Linkage maps.

Gene interactions: incomplete dominance, co-dominance, supplementary genes, genes, epistasis, position effect, atavism, lethal gene, multiple alleles- hemolytic disease of new born (HDN). Sex determination in Drosophila and man.

Genetics of blood group. Modern concept of gene.

Point mutation, chromosomal aberrations, chromosome number, form and rearrangement with reference to speciation in Drosophila, polyploidy (molecular basis of mutations).

Non-chromosomal inheritance, human genetics, diseases of single gene inheritance, normal and abnormal karyotypes, genetic counselling.

Unit 6. Molecular Genetics and Tools

10 lectures

10 marks

RFLP (Restriction Fragment Length Polymorphism), RAPD (Randomly Amplified Polymorphic DNA), AFLP (Amplified Fragment Length Polymorphism), Application of RFLP in DNA fingerprinting. Polymerase Chain Reaction (PCR). Human genome project.

RECOMMENDED BOOKS

Barke, J.D.C. *Cell Biology*. Williams & Wilkins Co.

deRobertis, E.D.P. & deRobertis, E.M.F. *Cell and Molecular Biology*. Holt-Saunders International Edn.

Gardener, E.J. *Principles of Genetics*. John Wiley & Sons Inc., New York.

Lehninger, A.L., Nelson, D.L. & Cox, M.M. *Principles of Biochemistry*. CBSD Publishers & Distributors, Delhi.

Prescott, D.M. *Methods in Cell Biology*, Bookman Associates, Jaipur. Strickberger, M.W. 2005. *Genetics*. Prentice-Hall of India, New Delhi

Swanson, c.P., Mezz, T & Young, W.J. *Cytogenetics: Chromosomes in divisions, Inheritance and Evolution*. Prentice-Hall of India, New Delhi.

ZOOLOGY HONOURS (SEMESTER-V) ZOO-506: Evolution, Adaptation, Ethology, Biotechnology & Bioinstrumentation		100 marks 120 lectures
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Unit 1. Evolution	30 lectures	30 marks
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History of evolutionary thought. Origin of life. Evidences of evolution, Modern concept of organic evolution, Hardy-Weinberg law, Sewall-Wright effect.

Role of mutation in evolution. Variation. Natural selection- directional, stabilizing and disruptive types.

Isolating mechanism and their role in evolution. Speciation. Evolution of man.

Unit 2. Adaptation	20 lectures	15 marks
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Structural adaptations of animals with Cursorial, Aquatic and Volant modes of life.

Basic concepts of adaptations of animals to deep sea, desert and cave.

Basic concepts of adaptations of animals to deep sea, desert and cave.

Colouration and mimicry in animals.

Adaptive radiation and convergence.

Unit 3. Ethology	25 lectures	20 marks
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Description and types of animal behaviour. Learning in animals.

Types of communications in insects. Pheromones and their role. Parental care in fishes.

Courtship behaviour in fishes and birds.

Biological Rhythm: Circadian rhythm.

Migration in insects, fishes and birds.

Unit 4. Biotechnology	30 lectures	25 marks
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Introduction, history, scope, importance and types of biotechnology.

Importance of viruses, bacteria, algae and fungi in biotechnology.

Biotechnology of alcohol fermentation and bio- insecticide.

Principles and techniques of animal cell cultures.

Brief idea of health care biotechnology, production of human insulin.

Elementary knowledge of genetic engineering. In-vitro fertilization in human and other

assisted reproductive technology (ART). Transgenic animals.

Unit 5. Bioinstrumentation

15 lecturers

10 marks

General principles and brief ideas on the types of Microscopy, Spectrophotometry, Electrophoresis, Chromatography and Centrifugation.

RECOMMENDED BOOKS

Alcock, J. *Animal behaviour- an evolutionary approach*. Sinauer Associates Inc., Massachussets

Chandrasekharan, M.K. *Biological Rhythm*. Vishwanathan Printers, Chennai.

Lull, R.S. 1976. *Organic Evolution*. Light & Life Publisher.

Plummer, D.T. *An Introduction to Practical Biochemistry*. Tata-McGraw Hill Publ., New Delhi.

Trehan, K. *Biotechnology*. John Willey & Sons.

Wilson, K. and Walker, J. 2000. *Practical Biochemistry*, Principles and Techniques, 5th Edn. Cambridge University Press.

ZOOLOGY HONOURS (SEMESTER-V) ZOO-507P: Practicals on Cell Biology and Genetics Evolution, Adaptation, Ethology, Biotechnology and Bioinstrumentation 100 marks

Cell Biology and Genetics	30 marks
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Squash preparation of onion root tip for the study of mitosis.

Temporary and permanent squash preparation of the grasshopper testis for the study of meiosis.

Temporary squash preparation of the salivary gland chromosomes of *Drosophila* and *Chironomus*.

Study of permanent slides showing autosomes and sex chromosomes of a grasshopper and a mammal.

Karyotyping of chromosomes.

Demonstration of Sex Chromatin (Barr body).

Demonstration of mitochondria by supra vital staining (Janus green)

Adaptation	10 marks
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Study of mimicry in insects: stick insect, leaf insect, moth, cicada, sea horse, flat fish, remora, flying lizard, bat etc.

Ethology	10 marks
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Tagging (paper/aluminium) of animals and recapture to study patterns of migration.

Study of different types of nests of animals. Study of Parental Care

Biotechnology	10 marks
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Demonstration of alcohol fermentation using yeast.

Demonstration of soyabean fermentation using starter culture.

Demonstration of curd making using starter culture.

Bioinstrumentation	10 marks
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Preparation of standard curve of amino acid and protein (bovine serum albumin).

Measurement of cell/spore size using micrometer.

Demonstration of oil emulsion technique in microscopy.

Separation of tissue extract using centrifuge.

Demonstration of electrophoresis- paper/gel

Practical Records	5marks
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Slide Submission Mitosis, Meiosis and Salivary Gland Chromosomes	10 marks
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Viva Voce	15 marks
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SCHEME OF PRACTICAL EXAMINATION FOR ZOO-507P

All questions are compulsory. There will be no options. The question setter will select any one from the options available below for a particular examination.

	Marks
1. Anyone of the following	10
a. Temporary slide preparation of Mitosis from onion root tip	
b. Temporary slide preparation of Meiosis from Grasshopper testis/mammals	
c. Salivary gland chromosome of Drosophila/Chironomus larva	
d. Vital staining of Mitochondria	
2. Demonstration of Barr body, stained and temporary mount	10
3. Karyotyping of images of chromosomes provided	10
4. Demonstration of Alcohol Soyabean/Curd fermentation	10
5. Anyone of the following:	10
a. Preparation of Calibration curve of Amino acid/Protein	
b. Measurement of Cell/Spore size using micrometer	
c. Preparation of tissue extract by centrifugation	
d. Setting up and demonstration of Electrophoresis	
6. Comment on adaptation: mimicry/camouflage of animal	10
7. Anyone of the following:	10
a. Demonstration of tagging experiment for migration of animals	
b. Demonstration of nesting behaviour/parental care of animals	
8. Permanent slide submission	10
(Mitosis-2; Meiosis-2; Salivary gland chromosome-1)	
9. Practical Record	5
10. Viva Voce	15

ELECTIVE ZOOLOGY (SEMESTER-V)		
ZOO-509: Cell Biology and Genetics, Evolution & Biological Techniques	75 marks	100 lecturers

Unit 1: Cell Biology	35 lectures	20 marks
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Characteristics of Prokaryotic and Eukaryotic cell, Chemistry of cell constituents.
 Concept of unit membrane, Structure and function of cell organelles – Plasma membrane, Mitochondria, Golgi Bodies, Endoplasmic Reticulum, Ribosomes, Lysosomes.
 Chromosomes: Polytene & Lampbrush chromosomes, Euchromatin, Heterochromatin, Mutation. Gene: Structural alteration and their significance; deletion, duplication, inversion, translocation.
 Cell division: Mitosis & Meiosis, cell cycle, sex determination in drosophila and man.
 Molecular expression of gene: gene action, protein synthesis and its regulation – Lac operon model.

Unit 2: Genetics	20 lectures	15 marks
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Mendel's laws, monohybrid and dihybrid cross, back cross, test cross, quantitative inheritance, gene variation, incomplete dominance, co-dominance, complementary genes, lethal genes, crossing over and linkage, genetic diseases and counselling, Human genome project.

Unit 3: Evolution & Adaptation	15 lectures	15 marks
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Neo Lamarkism, Darwinism, Neo Darwinism, Evidence of Evolution, Hardy-Weinberg Law, genetic drift, mutation theory, variation – types and causes, Natural selection, speciation, Fossil type and significance, Geological Time Scale.

Unit 4: Ethology	10 lectures	10 marks
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Social behavior in honey bee and termites; Parental care in insects, fishes and amphibians; Migration in insects, fishes and birds; Courtship and defensive behavior in insects, fishes and birds.

Unit 5: Biotechnology & Bioinstrumentation	20 lectures	15 marks
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Introduction, history and importance of Biotechnology, Principles and techniques of plant and animal cell cultures. Recombinant DNA Technology, GMO's. Application of Biotechnology in Agriculture, Health care and industries; Gene therapy, transgenic animals.
 Elementary ideas of Bioinformatics
 Principles of microscopy, Spectrophotometry, Electrophoresis, Chromatography, PCR and ELISA.

RECOMMENDED BOOKS

deRobertis, E.D.P. & deRobertis, E.M.F. *Cell and Molecular Biology*. Holt-Saunders

International Edn.

Gardener, E.J. *Principles of Genetics*. John Wiley & Sons Inc., New York.

Lehninger, A.L., Nelson, D.L. & Cox, M.M. *Principles of Biochemistry*. CBSD Publishers

& Distributors, Delhi.

Strickberger, M.W. 2005. *Genetics*. Prentice-Hall of India, New Delhi

Chandrasekheran, M.K. *Biological Rhythm*. Vishwanathan Printers, Chennai.

Lull, R.S. 1976. *Organic Evolution*. Light & Life Publisher.

Plummer, D.T. *An Introduction to Practical Biochemistry*. Tata-McGraw Hill Publ., New Delhi.

Trehan, K. *Biotechnology*. John Willey & Sons.

ZOO-510P: Practical on Cell Biology & Genetics, Evolution, Adaptation, Ethology, Biotechnology and Bioinstrumentation
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25 marks

Cell Biology & Genetics

7 marks

Squash preparation of onion root tip for the study of mitosis.

Temporary and permanent squash preparation of grasshopper testes for the study of meiosis. Temporary preparation of the salivary gland chromosomes of *Drosophila*/Chironomous/ Grasshopper and rat. Study of permanent slides of Autosomes and sex chromosomes of grasshopper and rat. Demonstration of sex chromatin (Barr body)

Adaptation & Ethology

5 marks

Study of mimicry in insects and animals: stick insect, leaf insect, moth, cicada, sea horse, flat fish, remora, flying lizard, bat etc. Study of different types of nests of animals. Study of parental care

Biotechnology & Bioinstrumentation

5 marks

Demonstration of alcohol fermentation using yeast/curd making using starter culture.

Preparation of standard curve of amino acids and proteins.

Demonstration of oil emulsion technique in microscopy.

Separation of tissue extract using centrifuge.

Demonstration of electrophoresis – paper/gel.

Practical Records

3 marks

Viva Voce

5 marks

ZOOLOGY HONOURS (SEMESTER-VI)
ZOO-608: Physiology, Endocrinology and Immunology

100 marks
120 lectures

ANIMAL PHYSIOLOGY

Physiology with special reference to mammals

Unit 1. Nutrition **15 lectures** **12 marks**

Nutritional requirements-macro and micronutrients, digestion and absorption

Unit 2. Heart, Blood and Circulation **15 lectures** **12 marks**

Origin, conduction and regulation of heart beat; cardiac cycle, electrocardiogram, composition and function of blood, blood group and Rh factor, haemoglobin and haemopoiesis; peripheral circulation, blood pressure and blood coagulation.

Unit 3. Respiration **15 lectures** **12 marks**

Mechanism and control of breathing. Transport of oxygen and carbon dioxide, Oxygen dissociation curves of haemoglobin, Bohr effect, Haldane effect, chloride shift

Unit 4. Excretion **15 lectures** **12 marks**

Physiology of urine formation, mechanism of micturition, role of kidney in water regulation, salt and acid-base balance.

Unit 5. Muscle, Nerve and Sense organs **25 lectures** **20 marks**

Ultrastructural, chemical and physiological basis of skeletal muscles, muscle contraction; molecular mechanism of muscle contraction, Cori's cycle.

Nerve impulse. Nature, origin and propagation of nerve impulse along a neuron; synapse and myo-neural junction. Integrative functions of central nervous system.

Sense organs: functions of organs related with vision, sound perception, taste, smell and touch. Electroencephalogram (EEG)

ENDOCRINOLOGY

Unit 6. Endocrinology **25 lectures** **25 marks**

Definitions of endocrine glands, neurosecretory cells.

Functions and hormones secreted by the following glands: pineal, hypothalamus, pituitary, thyroid, thymus, parathyroid, islets of Langerhans, adrenal, testis, and ovary.

Miscellaneous hormones secreted by gastrointestinal system, kidney, placenta and heart and their functions.

Unit 7. Immunology

10 lecturers

7marks

Introduction to immunology, innate immunity and acquired immunity, structure and types of Ig, antigen-antibodies reaction, mechanism of immune responses, brief idea of HIV and AIDS.

RECOMMENDED BOOKS

Bell, G., Davidson, J.N. & Smith, D.E. *Textbook of Physiology and Biochemistry*. ELBS and Churchill Livingstone.

Ganong, W.F. *Medical Physiology*. McGraw-Hill Publ., N. Delhi

Guyton, A.C. & Hall, J.E. *Textbook of Medical Physiology*. 9th Edn., Elsevier, a division of Reed Elsevier India Pvt., Ltd.

Keele, C., Neil, E. & Joels, N. *Samson Wright's Applied Physiology*. Oxford University Press, Bombay, Calcutta, Madras.

Prosser, C.L. & Brown, F.A. *Comparative Animal Physiology*. W.B. Saunders Co Philadelphia, Toppan Co. Tokyo, Japan.

Rastogi, S.C. *Essentials of Animal Physiology*. Wiley Eastern Ltd.

Schil-Nelson, K. *Animal Physiology, Adaptation and Environment*. Cambridge University Press.

Turner, C.L. *General Endocrinology*. W.B. Saunders, Toppan Co. Ltd., Tokyo, Japan.

120 lectures

Unit 5. Biological Chemistry**40 lectures****25 marks**

Biological chemistry, its scope and importance. Chemistry of carbohydrates, proteins, lipids and nucleic acids, enzymes, nature, classification and functions of enzymes. Co-enzymes and prosthetic groups. Enzyme actions.

Intermediary metabolism. Carbohydrate. Embden-Meyerhoff pathway, TCA cycle, Glycogenolysis and glycogenesis, gluconeogenesis. Biological oxidations with special reference to the role of the electron transport system. Basic concept of Bioenergetics

Lipid. Oxidation of fatty acids, fate of glycerol, ketone body formation and utilization.

Interaction of carbohydrate and lipids.

Proteins. Metabolism of amino acids. Oxidative deamination, trans-aminations, decarboxylation, enzymology of urea cycle. Fate of glucogenic and ketogenic aminoacids. Interrelationship of metabolic pathways.

RECOMMENDED BOOKS

Balinsky, B.I. *Introduction to Embryology*. Saunder College Publishers, Philadelphia.

Browder, L.W. *Developmental Biology*. Sauders College Publishing, Philadelphia

Fawcett, D.W. Bloom & Fawcett- *A textbook of histology*. Hodder-Arnold Publication.

Jayaraman, J.1981. *Laboratory Manual in Biochemistry*. New Age International Publishers, , New Delhi-II 0002.

Murray, R.K., Granner, D.K., Mayer, P.A. & Rodwell, V.W. *Harper's Biochemistry*. McGraw-Hill Publ.

Lehninger, A.L., Nelson, D.L. & Cox, M.M. *Principles of Biochemistry*. CBSD Publishers & Distributors, Delhi.

<p style="text-align: center;">ZOOLOGY HONOURS (SEMESTER-VI) ZOO-610P: Practicals on Animal Physiology, Endocrinology, Immunology, Developmental Biology, Histology & Biological Chemistry</p>	100 marks
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Animal Physiology

30 marks

Effects of isotonic, hypotonic and hypertonic solutions on erythrocytes

Counting of RBC using Haemocytometer

Counting of WBC using Haemocytometer

Estimation of haemoglobin percentage of a blood sample: amphibia or mammal.

Preparation of haemin crystals.

Coagulation of blood

Recording of frog's heart beat. Demonstration of the effect of acetylcholine, atropine and epinephrine on the heart beat.

Endocrinology

10 marks

Dissection of endocrine gland in rat

Study of permanent slides: sections of pituitary, thyroid, adrenal, pancreas, testis and ovary.

Immunology

10marks

Determination of ABO and Rh factor of Blood.

Developmental Biology

6 marks

Study of developmental stages of frog (permanent slides, WM): cleavage, gastrula and neurula.

Study of developmental stages of chick (permanent slides, WM): 18, 24, 36, 48 and 72 hours of incubation.

Study of permanent slides of sections of blastula and gastrula of chick and neurula and external gills of frog.

Histology **16 marks**

Microtomy - fixation, embedding, block making, sectioning, staining and mounting of tissues.

Study of permanent slides - sections of oesophagus, stomach, duodenum, ileum, pancreas, lung, kidney and skin of mammal.

Study of permanent slides - sections of oesophagus, stomach, duodenum, ileum, pancreas, lung, kidney and skin of amphibian

Biological Chemistry **10 marks**

General test for identification of carbohydrate, lipid and protein

Separation of amino acid using paper chromatography

Colorimetric estimation of protein from a calibration curve (provided)

Practical Record **8marks**

Slide Submission **5 marks**

Viva- Voce **10 marks**

SCHEME OF PRACTICAL EXAMINATION FOR ZOO-H610P

All questions are compulsory. There will be no options. The question setter will select any one from the options available below for a particular examination.

	Marks
1. Any one of the following:	12
a. Counting of RBC,	
b. Counting of WBC	
c. Estimation of Haemoglobin percentage	
2. Any one of the following:	8
a. Effects of isotonic, hypotonic and hypertonic solution on erythrocytes	
b. Preparation of Haemin crystals	
c. Coagulation of Blood	
3. Any one of the following: 10 marks	
a. Recording of heart beat of Frog	
b. Demonstration of effects of acetylcholine, atropine and epinephrine on heart beat of frog	
4. Determination of ABO and Rh blood group	10
5. Any one of the following: 10 marks	
a. Detection of carbohydrate/lipid/protein in tissue sample	
b. Separation of amino acid by paper chromatography	
c. Colorimetric estimation of Protein/Amino acid	
6. Section cutting and stretching of ribbon from the paraffin block supplied for histology	5
7. Dissection of an endocrine gland	4
8. Identification and comment on slides, 3 each of Endocrinology Histology and Embryology	(2x9)=18
9. Record Books	8
10. Submission of histology (microtomy) slides (10 slides)	5
11. Viva Voce	10

ELECTIVE ZOOLOGY (SEMESTER-VI)	
ZOO-611: Animal Physiology, Histology, Developmental Biology &	75 marks
Biological chemistry	100 lecturers

Unit 1. Animal Physiology **30 lectures** **20 marks**

Nutritional requirements, Digestion and absorption of proteins, carbohydrates and lipids, Vitamins and minerals. Composition and function of blood and lymph, blood group, Rh factor, coagulation of blood, transport of oxygen and carbon dioxide. Physiology of urine formation, Osmoregulation. Ultrastructure of muscle and mechanism of muscle contraction; Stress physiology; Nerve impulse transmission; Reflex action; Neurotransmitters; Structure and function of eye and ear.

Unit 2: Endocrine glands **15 lectures** **15 marks**

Endocrine glands: Structure of pituitary, thyroid, adrenal, pancreas, gonads. Hormones secreted by the glands and their functions. Mechanism of hormone action.

Unit 3: Histology **15 lectures** **10 marks**

Microscopic anatomy of the following organs of frog/toad and mammals: Skin, stomach, intestine, pancreas, liver, lungs, kidney, spinal cord, arteries, veins, testis and ovary.

Unit 4: Developmental Biology **25 lectures** **15 marks**

Gametogenesis: spermatogenesis and oogenesis; Fertilization, in-vitro fertilization; parthenogenesis. Types of eggs; cleavage pattern in animals; Blastulation and Gastrulation, development of three germinal layers in animals, frog and chick; organizer concept, placenta and types. Organogenesis: Central Nervous System, heart, kidney. Study of stem cells.

Unit 5: Biological Chemistry **15 lectures** **15 marks**

Scope and its importance. Chemistry of carbohydrates, proteins, lipids and nucleic acids. Enzymes: nature, classification and functions. Co-enzymes and prosthetic group. Mechanism of enzyme action. Glycogenolysis and glycogenesis. Urea cycle.

RECOMMENDED BOOKS

Ganong, W.F. *Medical Physiology*. McGraw-Hill Publ., N. Delhi

Guyton, A.C. & Hall, J.E. *Textbook of Medical Physiology*. 9th Edn., Elsevier, a division of
Reed Elsevier India Pvt., Ltd.

Keele, C., Neil, E. & Joels, N. *Samson Wright's Applied Physiology*. Oxford University
Press, Bombay, Calcutta, Madras.

Prosser, C.L. & Brown, F.A. *Comparative Animal Physiology*. W.B. Saunders Co Philadelphia,
Toppan Co. Tokyo, Japan.

Schil-Nelson, K. *Animal Physiology, Adaptation and Environment*. Cambridge University Press.

Turner, C.L. *General Endocrinology*. W.B. Saunders, Toppan Co. Ltd., Tokyo, Japan.

Balinsky, B.I. *Introduction to Embryology*. Saunders College Publishers, Philadelphia.

Jayaraman, J. 1981. *Laboratory Manual in Biochemistry*. New Age International Publishers, ,
New Delhi-II 0002.

Murray, R.K., Granner, D.K., Mayer, P.A. & Rodwell, V.W. *Harper's Biochemistry*. McGraw-
Hill Publ.

<p style="text-align: center;">ELECTIVE ZOOLOGY (SEMESTER-VI) ZOO-612P: Practicals on Animal Physiology, Histology, Developmental Biology & Biological chemistry</p>	<p style="text-align: right;">25 marks</p>
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Animal Physiology **7 marks**

Effects of isotonic, hypotonic and hypertonic solutions on erythrocytes
Counting of RBC and WBC using Haemocytometer
Estimation of haemoglobin percentage of a blood sample: amphibian or mammal
Preparation of haemin crystals

Study of permanent slides **6 marks**

Study of permanent slides: sections of pituitary, thyroid, adrenal, pancreas, testis and ovary.
Study of developmental stages of frog (permanent slides, WM): cleavage, gastrula and neurula.
Study of developmental stages of chick (permanent slides, WM): 18,24,36,48,72 hrs of incubation.
Study of permanent slides of sections of blastula and gastrula of chick and neurula and external gills of frog, sections of oesophagus, stomach, duodenum, ileum, pancreas, lung, kidney and skin of mammal and amphibian

Biological Chemistry **4 marks**

General test for identification of carbohydrate, lipid and protein.

Practical Record **3 marks**

Viva Voce **5 marks**



The programme of Under graduate three year course in Education will comprise of the following papers of 100 marks each.

<u>1st Semester</u> : 100 x 1	100
ES 101 : Philosophical and Sociological foundations of Education	
<u>2nd Semester</u> : 100 x 1	100
ES 201 : Educational psychology and Pedagogy	
<u>3rd Semester</u> : 100 x 1	100
ES 301 : Development of Education in India	
<u>4th Semester</u> : 100 x 1	100
ES 401 : Issues and trends in contemporary Indian Education.	
<u>5th Semester</u> : 100 x 3	300
ES (H) 505 : Educational Evaluation and Statistics in Education.	
ES (H) 506 : Educational Management and Educational Technology	
ES (H) 507 : Educational Guidance and Curriculum construction.	
<u>6th Semester</u> : 100 x 3	300
ES (H) 608 : Educational thought and practice.	
ES (H) 609 : Child Psychology	
ES (H) 610 : Experimental Education and Statistics	

Or

Project Work

Total = 1,000 Marks.

1st Semester :

ES: 101 : Philosophical and Sociological Foundations of Education

Unit I : Concept, scope, aims and functions of education.

- Education as a science, social process and human resource development.
- Individual and social aims of education.
- Development of basic knowledge, interest, appreciation leading to self actualization and successful living.
- Development of social, moral and spiritual values.

Unit II : Role of Philosophy in Education

- Science of Education and Philosophy of education.
- Idealism, naturalism, realism and pragmatism – their contribution to present day education.
- Educational thought of Plato, Aristotle, Rousseau, Froebel and Dewey.

Unit III : Freedom and discipline

- the concept of freedom and discipline
- relationship between discipline, liberty and democracy.
- importance of discipline in social life

Unit IV : Sociology and Education

- Nature and scope of educational sociology.
- Need for sociological approach in education.
- Education as an agency of social change.
- School as a social sub-system.
- Mass media as a social means.

Unit V : Social group, culture and Social problems.

- Social groups, social interaction and social stratification.
- Education and Culture.
- Problems of equalization of educational opportunities, education of backward classes, illiteracy and social education, role of the community in solving social problems in the field of education.

SUGGESTED READINGS :

1. Brown, F.J : Educational Sociology, Prentice Hall Inc., New York, 1961.
2. Brubacher J.S.(Ed.) : Modern Philosophy of Education, Chicago Press Chicago, 1956.
3. Curties, S.J.: Philosophy of Education, Univ. Tutorial Press, London, 1968.
4. Mc Iver and page : Society : An Introductory Analysis, McMillan, Madras, 1988.
5. Ross, J.S.: Groundwork of Educational Theory, Oxford University Press, Caneulla, 1972.
6. Ruhela S.P. and Vyas, K.C. : Sociological Foundations of Education in contemporary India, Dhansaptrai and sons, Delhi, 1970.
7. Setharamu, A.S.: Philosophy of Education, Ashish, New Delhi, 1978.
8. Wingo, G.M.: Philosophies of Education, Sterling Publishers, New Delhi, 1975.

2nd Semester

ES: 201: Educational Psychology and Pedagogy

Unit I : Educational Psychology

- Definition of Psychology
- Relationship between Psychology and education.
- Nature, scope and methods of educational psychology
- Application of educational psychology in teaching-learning and understanding individual's behaviour.
- Psychological basis of mental life.
- Social, moral and intellectual development.
- Individual difference and creativity.

Unit II : Personality, its types and traits.

- Definition, meaning and nature
- theories of personality (Freudian).
- Determinants of personality.
- types and traits of personality.

Unit III : Learning : Meaning, nature and factors.

- Learning and maturation.
- Learning and motivation
- Theories of learning (Thorndike and Skinner)
- Insightful learning.

Unit IV : Pedagogy and its implications

- Science of teaching-relationship between teaching and learning.
- Factors affecting teaching-learning process.
- Input and Output variables.
- General principles of teaching, maxims of teaching, fundamentals of teaching.

Unit V : Classroom behavior

- Characteristics of good teacher behaviour.
- Flander's interaction analysis
- Functions of a teacher.
- Traditional, Macro and Micro-teaching.

SUGGESTED READINGS ;

1. Bhatia & Bhatia: The principles and methods of teaching, Doaba House, Delhi, 1966.
2. Bhamagar, S.: Advanced Educational Psychology, R.Lall Book Depot, Meerut, 1995.
3. Ross, J.S.: Groundwork of Educational Psychology, Oxford Univ. press, Calcutta 1972
4. Chauhan, S.S.: Advanced Educational Psychology, Vikas Publishing House, N.D. 1993.
5. Kuppaswamy, B.: Advanced Educational Psychology. D.U Publishers, Delhi-1964.
6. Sharma, R.A.: Fundamentals of Educational Psychology, R.Lall Book Depot, Meerut 1976
7. Skinner, Charles E: educational psychology, Prentice Hall, New Delhi, 1970.
8. Yaokam & Simson : Modern methods and techniques of teaching.

3rd Semester :

ES: 301 : Development of Education in India

Unit I: Education in ancient India

- Vedic education : aims of education, process of education, curriculum and organization.
- Buddhist education : aims of education, curriculum and the four eternal truths.

Unit II : Education in Medieval India

- Types of educational institutions, state patronage in educational endeavour.
- Islamic education: its salient features, objectives and curriculum.

Unit III : Education in British India

-Indigeneous education in India at the beginning of the 18th century-The Charter Act 1813, Macauley's minute 1835, Wood's dispatch 1854, Report of Hunter Commission 1882, Gokhale's bill for compulsory education, University Education Commission 1902, Calcutta University Education Commission 1917, Hartog Committee Report 1929.

Unit IV: Development of Indian Education in the Post-independence period.

-Recommendations of University Education Commission 1948-49, Secondary Education Commission 1952-53, Kothari Commission 1964-66, NPE 1986 and POA 1992..

Unit V: Development of Education in Manipur.

-Education in Manipur during the pre and post independence periods. Elementary education, Secondary Education, Higher Education and teacher education.

SUGGESTED READINGS :

1. Altekar, A.S.: Education in ancient India, Nabakishore & Bros, Banaras, 1948.
2. Devi, Jamini, Ch: Education in Manipur, Raipravina Bros & sons, Imphal, 1989.
3. Naik, J.P. (et.al): A student's History of Education in India, Macmillan and Co., New Delhi 1974.
4. Mukherjee, S.N. : History of Education in India, Acharya Book Depot, Baroda, 1975.
5. Govt. of Manipur.: Report of the comprehensive survey of Education in Manipur, NCERT, 1973.
6. Govt. of Manipur. : Report of the Education Commission Report I & II, Imphal, 1992.
7. Tewari, R.P.: Development and Problems of Education in NER, India., Akashi Depot, Shillong, 1978.
8. Govt. of India: Vocationalisation of First Degree Education, UGC, Sept., 1993, Educational consultants India, New Delhi, 1993.

4th Semester

ES 401 : Issues and trends in Contemporary Indian Education.

Unit I : Elementary Education

-Aims and objectives, universalization, girl's education, problems of non-retention, functions of DIETS, NCERT, SCERT, Operation Black Board, District Primary Education programmes and SSA.

Unit II: Secondary Education.

-Aims and objectives of general and vocational secondary education.

-Role of NCERT, SCERT, NUEPA CBSE, Board of Secondary Education and Council of Higher Secondary Education, Manipur.

Unit III : Alternative Schooling

-Elementary, Non-formal, National Adult Education programme, Mass programme of Functional Literacy, National Literacy Mission, Total Literacy campaign, Post-Literacy campaign, Jana shiksha Nilayam.

Unit IV : Continuing Education

-Open Learning system – general and liberal.

-Mass media, communication process.

- Use of software in education.
- UGC programmes for open learning system.

Unit V : Population education, Value education and work experience

- Sex Education.
- Adolescent Education.
- Fundamental life skills.
- Value oriented education.
- Work experience and SUPW
- Environmental education

SUGGESTED READINGS :

1. Dash, B.N.: Principles of Education and Education in Emerging Indian society, Ajanta Prakashan, Delhi 1982.
2. GOI : Environmental Education : A Resource Book for teacher Educators (level 1,2 and 3), CEE, Ahmedabad, 2007.
3. GOI : Report of Secondary Education Commission, 1952-53, Controller of Publications, New Delhi, 1973.
4. GOI : National policy on Education 1986 (Modifications made in 1992), Manager of publications, New Delhi 1986 and 1992.
5. GOI : Programme of Action 1986 and 1992, Manager of publications, New Delhi 1986 and 1992.
6. Rao, V.K.: Population education, APH Publishing Corporation, New Delhi, 2004.
7. Singh, R.P. : Non-formal Education : An Alternative Approach, Sterling Publishers, New Delhi, 1987.
8. Talukdar, B.K. : Adult Education : Concepts and Methods, Bina Library, Gauhati 1993.

5th Semester

ES(H) 505 : Educational Evaluation and Statistics in Education

Unit I : Educational evaluation.

- Meaning and scope of educational measurement
- Need for measurement in Education
- concept of evaluation in Education, relation between measurement and evaluation.

Unit II : Types of evaluation

- Formative and summative evaluation.
- Quantitative and qualitative evaluation.
- Principles and techniques of Continuous and Comprehensive Evaluation.

Unit III: Measuring instruments and their classifications.

- Errors in measurement.
- Types of scales in educational measurement.

- Characteristics of good measuring instruments – reliability, validity and objectivity – methods of determination.
- General principles of test construction and standardization.

Unit IV: Statistics in education

- Meaning, Nature and scope of Educational Statistics.
- Measures of central tendency – their uses and limitations.
- Measures of variability – their uses and limitations.
- Concept of normal distributions and their uses.

Unit V : Types of data and bivariate distribution

- Grouped and ungrouped data
- Graphical presentation of data – Pie-diagram, histogram, polygon, cumulative frequency graph – ogive and their uses.
- Scattergram, correlation, computation of co-efficient of correlation by rank difference, product moment method, interpretation of coefficient of correlations.
- application of computer in data processing.

SUGGESTED READINGS :

1. Agrawal, R.L. and V. Asthana : Educational Measurement and Evaluation, Vinod Pustak Mandir, Agra, 1983.
2. Chakraborty and Chakraborty : Statistics in Educational Psychology and Mental measurement, Book Syndicate, Calcutta, 1978.
3. Ebel, R.L. and Frisbel, D.A. : Essentials of Educational Measurement, Prentice Hall, New Delhi, 1981.
4. Freeman, F.S.: Theory and practice of psychological testing, Oxford & IBM Publishing Company, Calcutta, 1968.
5. Garrett H.E.: Statistics in Psychology and Education, Vikils, Feffer and Simsons, Bombay, 1969.
6. Guilford, J.P.: Fundamental statistics in Psychology and Education, Mc Graw-Hill Book Co., New York, 1956.
7. Lindquist, E.F.: Statistical Analysis in Educational Research, Oxford & IBF Co., Calcutta 1970
8. Thorndike R.L. and Hagel, E : Measurement and Evaluation in Psychology and Education, Willy Eastern, New Delhi, 1970.

ES(H) 506 : Educational Management and Educational Technology

Unit I : Educational Management

- Concept of Educational management, meaning, nature, need and scope.
- Types of educational management – Centralised and decentralized, external and internal, authoritarian, democratic, dynamic and Laissez-faire.

Unit II : financial management and managerial behaviour

- Sources of income, pattern of plan and non-plan expenditure and problems of finance.

- Management of educational finance with reference to state Educational finance.
- Factors affecting managerial behaviour – personal, social cultural, political and institutional

Unit III: Educational planning

- Meaning, need and significance of educational planning.
- Types of educational planning, strategies in educational planning.
- Steps in educational planning – centre, state and district
- Institutional planning and management.

Unit IV : Educational Technology.

- Concept and scope of Educational technology.
- Communication process : theory, concept, nature, process, components.
- types of communication, mass media approach in educational technology.

Unit V : System approach to instruction

- System approach in educational process.
- Institutional system designing : Concept, components, physical and human resources, steps
- Innovations in Educational technology, programmed Learning Material, personalized system in Instruction, Computer Assisted Instruction, simulated teaching and distance teaching.

SUGGESTED READINGS :

1. Allen, Louis : Management and Organisation, McGraw Hill Book Co. New York, 1950.
2. Chauhan, S.S.: A Text-book of programmed Instruction, Sterling publishers, New Delhi, 1982.
3. Koontz, H and O'Donnel, C: Principles of Management, McGraw Hill Book Company, New York, 1979.
4. Mathur, S.S.: Educational Administration, Principles and practices, Krishna Press, Jullunder, 1969.
5. Mukherjee, S.N.: Administration of Education (Theory and Practice), Acharya Book depot, Baroda, 1970.
6. Newman, W.H. et al.: The patterns of management, Prentice Hall of India, New Delhi, 1976.
7. GOI : Report of the CABE Committee on the Decentralised Management of Education, MHRD, New Delhi, 1993.
8. Skinner, B.F.: The technology of Teaching, Appleton Century Crafts, New York, 1967.
9. Sampath et al.: Introduction to Educational Technology, Sterling publishers, New Delhi, 1984.
10. Sharma, R.A.: Advanced Educational Technology, R. Lall Book Depot, Meerut, 1993.

ES(H) 507 : Educational Guidance and Curriculum Construction

Unit I : Educational guidance:

- Meaning, Nature and scope of guidance.

- Need and importance of educational guidance,
- Basic data necessary for educational guidance- abilities, aptitudes, interest, attitudes, educational attainments and personality traits.
- Construction, administration and interpretations of cumulative record cards and individual inventories.

Unit II : Vocational guidance

- Purpose and functions of vocational guidance, relationship between educational and vocational guidance, vocational guidance and work education.
- Job analysis and occupational information services.

Unit III : Concept of Counselling

- Meaning, nature and scope of counseling, different types of counseling.
- Various steps and techniques of counseling.
- Necessary personal and professional qualities of a good Counsellor.
- Role of Counsellor in Secondary schools.
- Relationship between guidance, counseling and teaching.

Unit IV : Curriculum Construction

- Curriculum: concept and nature.
- Traditional and modern concept of curriculum.
- Principles of curriculum construction.
- Sociological and psychological foundations of curriculum.

Unit V : Curriculum development and its process

- Role of the local, state and national level agencies in curriculum development.
- National curriculum framework – a critical study.

SUGGESTED READINGS :

1. Chandra, A : Curriculum Development and Evaluation in Education, 1973.
2. Chauhan, SS. : Principles and techniques of Guidance, Vikas, New Delhi, 1991.
3. GOI, Report of the Secondary Education Commission, 1952-53, Controller of Publications, New Delhi 1973.
4. James, A : Principles of Guidance, Tata McGraw Hill, New Delhi, 1963.
5. Jayaswal, S.R. : Guidance and Counselling , Prakashan Kendra Lucknow 1985.
6. NCTE : Curriculum Framework for quality teacher education, NCTE, New Delhi, 1999.
7. NCERT : National Curriculum Framework, NCERT, New Delhi 2005.
8. Kochhar, S.K. : Educational and vocational guidance in secondary schools, Sterling publishers, New Delhi, 1990.
9. Pasricha, P.: Guidance and Counselling in Indian Education, NCERT, New Delhi, 1976.

6th Semester

ES (H) 608 : Educational Thought and Practices

Unit I : Jean Jacques Rousseau

- His educational ideas, aims of education for the *Emile* and *sophy*.
- Methods of teaching and role of the teacher
- Rousseau's contribution in the field of education.

Unit II : John Dewey

- His philosophy, aims of education, democracy and education.
- Scheme of education and methods of teaching.
- His contributions in the field of education.

Unit III: Rabindranath Tagore

- His philosophy of education and teacher-student relationship.
- Methods of teaching, religious and spiritual education.
- Tagore's Shantiniketan and Vishva Bharati.

Unit IV : Swami Vivekananda

- His educational philosophy, Aims of education and views about the curriculum.
- Methods of teaching and place of the teacher.
- Evaluation of his philosophy of Education.

Unit V : Mahatma Gandhi

- His philosophy of education and aims of education.
- Methods and procedures of education, curriculum and content of education.
- Evaluation of his philosophy of education.

SUGGESTED READINGS

1. Dash, B.N.: Principles of Education and education in Emerging Indian society, Ajanta Prakashan, Delhi, 1982.
2. Dash, R.: Gandhi in 21st century, Sarup and Sons, New Delhi, 2002.
3. Dewey, John : Democracy and Education, McMillan, New York, 1963.
4. Mani, R.S.: Educational Ideals of Gandhi and Tagore, New Book Society of India, New Delhi, 1966.
5. Mithal, H.C. : Foundations of Educational Thought and Practice, Dhanpat Rai and Sons, Delhi, 1978.
6. Richards, G.: Gandhiji's philosophy of Education, Oxford University Press, New Delhi, 2001.
7. Rusk, R.R. : The Doctrines of Great Educators, McMillan & Co., New York, 1957.
8. Safaya, R.N. and Shaida, B.D.: Principles and Techniques of Education, Dhanpat Rai & Sons, Delhi, 1978.

ES(H) 609 : Child Psychology

Unit I : Nature and scope

- The relevance of child development to educational practice.

- Importance of Early Childhood years.
- Modern approaches to Child study.

Unit II : General nature of Growth and development

- Developmental principles, factors affecting development.
- Development during the pre-natal, post-natal, neo-natal stages.
- Characteristics and needs of new born child and his/her early experiences.

Unit III: Development upto Pre-adolescence.

- Physical and motor development.
- speech and language development, perceptual development.
- emotional development, social development and process of socialization.

Unit IV: Development of understanding and intelligence.

- Concept formation, readiness and maturation as related to learning.
- Value of play, types of play, play and child development.
- Individual differences in abilities, interest and their educational implications.

Unit V : Development of self and personality

- Fundamental needs and their satisfaction.
- Role of the family, school, peers.
- Problems of adjustment, normal and abnormal patterns of behavior in different stages.

SUGGESTED READINGS

1. Choube, S.P.: Child Psychology, Lakshman Narayan Agrawal, Agra, 1993.
2. Dinkmeyer, D.C.: Child Development : The Emerging self, Prentice Hall, 1965.
3. Erikson, E.M.: Childhood and society, Norton, New York, 1950.
4. Helen, B. & Denise, B.: The developing child, Pearson Education, Delhi, 2004.
5. Hurlock, E.B. : Child Growth and Development, Tata McGraw Hill, New Delhi, 1992.
6. Hurlock E.B.: Developmental Psychology : A life span Approach, Tata McGraw Hill, New Delhi, 1994.
7. Thomson, G.G.: Child Psychology (Reprint), Surjeet Publications, Delhi, 1981.
8. Yogendrajit, B.: Developmental Psychology, Vinod Pustak Mandir, Agra, 1982.

ES(H) 610 : Experimental Education and Statistics.

FIRST HALF : 50 marks : Experimental work & Test Administration.

Distribution of marks :

Experiments and Test Administration	: 20
Note Book	: 15
Viva-Voce	: 15

List of Experiments :

1. Memory : (a) Immediate memory span
(b) Immediate recall and recognition
2. Learning : (a) Maze/Mirror learning
(b) Part and whole learning
3. Fatigue : (a) Physical Fatigue
(b) Mental Fatigue

List of Tests :

1. General Mental Ability : (a) Verbal Test.
(b) Non-verbal Test
© Performance Test.
2. Personality : (a) Inventory/Checklist
(b) Thematic Apperception Test/Inkblot Test
© Attitude scale/values test.
3. Achievement : Preparation of an achievement test of 50 items of five types on a school subject. This will be an exercise in test construction and standardization.

SECOND HALF : 50 Marks. Test Development and statistical indices.

Distribution of marks.:

Test construction & standardization :	20
Note Book :	15
Viva-Voce	15

Test Development :

1. Item preparation, Item revision and Item analysis – Index of difficulty, Index of discrimination.
2. Test reliability and its determination.
3. Test validity and its determination.

Statistical Measures and Calculation :

1. Norms and their calculation/computation.
2. Sociometry and its application/use in classroom management.
3. Determination of association among two variable-Rank-difference and product-moment coefficients of correlation and their calculation and interpretation.

Note:

1. Students should be prompted to prepare their own test materials/tools of assessment appraisal and evaluation as far as possible.
2. The record of experiments/practical work/statistical exercises should be maintained in a practical Note-Book prepared by each student which may be regularly/duly inspected and scanned by the concerned teacher throughout the academic session.
3. The final year – end examination will be conducted by an external examiner in collaboration with the internal examiner, a senior qualified teacher of the subject, Education or Psychology.

SUGGESTED READDINGS ;

1. Agrawal, Y.P.: Statistical methods : Concept, applications and computerization, Sterling Publishers, New Delhi, 1990.
2. Chakraborty and Chakraborty, : Statistics in Educational Psychology and mental measurement, Book Syndicate, Calcutta, 1978.
3. Kuppuswamy. B. Elementary experiments in Psychology, Wesley press, Mysore, 1954.
4. Jalota, S. Students Manual of experimental Psychology, Asia Publication, Bombay 1976.
5. Mohsin, S.M.: Experiments in Psychology, Orient Longman, Bombay, 1976.
6. Garrett, H.E.: Statistics in Psychology & Education, Vakils feffer and simson, Bombay, 69.
7. Guilford, J.P. Fundamental Statistics in Psychology and Education, McGraw Hill, New York 1956.
8. Woodworth R.S. and Schlosberg H : Experimental psychology Oxford and IBH publishers, Calcutta, 1971.

OR

PROJECT WORK

ES(H) 610

Distribution of marks :

Project Report	75 marks.
Viva-Voce Test	25 marks.

Each student offering project work will select a topic under the guidance of the assigned teacher who will act as his project supervisor. The selected topic will be related to one of the areas, papers or units prescribed in Education Honours course. It will cover the following steps :

- (a) Selection and definition of the problem
- (b) Review of the related literature
- © Collection, Analysis and Interpretation of Data
- (d) Findings and conclusions
- (e) Implication for Educational theory and Practice.

The project report will be submitted in typed form (two copies) on dissertation size (A4) paper and shall have not less than 50 pages. In addition, it shall have a brief summary (three to five pages) and a short bibliography. The project work will be an exercise in acquaintance and awareness with the elements of research methodology and statistical analysis.

The project report will be prepared under the guidance of a senior teacher and will be evaluated by a Board of Examiners consisting of (a) Head of the Department or Principal of the college, (b) the Supervisor and (c) at least one external examiner, likewise, the viva-voce will be comprehensive in nature and will be conducted by two examiners one internal (supervisor of the candidate) and the other external (expert in Education discipline).

As a guiding rule the external examiner who evaluates the project report will be associated with the conduct of the viva-voce examination. The size of sample studied will be a randomly selected group of 50 to 100 students or case studies of at least five educational institutions or case studies of 10 to 15 deviant/exceptional/disabled individuals. Studies of the following may be encouraged in project work.

- (a) Truant, Mentally retarded, Gifted, Creative, Problem, Slow learning, Drop-out etc.
- (b) Senior, popular, National awardee successful teachers.
- © Successful, Innovative, Experimental, Educational Institutions or organizations.
- (d) New, Imaginative educational programmes, Policies Projects.
- (e) Comparative studies of two educational philosophers, thinkers, social activists or such studies of two states, countries, cultures, village communities.

Note :

The students shall submit the project work for evaluation at least one month before the commencement of theory examination and the viva-voce test shall be conducted within one month of the last theory paper so that the declaration of examination result is not delayed

SUGGESTED READINGS :

1. Bhargava Mahesh : Essentials of Project Report writing, National Psychological Corporation, Agra, 1990.
2. Choudhury, R.R. : Challenges of Women's participation in Higher Education : Importance of Hostel Accommodation, project report, NIEPA, New Delhi 1994.
3. Chandra, A. & Saxena, T.P. : Style manual: writing Theses, dissertation and papers in Social studies, Metropolitan Book Co., New Delhi, 1979.
4. Fried Booth, Diana L : Project Work Oxford University Press, U.K. 1988.
5. IGNOU : Project Work (Diploma in Higher Education), School of Education, IGNOU, New Delhi, 1992.
6. Koefod, Poul, E : The writing requirement for Graduate degrees, Prentice Hall., Eaglewood Cliffs, N.J., 1964.
7. NCERT : Sixth survey of Educational Research (1988-92), NCERT, New Delhi, 2006.
8. Tuck man, Bruce, W. : Conducting Educational Research, Harcourt Brace Jovanovich Publishers, New York, 1988.

New

MANIPUR UNIVERSITY
CANCHIPUR:IMPHAL

Syllabus for Education
(Fifth Semester)

5th Semester

ES 501 :Educational Evaluation and Statistics

Unit I : Educational Evaluations

- Concepts of measurement and Evaluation
- Need for educational measurement and Evaluation
- Relationship between measurement and evaluation

Unit II: Types of Evaluation

- Placement evaluation
- Diagnostic evaluation
- Continuous and comprehensive Evaluation
- Formative and Summative Evaluation

Unit III:Measuring instruments and their classification

- Types of scales in Educational measurement
- General principles of test construction and standardization
- Methods of determining reliability and validity

Unit IV: Statistics in Education

- Nature and scope of Educational Statistics
- Measures of central tendency – mean, median and mode
- Measures of variability—Range, Quantile deviation (Q), Average Deviation (AD), Standard Deviation (SD)

Unit v : Types of data and variate distribution

- Group and ungrouped data
- Graphic representation of data – polygon, histogram and ogive.
- Computation of co-efficient of correlation by Rank difference method.

Suggested Readings

1. Aggrawal, R.L. and V. Ashana : Educational Measurement and evaluation, Vinod pustak Mandirm Agra, 1983.

2. Chakraborty and Chakraborty : Statistics in Educational Ppsychology and Mental measurement, Book Syndicate, Calcutta, 1978.

3. Ebel, R.L. and Frisbel D.A. : Essentials of Educational Measurement, Prentice Hall, New Delhi, 1981.

4. Freeman, F.S. : Theory and Practice of psychological testing, Oxford & IBM publishing company, Calcutta, 1968.

5. Garrett H.E. : Statistics in Psychology and Educatio, Vikils, Feffet and Simsons, Bombay, 1969.

6. Guilford, J.P. : Fundamental Statistics in Psychology and Education, McGraw Hill Book Co., New York, 1956.

7. Lindquist F.F. Statistical Analysis in Educational Research, Oxford & IBF Co., Calcutta, 1970.

8. Thorndike R.L. and Hagel, E. : Measurement and Evaluation in Psychology and Education, Willy Eastern, New Delhi, 1970.

MANIPUR UNIVERSITY
CANCHIPUR:IMPHAL

Syllabus for Education
(Sixth Semester)

6th Semester :

ES 601 : Educational Guidance and Curriculum Construction

Unit I: Educational guidance

- Concept, Nature and scope of guidance.
- Need and importance of educational guidance
- Basic data necessary for educational guidance – abilities, aptitudes, interest and attitudes.

Unit II; vocational guidance

- Purpose and functions of vocational guidance, relationship between educational and vocational guidance and work education.
- Job analysis and occupational information services.

Unit III: Concept of counseling

- Nature and scope of counseling, types of counseling.
- Steps and Techniques of counseling.
- Personal and Professional qualities of a good counselor.
- Relationship between guidance and counseling.

Unit IV: Curriculum construction

- Nature of curriculum
- Traditional and modern concepts of curriculum
- Principles of curriculum construction

Unit V : Curriculum development and its process

- Role of the local, state and national level agencies in curriculum development.
- National curriculum frameworks.

Suggested Readings :

- 1.Chandra, A.: Curriculum Development and Evaluation in Education, 1973
- 2.Chauhan, SS: Principles and techniques of guidance Vikas, New Delhi, 1991.
- 3.GOI, Report of the Secondary Education Commission, 1952-53, Controller of Publications, New Delhi, 1973.
- 4.James, A: Principles of Guidance, Tata McGraw Hill, New Delhi, 1963.

5.Jayaswal, S.R.: Guidance and Counselling, Prakashan Kendra, Lucknow, 1985.

6.NCTE: Curriculum Framework for quality teacher education, NCTE, New Delhi, 1999.

7.NCERT : National Curriculum Frameworkm NCERT, New Delhi, 2005.

8.Kochhar, S.K.: Educational and Vocational Guidance in secondary Schools, Sterling Publisher, New Delhi, 1990.

9.Parischa,P.: guidance and Counselling in Indian Education, NCERT, New Delhi, 1976.

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MANIPUR UNIVERSITY
CANCHIPUR: IMPHAL

Syllabus for BA (General) Education (Semester System)

ES 503: Educational Evaluation and Statistics	Marks: 100
Unit I: Educational Evaluation	
-Concepts of measurement and Evaluation	
-Need for educational measurement and Evaluation	20
-Relationship between measurement and evaluation.	
Unit II: Types of Evaluation	
-Placement evaluation	
-Diagnostic evaluation	20
-Continuous and comprehensive Evaluation	
-Formative and Summative Evaluation.	
Unit III: Measuring instruments and their classification	
-Types of scales in Educational measurement	20
-General principles of test construction and standardization	
-Methods of determining reliability, validity and objectivity.	
Unit IV: Statistics in Education	
-Nature and scope of Educational Statistics	20
-Measures of central tendency – mean, median and mode.	
-Measures of variability – Range, Quantile deviation (Q), average Deviation (AD), Standard Deviation (SD)	
Unit V: Types of data and variate distribution.	
-Group and ungrouped data.	
-Graphic representation of data– polygon, histogram and cumulative Frequency graph.	20
-Correlation and computation of co-efficient of correlation by Rank difference method.	

Suggested Readings

- 1 Aggrawal, R.L. and V.Asthana: Educational Measurement and evaluation Vinod Pustak Mandir, Agra, 1983.
2. Chakraborty and Chakraborty: Statistics in Educational Psychology and Mental measurement, Book Syndicate Calcutta, 1978.
- 3 Ebel, R.L. and Frisbel, D.A.: Essentials of Educational Measurement, Prentice Hall, New Delhi, 1981.
- 4 Freeman F.S.: Theory and practice of psychological testing, Oxford & IBM publishing Company, Calcutta, 1968.
5. Garrett H.E.: Statistics in psychology and education, Vikils, Feffer and Simsons, Bombay, 1969.
6. Guilford, J.P.: Fundamental statistics in psychology and education, McGraw Hill Book Co., New York, 1956.
- 7 Lindquist, F.F.: Statistical Analysis of Educational Research, Oxford & IBF Co., Calcutta, 1970.
8. Thorndike R.L. and Hagel, E.: Measurement and Evaluation in Psychology and Education, Willy Eastem, New Delhi, 1970.

Manipur University

Canchipur: Imphal

Syllabus for Bachelor of Economics (Semester System)

Semester 1: Indian Economic Problems

Semester 2: Microeconomics I

Semester 3: Microeconomics II

Semester 4: Macroeconomics

Semester 5: Public Finance

Political Economy of Development

Quantitative Methods for Economic Analysis

Semester 6: Development Economics

Environmental economics

International Economics

Indian Economic Problems

Unit – I

Basic features of and the nature of Indian Economy- (i) Basic features of the Indian Economy as a developing economy; (ii) Indian economy as a mixed economy and (iii) Changing nature of the Indian economy from “controlled economy” to a “liberalised economy” ; National income: trends in the growth of India’s national income and per capita income, trends in the composition and sectoral distribution of national income.

20 Marks
15-Lectures

Unit – II

Natural Resources, Economic development and Population: India’s natural resources, economic development and environmental degradation; interrelationships and issues; Population growth and economic development. Basic features of India’s population; issues and interrelationships.

20 Marks
15-Lectures

Unit – III

Agricultural development: Agricultural development since independence; Green Revolution; Land reforms: Meaning, objectives, and significance – food security and policy measures.

20 Marks
15- Lectures

Unit – IV

Industrialization – Industrial Policies of India since independence (1956 & 1991) industrial growth and pattern of Industrialization; Problems of large-scale industries and policy measures; Micro, small and Medium enterprises (MSMEs): Concept or definitions of MSME; their role in Indian Economy Public Sector Reform, privatisation and disinvestments.

20 Marks
15- Lectures

Unit – V

Planning and development Issues: Trends in India’s foreign trade since independence: Trade Policy – changing features and critical evaluation of India’s foreign trade policy; Planning in India: Objectives, priorities and strategies: Problems of Unemployment and poverty: estimates of poverty – Employment generation and poverty alleviation programmes; economic reforms: Structural transformation in Indian economy.

20 Marks
15- Lectures

Readings:

1. R. datt and K.P.M. Sundharam: Indian Economy, Latest Edition (S. Chand & Co.)
2. A.N. Agrawal: Indian Economy, Latest Edition (New Age International Publishers)
3. M.L. Dantwalla et al: The Dilemmas of Growth: the Indian Experience (Sage Publication)
4. C.H. Hanumantha Rao & Hans Linneman (ed): Economic Reforms and Poverty Alleviation in India (Sage Publication)
5. T.C. Kurein: The Economy: An Interpretative Introduction (Sage Publication)
6. N.V. Nadkarni, A.S. Seetha Ramu & Abdul Aziz: India the emerging challenges (Sage Publications)
7. V.M. Dandekar: Indian Economy 1947-2, Vol.I: Agriculture Vol.II, Population, Poverty & Employment (Sage Publication)
8. Govt. of India: Economic Survey; various resources
9. Planning Commission, Government of India: Five year Plans (including the Eleventh Five Year Plan)
10. Angus Deaton and Jean Dreze (2002): "Poverty and Inequality in India: A Reexamination", EPW, September 7, 2002.
11. Jean Dreze and Amartya Sen (2002): India Development and Participation, OUP

Microeconomics I

Unit – I

Why study Microeconomics – The themes of microeconomics: trade offs, prices and markets, equilibrium, theories and models, positive and normative analysis – definition of a market, competitive and non-competitive markets – the demand curve and the supply curve- the market mechanism – changes in market equilibrium.

20 Marks
15-Lectures

Unit –II

Theory of Demand: the cardinal utility theory, the indifference curves theory, the revealed preference hypothesis, the consumer's surplus – the derivation of the market demand, elasticities of demand-market demand, total revenue and marginal revenue.

20 Marks
15- Lectures

Unit – III

Theory of the Production: the production function for a single product, laws of production, technological progress and the production function – Equilibrium of the firm; maximization of output subject to cost constraint, minimization of cost for a given level of output – Optimal expansion plan in the short and long run production function of a multi product firm – the traditional and modern theory of cost, concept of economies of scale.

20 Marks
15-Lectures

Unit IV

Perfect Competition: assumptions, short and long run equilibrium of the firm and industry; monopoly: short run and long run equilibrium of the monopolist.

20 Marks
15-Lectures

Unit –V

Price Discrimination: assumptions and effects of price discrimination, price discrimination and elasticity of demand; Equilibrium of the firm under monopolistic competition, product differentiation and the demand curve: Oligopoly: Cournot's Duopoly Model, the Kinked – demand model.

20 marks
15 – Lectures

Readings:

1. A. Koutsoyiannis: Modern Micro-economics, Macmillan
2. A.W. Stonier and Douglas C. Hague: A Textbook of economic theory
3. Robert S. Pindyck, D.L. Rubinfeld & P.L. Mehta: Microeconomics, Pearson , latest edition
4. Hal R. Varian (1993): Intermediate Microeconomics, a Modern Approach, 3rd edition, Affiliated East-west Press.

Microeconomics II

Unit –I

Price and employment of factor inputs: competitive factor markets – demand for a factor input when only one variable/several variables is/are variable, the supply of inputs to a firm; Equilibrium in competitive factor market; factor markets with monopsony power; factor markets with monopoly power.

20 Marks
15-Lectures

Unit – II

The Walrasian system- the two factor, two commodity, two consumer General Equilibrium system (2X2X2 model), static properties of a General equilibrium state - GE and allocation of resources, prices of commodities and factors, factor ownership and income distribution.

20 Marks
15-Lectures

Unit – III

Criteria of welfare: the Pareto optimality criterion, the Kaldor Hicks Compensation Criterion, the Bergson Criterion, ‘Social welfare function’ ; Welfare Maximization and perfect competition.

20 Marks
15- Lectures

Unit –IV

Externalities and public goods: negative and positive externalities, ways of correcting market failure; externalities and property rights, common property resources, public goods and efficiency, private preference for public goods.

20 Marks
15-Lectures

Unit –V

Market with asymmetric information: limitations of asymmetric information, quality uncertainty and market for lemons-market signalling, a model of job market signalling, guarantees and warranties; Moral hazard, The Principal Agent Problem in private and public enterprises.

20 Marks
15-Lectures

Readings:

1. A. Koutsoyiannis: Modern Micro-economics, Macmillan
2. A.W. Stonier and Douglas C. Hague: A Textbook of economic theory
3. Robert S. Pindyck, D.L. Rubinfeld & P.L. Mehta: Microeconomics, Pearson , latest edition
4. Hal R. Varian (1993): Intermediate Microeconomics, a Modern Approach, 3rd edition, Affiliated East-west Press.

Macroeconomics

Unit – I

Theories of Income & Employment: the Basic Classical Model; say's Law of Markets- its relevance in a modern economy- Labour market equilibrium, saving, investment, and the rate of interest – the quantity theory of money – relationship between money wages, prices and real wages and price flexibility, The classical dichotomy and neutrality of money.

20 marks
15-Lectures

Unit –II

Theories of Income & employment: the Basic Keynesian Model: determination of the level of income in the short run; Aggregate demand: consumption function, multiplier process; the investment function, the marginal efficiency of capital, liquidity preference and the rate of interest, the acceleration principle.

20 Marks
15-Lectures

Unit – III

The neo-classical synthesis: derivation of the IS-LM mo curves, general equilibrium and integration in the product, labour and money markets; aggregate supply, fiscal and monetary policy effects.

20 Marks
15-Lectures

Unit –IV

Inflation: theories of cost push and demand pull Inflation effects of inflation- Inflation control measures; Phillip's curve: Trade off between inflation and unemployment, Money: concept of money supply, alternative measures of money supply in India and their components – High powered money: meaning and uses.

20 Marks
15- Lectures

Unit –V

Introduction to growth theory ; the stylized facts of growth; one sector growth model and dynamics of growth, Harrod-Domar growth model, Solow Model.

20 Marks
15- Lectures

Readings:

1. G. Ackley: Macroeconomics – Theory and Policy 9macmillan)
2. S.B. Gupta: Monetary economics (S. Chand & Co.)
3. E. Shapiro (1991): Macroeconomic analysis, Galgotia Publications
4. Rudiger Dornbusch, Stanley fischer and Richard startz (1998):
Macroeconomics, Irwin McGraw-Hill
5. N. Gregory Mankiw: Macroeconomics, Worth Publishers

Reference Books

1. M.R. Edgmand: Macroeconomics – Theory and Policy (Prentice Hall)
2. M.G. Mueller(ed): Readings in Macroeconomics (Surjit Publication)
3. C. John: Introduction to economic Growth, W.W. Norton & company

Public Finance

Unit –I

Nature and scope of Public Finance – the principle of maximum social advantage, Fiscal functions o in the developing economy – provision of social groups.

20 marks
15-Lectures

Unit –II

Techniques of Budgetting, principles of budgeting – Government Budgetting: Budgetary procedure preparation of the budget, Revenue accounts, Public account, Performance budgeting – meaning and need of performance budgeting

20 marks
15- Lectures

Unit –III

Principle of Taxation: Equity horizontal and vertical equity, incidence of taxes, efficiency criterion – tax evasion, taxable capacity – absolute and relative taxable capacity, factors determining taxable capacity, limit of taxable capacity; features of VAT, GST and DTC.

20 Marks
15-Lectures

Unit –IV

Public Expenditure: Factors affecting public expenditure, Wagner’s Law of and Peacock Wiseman hypothesis, effects of public expenditure on production, distribution and economic stability.

20 Marks
15-lectures

Unit –V

Fiscal federalism, Centre state financial relations: Constitutional provision in India, the formulae for devolution of shareable taxes, grants—in-aids by the latest Finance Commission, Fiscal Policy in India, Fiscal Responsibility and Budgetary Management (FRBM) act and implications, Local Bodies and their financial responsibilities.

20 Marks
15-Lectures

Readings:

1. H.L. Bhatia: Public Finance, Vikas Publishing House
2. R.A. Musgrave & P.B. Musgrave: Public Finance in Theory and Practice (Asian Student Edition)

Reference Books:

1. R. Jha (1987): Modern Theory of Public Finance, Wiley Eastern Ltd.
2. Raja Chelliah: Fiscal Policy in under developed countries, George allen and Union
3. M.J.K. Thavaraj: Fiscal Policy & Financial Administration in India (S. Chand & Co.)
4. Hemlata Rao: Central-State Financial Relations
5. Govt. of India: Report of the Latest Financial Commission

Political Economy of Development

Unit – I

The scope of political economy: Political economy: Meaning: Changing nature of political economy; classical political economy, Marxian political economy; An overview; Marxian concept of mode of production and its uses in defining systems, correlation between production, distribution, exchange and consumption; The method of political economy.

20 Marks
15-Lectures

Unit – II

Evolution of Society, State and Economy; Emergence of socio-economic formations and the state, feudalism as a mode of production; the concept of primitive accumulation of capital, the role of foreign trade, the relationship between merchant capital and industrial revolution.

20 Marks
15-Lectures

Unit – III

Characteristics of capitalism as a mode of production: the accumulation process and technical change, the growth of monopoly capital: the role of multi-national corporations: long run development under capitalism.

20 Marks
15-Lectures

Unit – IV

Global Capitalist System: An outline of the main features of NPE: New: New Political Economy and economic development: Analytical approaches: the role of the state: Political economy of development and underdevelopment. Globalisation and structural adjustment programmes: Global capital mobility, Markets, Democracy, Governance and Public interests.

20 Marks
15-Lectures

Unit – V

Political economy of Indian economic development: Feudalism in Pre-Independence period; Post-Independence India: Agrarian relationship in Post-Independence period; Political economy of Indian agriculture; Main aspects and policy measures; Post liberalisation political economy- globalisation, structural adjustment programmes and trade reforms.

20 Marks
15-Lectures

Readings:

1. Maurice Dobb: Studies in Development of Capitalism; Routledge & Kegan Paul)
2. Paul Baran: Political Economy of Growth (Monthly Review Press, New York)
3. Dhiresh Bhattacharya: The Political Economy of Development (Academic Press)
4. Paul Baran and M.P. Sweezy: Monopoly Capital, Penguin
5. Subroto Roy and William E. James (ed): Foundations of India's Political Economy
6. B.N. Ghosh: Political Economy: a Marxist approach (Macmillan), 1990
7. Ranjit Sau: Economy, class and society (Longman), 1986
8. Biplab Dasgupta: Structural Adjustment, Global Trade and the New Political (Vistar Publications, New Delhi), 1998
9. Barbara Hariss – White: India's Market Society: Three Essays in Political Economy, Three Essays Collective , New Delhi
10. Coin Leys (2008): Market Driven Politics: Neoliberal Democracy and the Public Interest, London, Verso
11. Pranab Bardhan (2003): Poverty, Agrarian Structure and Political Economy in India: Selected Essays, OUP

Quantitative Methods for Economic Analysis

Unit – I

Importance of Statistics and Mathematics in economics - Measures of central tendency and dispersion – mathematical versus nonmathematical Economics – Ingredients of a mathematical model : variables, constants and parameters, equations and identities ; Functions and types of functions - constant, polynomial and Rational functions ; Matrix algebra: addition and multiplication – determinant, inverse of a matrix, Cramer's rule for the solution of simultaneous equations.

20 Marks

15 Lectures

Unit – II

The derivative of a function, Techniques of differentiation ; sums, products and quotients of functions; composite functions and chain rule. Partial differentiation; Partial derivatives in economics. Homogeneous and homothetic functions. Elasticity of substitution. Maxima and minima, saddle points, unconstrained optimization, necessary and sufficient conditions for local optima. Constrained optimization (equality constraints). The method of Lagrange multipliers. Interpretation of the Lagrange multiplier-Economic examples.

20 Marks

15 Lectures

Unit – III

Concepts of Sample space and events, probability of an event; addition and multiplication theorems; conditional probability and independence of event- Bayes rule; Concept of a random variable; Probability distribution, Joint Marginal and Conditional Distributions, Independence of random variables; mean and variance of a random variable; Binomial and Normal distribution; Law of large numbers and Central Limit theorem.

20 Marks

15 Lectures

Unit – IV

Correlation analysis, Pearsonian Coefficient of correlation, rank correlation. Correlation vs causality, Simple linear regression; Interpretation of regression parameters; Method of Least squares, Derivation of the normal equation; Economic examples. Time Series Analysis: Components of a time series; finding a linear trend using least square method.

20 Marks

15-Lectures

Unit – V

Concept of an index number, Uses of index numbers, Laspeyres's, Paasche's and Fisher's Index Numbers; Time Reversal, Factor reversal and circular tests; Chain base index; Problems in the Construction of an index number; splicing; base shifting and use of index number for deflating other series; Wholesale price index, Consumer price index and Agricultural production index, measuring inflation rate.

20 Marks

15-Lectures

Readings:

1. Knut Sydsaeter and Peter J. Hammond (2002): Mathematics for Economic Analysis, Pearson Educational Asia: Delhi (Reprint of 1st 1995 edition)
2. Alpha C. Chiang (1984): Fundamental Methods of Mathematical Economics, McGraw Hill (3rd edition).
3. A.L. Nagar, & R.K. Das: Basic Statistics, Oxford University Press
4. M.R. Spiegel (2nd edition): Theory and Problems of Statistics, Schaum Series.

Development Economics

Unit-I

Economic Growth and Development: Concepts of Economic Growth and Development and their measurement: Theories of growth: Classical Approach: Adam Smith, Marx and Schumpeter – Neo classical approach; Robinson, Solow, Kaldor and Harrod-Domar, Factors of growth: natural resources and population.

20 Marks
15-Lectures

Unit-II

Strategies of Development: Low-level equilibrium trap and big push; Balanced Growth and Unbalanced Growth; Choice of technique-basic issues.

20 Marks
15-Lectures

Unit-III

Policy Issues: Fiscal Policy and Economic Development – Monetary Policy in Economic development, Deficit Financing – need, significance and limitations; Price Policy and economic Development; Capital formation and development.

20 Marks
15-Lectures

Unit-IV

Technology Transfer and Trade Policy: Needs, significance and problems of Technology transfers. Trade Policy-export promotion and the import substitution, recent changes in trade policy. Developing countries and WTO. Foreign capital and developing countries.

20 Marks
15-Lectures

Unit-V

State, Market and Planning: Role of the State and the market. Planning in a developing economy. Planning regulation and market. Indicative Planning , Decentralised planning. Inclusive growth and Development.

20 Marks
15-Lectures

Readings:

1. M.P. Todaro & S.C. Smith: Economic Development; Pearson Education Asia
2. M.P. Todaro: Economic Development in the Third World (Longman)
3. Debraj Ray (1998): Development Economics (OUP)
4. Yujiro Hayami: Development Economics from the Poverty to the Wealth of Nations; Oxford University Press
5. Rodrick Dani (2000): Institutions for High-Quality Growth, NBER Working Paper, No. W7540
6. Planning Commission: Eleventh Five Year Plan Vol. 1

Environmental Economics

Unit –I

What is Environmental and Natural Resource economics – Origins of environmental economics- Independence between economy and the environment – Issues in environmental economics – The Laws of Thermodynamics and environmental economics.

20 Marks
15-Lectures

Unit-II

Environmental Problems and Policy Solutions: Climate Change, Standards via command and control, criteria for approaches – economic and noneconomic, choosing policy instruments.

20 Marks
15-Lectures

Unit-III

Market failure with environmental consequences – Pollution Externalities – Review of basics – Public goods – common property resources and the issue of property rights – Economic Solutions to Market failures.

20 Marks
15-Lectures

Unit-IV

Renewable resource extraction under monopoly and perfect competition; Non-renewable resource extraction under monopoly and perfect competition.

20 Marks
15-Lectures

Unit-V

Environmental Kuznets Curve and Economics of Sustainable Development.

20 Marks
15-Lectures

Readings:

1. Kolstad, Charles D. (2006): Environmental Economics, Oxford University Press (India Edition)
2. Pearce, David and Barbier, Edward: Blueprint for a Sustainable Economy; Earthscan, 2000
3. Stern N. 2006, Stern Review: The Economics of Climate Change, Report to the Prime Minister and Chancellor, UK HM Treasury, London 2006
4. Baumgartner, Stefan and Martin Quass: "What is sustainability economics?" Ecological Economics, 2010 (Manipur University's Department of Economics would make this article and some more available to the colleges).

International Economics

Unit – I

Nature and Significance of International Economics, need for a separate theory of international trade, classical theory of trade: Adam Smith's theory of absolute advantage, Ricardo's theory of comparative advantage and its formulation in terms of opportunity costs.

20 Marks
15-Lectures

Unit – II

Modern Theory of Trade: Heckcher-Ohlin theorem, Leontief Paradox, Factor price equalization.

20 Marks
15-Lectures

Unit – III

Balance of Payments: Balance of Payments Accounting – Accommodating and Autonomous items and their relevance to Balance of Payments equilibrium and disequilibrium: Exchange rate determination under Mint Parity theory and purchasing power parity theory.

20 Marks
15-Lectures

Unit – IV

Trade Policies: Free Trade vs. Protection, Tariffs, optimum tariff, Quotas, Theory of customs union, Globalization.

20 Marks
15-Lectures

Unit – V

IMF – Objectives and functions and achievements; GATT/ World Trade Organisation and developing countries.

20 Marks
15-Lectures

Readings:

1. Bo-Sodersten & Geoffrey Reed: International Economics (3rd edn. Macmillan)
2. Paul R. Krugman & Maurice Obstfield (2009): International Economics Theory and Policy (latest edition) Pearson.

Introduction to Quantitative Methods for Economic Analysis

Unit-I

Importance of statistics and mathematics in economics; Ingredients of a mathematical model: variables, constraints, and parameters, equations and identities; Matrix algebra: addition and multiplication, determinant, inverse of a matrix.

20 Marks

15-Lectures

Unit-II

Function and derivative of a function; Techniques of differentiation: sum, product and quotient rule; partial differentiation; Applications in demand, production and elasticity analysis.

20 Marks

15-Lectures

Unit-III

Concepts of sample space and events, probability of an event; Addition and multiplication theorems; Conditional probability; Concept of a random variable; Probability distribution – Normal distribution.

20 Marks

15-Lectures

Unit- IV

Correlation and regression analysis, Pearsonian Coefficient of correlation, Rank correlation; Correlation vs. causality; Simple linear regression; Interpretation of regression parameters; Method of Least Squares.

20 Marks

15-Lectures

Unit- V

Index Numbers, uses of index numbers; Laspeyer's, Paasche's and Fisher's Index numbers; Time Reversal, Factor Reversal and Circular tests; Problems in the construction of an index number; Concepts of wholesale price index and consumer price index.

20 Marks

15-Lectures

Readings:

1. Chiang Alpha C. and Kevin Wainwright (2005). Fundamental Methods of Mathematical Economics. Tata Mc-graw Hill.
2. Nagar, A.L. and R.K. Das (1993). Basic statistics. Oxford University Press.
3. Spiegel, M.R. and Larry J. Stephens (1998). Theory and Problems of Statistics. Schaum Series.

ISSUES IN ECONOMIC DEVELOPMENT

Unit-I

Political economy meaning, nature of political economy, Socialist, Capitalism and Mixed economies.

20 Marks
15-Lectures

Unit-II

Economies of growth and development, Strategies of development Balanced and Unbalanced growth.

20 Marks
15-Lectures

Unit -III

Nature and significance of public economics; Characteristics of public goods; Budgets; Types of taxes.

20 Marks
15-Lectures

Unit-IV

Introduction to environment economics; Interdependence between environment and economy; Environment problems and policy; Command and control, and market based instruments; problems of climate change nature and its consequences.

20 Marks
15-Lectures

Unit-V

Nature and significance of International economics; Adam Smith's theory of absolute advantage; World Bank, International Monetary Fund and World Trade Organisation.

20 Marks
15-Lectures

Readings:

1. Dobb, Maurice (1981), Studies in the Development of capitalism, Taylor and Francis.
2. Ghosh, B.N. (2000), Political economy : A Marxist Approach, Macmillan.
3. Goulder, Lawrence H and William A, Pizer (2006). The Economics of Climate Change. Working Paper 11923, NBER (www.nber.org/papers/w11923)
4. Hanley, N., J.F. Shogren and Ben White (1995), Environmental Economics in Theory and Practice, Macmillan.
5. Kolstad, C.D. (2000). Environmental Economics. Oxford University Press.
6. Musgrave, Richard and Peggy Musgrave (1995). Public Finance. McGraw Hill.
7. Savatore, Dominick (2002). International Economics. John Wiley and Sons.
8. Sodersten, Bo and Geoffrey Reed (1994), International Economics, Macmillan.
9. Thirwall, A.P. (2006). Growth and Development: With Special Reference to Developing Economies. Palgrave Macmillan.
10. Todaro, Michael P. and Stephen C. Smith (2004); Economic Development. Pearson.

UNDER-GRADUATE SEMESTER SYSTEM

ENGLISH SYLLABUS 2010

(Being Introduced from 2010 Session)

SEMESTER - I

GENERAL ENGLISH -I

Full Marks: 100

Unit I: Grammar

20 marks

Voice: Active/Passive; Speech: Direct and Indirect; Time, Tense and Aspect;
Phrasal Verbs; Auxiliary Verbs; Use of Shall, Will, For, Since; Idioms and Phrases;
Common Errors; Prepositions; Synonyms and Antonyms; Syntax

Unit II: Unseen part:

- | | | |
|-------|-----------------------------------|----------|
| (i) | Essay: General and Current Topics | 20 marks |
| (ii) | Précis writing | 10 marks |
| (iii) | Comprehension | 10 marks |
| (iv) | Paragraph writing | 5 marks |
| (v) | Report writing | 5 marks |

Unit III: Short Stories

30 marks

- | | |
|-------|---|
| (i) | Y. Iyomcha Singh: <i>Water</i> |
| (ii) | Temsula Ao: <i>Three Women</i> |
| (iii) | N. Kunjamohan Singh: <i>The Taste of an Hilsa</i> |
| (iv) | MK Binodini: <i>A String of Beads</i> |

Books recommended:

1. *Contemporary Indian Short Stories*, Series IV. New Delhi: Sahitya Akademi.
2. Temsula Ao. *Laburnum for My Head*. 2009. Penguin India.
3. *The Taste of an Hilsa and Other Stories*. New Delhi: Sahitya Akademi.
4. Ch. Jamini Devi. *Malem*. 2007. Leikol.

SEMESTER -II
GENERAL ENGLISH -II

Full Marks: 100

Unit I:

50 marks (Long and Short Questions (30+20))

William Shakespeare: *Merchant of Venice*

Unit II: Poetry

50 marks

-
- (i) William Shakespeare - *All the World's a Stage*
 - (ii) William Blake - *Tiger*
 - (iii) William Wordsworth - *To a Skylark*
 - (iv) ST Coleridge: *Dejection*
 - (v) PB Shelley: *To the Skylark*
 - (vi) Alfred Lord Tennyson - *Crossing the Bar*
 - (vii) Robert Browning - *Prospice*
 - (viii) Thomas Hardy - *The Darkling Thrush*
-
- (ix) Rudyard Kipling - *If*
 - (x) A.E. Housman - *Loveliest of Tree*
 - (xi) Walt Whitman - *O Captain My Captain!*
 - (xii) Emile Dickinson: *Because I cannot Stop for Death*
 - (xiii) Rabindranath Tagore - *Where the Mind is Without Fear*
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Books recommended:

1. *An Anthology of Verse*. 2010. Published on behalf of Manipur University.
2. Th. Ratankumar Singh. *Golden Laurels*. 2009, Foundations.

SEMESTER - I

Course Code: ELECTIVE ENGLISH: E₁-101

Title of Course: ENGLISH LITERATURE: HISTORY, POETRY AND DRAMA
(Old English -the 19th Century)

Full Marks: 100

Unit I: History of English Literature: A Survey of the Major
Periods from Old English to the 19th Century)

30 marks

Unit II: Poetry Section:

40 marks

- (i) Sonnets of Shakespeare: (2) *When forty winters shall ...*; (12) *When I do count the clock; (73) That time of year...*
- (ii) John Milton: *Lycidas*
- (iii) John Donne: *The Good-Morrow; A Hymn to God the Father; Death Be not Proud*
- (iv) Thomas Gray: *An Elegy Written in the Country Churchyard*
- (v) William Wordsworth: *Tintern Abbey*
- (vi) P.B. Shelley: *Ode to the West Wind*
- (vii) John Keats: *To Autumn*
- (viii) Lord Byron: *All for Love*
- (ix) Alfred Lord Tennyson: *The Lotus Eaters; Tears Idle Tears*
- (x) Christina Rossetti: *Goblin Market*
- (xi) Robert Browning: *Porphyria's Lovers*

Unit III: Drama Section:

30 marks

- (i) William Shakespeare: *Macbeth*
- (ii) Christopher Marlowe: *The Jew of Malta*

Books recommended:

An Anthology of Verse. 2010. Published on behalf of Manipur University.
 Francis Turner Palgrave: *The Golden Treasury*. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
 William J. Long. *English Literature: Its History, Its Significance*

SEMESTER - II**Course Code: ELECTIVE ENGLISH: E₂-202****Title of paper: BRITISH FICTION****Full Marks: 100****Unit I: Lectures on Trends in British Fiction – Age-wise**

10 marks

Unit II:

90 marks

1. Henry Fielding: *Joseph Andrew*
2. Jane Austen: *Sense and Sensibility*
3. George Eliot: *Silas Marner*
4. Charlotte Bronte: *Jane Eyre*
5. Charles Dickens: *A Tale of Two Cities*
6. Thomas Hardy: *Far from the Madding Crowd*

SEMESTER - III
ELECTIVE ENGLISH: E₃-303

Title of Course: **WESTERN CRITICISM**

Full Marks: 100

Unit I:

85 marks

1. Aristotle's *Poetics*
2. *Tragedy and Comedy*
3. *Classicism and Romanticism*
4. Samuel Johnson: *Preface to the Plays of Shakespeare*
5. William Wordsworth: *Preface to Lyrical Ballads*
6. ST Coleridge: *Biographia Literaria* (Books: XII-XIII)
7. Matthew Arnold: *The Study of Poetry*
8. TS Eliot: *The Function of Criticism*
9. DH Lawrence: *Why the Novel Matters*

Unit II: Practical Criticism

15 marks

Books recommended:

1. B Das and J.M. Mohanty. *Literary Criticism: A Reading*. Calcutta: OUP, 1998.
2. SM. Schreiber. *An Introduction to Literary Criticism*. Oxford.
3. DJ Enright and Chickera. *English Critical Text*.
4. CB Cox and AE Dyson. *The Practical Criticism of Poetry*. New Delhi: Arnold Heinmann.

SEMESTER - IV

Course Code: **ELECTIVE ENGLISH: E₁-404**

Title of paper: **LINGUISTICS AND ENGLISH LANGUAGE**

Full Marks: 100

Unit I: Linguistics

75 marks

- (i) Nature of study: (a) Phonetics: Organs of Speech, the English Vowels and Consonants, Transcriptions, Stress and Intonation Patterns; (b) Phonology: Concepts of Phoneme and Allophone; (c) Morphology: Morpheme and Allomorphs, Morpheme types; Syntax: Traditional and modern approaches to English Grammar, Syntagmatic and Paradigmatic relations, IC Analysis; Semantics
- (ii) Scope and branches of Linguistics

- (iii) Human Language and animal communication: Different theories of origin and fallacies; Characteristics and properties of human language

Unit II: English Language

25 marks

- (i) A Brief sketch of the origin and history of the English language
(ii) Changes and influences (Greek, Latin, French, Indian etc)

Books recommended:

AC Gimson: *An Introduction to the Pronunciation of English*. Edward Arnold.

CL Barber. *The Brief History of the English Language*. ELBS.

Daniel Jones: *English Pronouncing Dictionary*. ELBS.

FL Wood: *Outline of the History of English Language*. Macmillan.

George Yule. *The Study of Language*. 2006. Cambridge University Press.

JD O'Connor. *Better English Pronunciation*. New Delhi: Universal Book Stall.

John Lyons. *Language and Linguistics: An Introduction*. Cambridge University Press.

SEMESTER –V

ENGLISH HONOURS PAPERS

1. EnH-505: 20TH CENTURY BRITISH LITERATURE
2. EnH-506: INDIAN WRITING IN ENGLISH
3. EnH-507: LITERARY THEORY

1. EnH-505: 20TH CENTURY BRITISH LITERATURE

Full Marks: 100

Unit I: Poetry Section

25 marks

1. WB Yeats: *Easter 1916; The Second Coming*
2. TS Eliot: *The Hollow Men; Journey of the Magi*
3. DH Lawrence: *Snake*
4. Rupert Brooke: *The Soldier*
5. WH Auden: *Seascape; The Unknown Citizen*
6. Thom Gunn: *Tamer and Hawk*
7. Ted Hughes: *The Thought Fox*

Unit II: Fiction

30 marks

1. Virginia Woolf: *Mrs Dalloway*

2. George Orwell: *The Animal Farm*

45 marks

Unit III: Drama

1. GB Shaw: *Arms and the Man*
2. John Galsworthy: *Strife*
3. Harold Pinter: *The Birthday Party*

Book recommended (Poetry Section):

An Anthology of Verse. 2010. Published on behalf of Manipur University

2. EnH-506: INDIAN WRITING IN ENGLISH

Full Marks: 100

Unit I: Poetry Section

25 marks

1. Henry Derozio: *To the Pupils of Hindu College; Chorus of Brahmins*
2. Toru Dutt: *Our Casuarina Tree; The Lotus*
3. Rabindranath Tagore: *The Child*
4. Nissim Ezekiel: *Night of the Scorpion; In India*
5. AK Ramanujan: *The Striders; Another View of Grace*
6. Kamala Das: *The Dance of the Eunuchs; The Sunshine Cat*

Unit II: Fiction

45 marks

1. Mulk Raj Anand: *Untouchable*
2. Arun Joshi: *The Apprentice*
3. Geeta Hariharan: *The Thousand Faces of Night*

Unit III: Drama:

30 marks

1. Girish Karnad: *Tughlaq*
2. Mahesh Dattani: *Where There's a Will*

Books recommended:

1. *An Anthology of Verse*. 2010. Published on behalf of Manipur University.
2. Gokak, V.K. (ed). 1989. *The Golden Treasury of Indo-Anglian Poetry*. New Delhi: Sahitya Akademi.
3. Paranjape, Makarand (ed). 1993. *Indian Poetry in English*. Madras: Macmillan.

3. EnH-507: LITERARY THEORY

Full Marks: 100

1. Structuralism (Ferdinand de Saussure: Nature of the Linguistic Sign)
2. Post-structuralism (Roland Barthes: ("Work to text"; "The Death of the Author"; MH Abrams: "The Deconstructive Angel")
3. Post-modernism (Linda Hutcheon: Theorizing the Postmodern: Towards a Poetics)
4. Post-colonialism (Edward Said: Introduction to *Orientalism*)
5. Feminism (Elaine Showalter: "Towards a feminist Poetics"; Helen Sixous: "The Laugh of the Medusa")
6. Marxism and Marxist Literary Criticism (Louis Althusser: "Ideology and Ideological State Apparatuses")

N.B.: Works cited above within the brackets need not be the only essays to be studied)

Recommended books:

1. Peter Berry. 1995. *Beginning Theory*. Manchester: MUP
2. Bill Ashcroft, Gareth Griffiths, and Helen Tiffin. 1998. *The Empire Writes Back*. London: Routledge.
3. ———. 1997. *The Post-colonial Studies Reader*. London: Routledge.
4. David Lodge (ed). 2003. *Modern Criticism and Theory: A Reader*. Singapore: Pearson.
5. Edward W. Said. 1995. *Orientalism*. London: Penguin.
6. Elleke Boehmer. 1995. *Colonial and Post-colonial Literature*. New York: OUP.
7. Linda Hutcheon. 1988/2003. *Postmodernism: History, Theory, Fiction*. New York: Routledge.
8. M.S. Nagarajan. 2007. *English Literary Criticism and Theory*. Bangalore: Orient Longman.
9. Philip Rice and Patricia Waugh (eds). 1999. *Modern Literary Theory: A Reader*. London: Routledge.
10. Raman Selden, Peter Widdowson, and Peter Brooke. 1997. *A Reader's Guide to Contemporary Theory*. London: Prentice Hall.
11. Simone de Beauvoir. 1949. *The Second Sex*. New York: Virago.

SEMESTER- VI

ENGLISH HONOURS PAPERS

4. EnH-608: NORTH-EAST LITERATURE
5. EnH-609: COMMONWEALTH AND AMERICAN LITERATURE
6. EnH- 610: EUROPEAN LITERATURE IN TRANSLATION

Full Marks: 100

Unit I: Poetry Section

50 Marks

1. Mamang Dai: *The Missing Link; Sky Song*
2. Nilamani Phukan: *Poems; Ecstasy*
3. Yumlembam Ibomcha: *For the Next Birth; Story of a Dream*
4. Thangjam Ibopishak: *Dali, Hussain, or Odour of Dream, Colour of Wind; The Land of the Half Humans*
5. Desmond L. Kharmawphlang: *The Conquest*
6. Robin S. Ngangom: *Bad Places; Poems for Joseph*
7. Kynpham Sing Nongkynrih: *Ren; When the Prime Minister Visits Shillong the Bamboos Watch in Silence*
8. Chandra Kanta Murasingh: *O, Poor Hackukrai!!; Of a Minister*
9. Hijam Irawat Singh: *Hymn to Mother; Factory*

Unit II: Fiction

30 Marks

1. Lamabam Kamal. *Madhabi*. Trans. RK Birendra Singh.
2. Indira Goswami. *Pages Stained with Blood*. Trans. Pradip Achary. New Delhi: Katha, 2002.

Unit III: Short Stories

20 Marks

1. Anima Dutta: *The Holy Dip*.
2. Harekrishna Deka: *The River Within*.
3. Lamabam Virmani: *Inspection Report*
4. Vanneihluanga: *Thunderbird*
5. K. Priyokumar: *Acacia*

Books recommended

1. *An Anthology of Verse*. 2010. Published on behalf of Manipur University
2. Nongkynrih, Kynpham Singh, and Robin S Ngangom. (eds.) *Anthology of Contemporary Poetry from the Northeast*. Shillong: NEHU, 2003.
3. Geeta Dharmarajan (ed.). 2004. *The Heart of the Matter*. New Delhi: Katha.
4. Kailash C. Baral (ed.). 2005/2007. *Earth Songs: Stories from Northeast India*. Sahitya Akademi.
5. K. Sadananda (ed). *Torrents*. 2005. The Seawaves.
6. *Quarterly Journal*. Manipur State Kala Akademi Pub.

5. EnH-609: COMMONWEALTH AND AMERICAN LITERATURE

Full Marks: 100

Unit I: Poetry Section

1. Chinua Achebe: *An 'If' of History; Those Gods are Children*
2. Margaret Atwood: *Journey to the Interior; Animals in that Country*
3. AD Hope: *Australia; The Death of the Bird*
4. David Malouf: *The Year of the Foxes*
5. Derek Walcott: *A Far Cry from Africa*
6. Yasmine Gooneratne: *On an Asian Poet Fallen Among American Translators; There was a Country*
7. Walt Whitman: *Out of the Cradle Endlessly Rocking*
8. Robert Frost: *The Mending Wall; The Road Not Taken*

Unit II: Fiction

1. Ernest Hemingway: *The Old Man and the Sea*
2. Ngugi wa Thiong'o: *Devil on the Cross*
3. John Steinbeck: *Of Mice and Men*
4. Margaret Atwood: *The Edible Woman*

Books recommended:

1. *An Anthology of Verse*. 2010. Published on behalf of Manipur University C.D.
2. Narasimhaiah (ed.). 1990. *An Anthology of Commonwealth Poetry*. Madras: Macmillan.
3. Chinua Achebe. 1971. *Beware, Soul Brother: Poems*. Heinemann.

6. EnH- 610: EUROPEAN LITERATURE IN TRANSLATION

Full Marks: 100

Unit I: Poetry Section

15 marks

Homer: *The Odyssey*, Book I

Unit II: Fiction

70 marks

1. Albert Camus: *The Outsider*
2. Franz Kafka: *The Castle*

3. Short stories of Guy de Maupassant:

- i. *The Jewels*
- ii. *Mother Savage*
- iii. *My Uncle Jules*

4. Short stories of Anton Chekhov:

- (i) *The Grasshopper*
- (ii) *Gooseberries*

Unit III: Drama

Sophocles: *Antigone*

Books recommended:

- 1. Guy De Maupassant. 1971. *Selected Short Stories*. Trans. Roger Colet. Calcutta: Rupa.
- 2. Anton Chekhov. 1973/1984. *Selected Works*. Vol. I. Moscow: Raduga Publishers.

SEMESTER – VI

Literary trends, Criticism, Theory & Poetry (EPC-2)

100 Marks

A. Literary Trends

15 Marks

- i) Elizabethan Period
- ii) Restoration Period
- iii) Victorianism
- iv) 20 Century

B. Literary Criticism & Theory

45 Marks

- i) Virginia Woolf: Modern Fiction
- ii) TS Eliot: Tradition and Individual Talent
- iii) Third World Literature
- iv) New Literatures in English
- v) Women's Literature
- vi) Diaspora Literature

C. Poetry

40 Marks

- i) W.B. Yeats: *Sailing to Byzantium*
- ii) Robert Frost: *Stopping by Woods on a Snowy Evening*
- iii) Henry Derozio: *The Harp of India*
- iv) Sri Aurobindo: *The Trojan War*
- v) Robin S. Ngangom: *Native Land*
- vi) Temsula Ao: *Stone-People from Lungterok*
- vii) E. Nilakanta Singh: *Pilgrimage (Tran of Tirtha Yatra)*
- viii) L. Samarendra Singh: *And Yonder East Blooms the Lotus (Tran of Mamang Leikai Thambal Satle)*

Recommended books

1. Vinayak Krishna Gokak, Ed. *The Golden Treasury of Indo-Anglian Poetry*. Sahitya Akademi, rpt. 2010.
2. Kynpham Sing Nongkynrih and Robin S. Ngangom. Eds. *Anthology of Contemporary Poetry from the Northeast*. Shillong: NEHU, 2003.
3. The translated poems of E. Nilakanta Singh and L. Samarendra Singh are being published in the next issue of *Manipuri Literature* (A Half Yearly Journal) of Manipur State Kala Akademi, being released in August 2012.

MANIPUR UNIVERSITY
UNDERGRADUATE SYLLABUS FOR ENGLISH PASS COURSE

SEMESTER - V

Fiction and Drama (EPC-1)

100 Marks

A. Fiction

I. Short Stories

30 Marks

- i) Leo Tolstoy: *The Three Hermits*
- ii) Munshi Premchand: *The Shroud*
- iii) Cyprian Ekwensi: *The Ivory Dancer*
- iv) Jean Arasanayagam: *The Sack*
- v) RK Narayan: *An Astrologer's Day*

II. Novel

35 Marks

- i) Gabriel Garcia Marquez: *Chronicle of a Death Foretold*
- ii) Arun Joshi: *The Strange Case of Billy Biswas*

B. Drama

35 Marks

- i) William Shakespeare: *Taming of the Shrew*
- ii) John Galsworthy: *Justice*

Recommended book

- 1. M. Mani Meitei. Ed. *The Grasshopper and Other Stories*. Foundation Books, 2011.

(3)

SYLLABUS
BACHELOR OF SCIENCE (B.Sc)
MATHEMATICS
FIRST YEAR

BMath : 101 [SEMESTER-I]
ALGEBRA -I

Full Marks 100

Unit-I

Inequalities (10 Marks)

Geometric Mean and Arithmetic mean, Cauchy-Schwarz, Holder's and Minkowski's inequalities. [6 lectures]

Theory of Equations (15 Marks)

Polynomial, Descartes rule of signs, Fundamental theorem of Algebra (Statement only), Relation between roots and coefficient, Symmetric functions of roots, Transformation of equations, Solution of cubic equations by Cardan's method and biquadratic equations by Ferrari's method. [12 lectures]

Unit-II

Convergence of Series (15 Marks)

Infinite series-definitions, Cauchy's general principle for convergence, Geometric series, some useful theorems on series of positive terms, Comparison test of convergence, convergence and divergence of p-series. Cauchy's root test, D'Alembert's ratio test, Raabe's test, Logarithmic test, D'Morgan & Bertrand test, Leibnitz's test for alternating series. Conditional and Absolute convergence. (Ref. Ch.XIV [6], Ch.4[2])) [12 lectures]

Unit-III

Abstract Algebra (25 Marks)

Mappings, Equivalence relations and partitions, Congruence modulo n

Group and its elementary properties, Examples of Abelian and Non-abelian groups, Subgroups, Condition for being a subgroup, Order of a group and order of an element of a group, Cyclic groups and generators, Permutation group, Symmetric groups S_1, S_2, S_3, S_n is abelian for $n \leq 2$ and non-abelian for $n=3$ Cycle notation, Even and odd permutation, Alternating groups, Coset decomposition, Lagrange's theorem, Fermat's and Wilson's Theorem(Group Theoretic approach), Isomorphism of groups and their elementary properties

(i) $\phi(e)=e'$, (ii) $\phi(a'')=\phi(a)''$ (iii) $\phi(G)$ is abelian iff G is abelian, (iv) $\phi(G)$ is cyclic iff G is cyclic, (v) ϕ^{-1} is isomorphic if ϕ is isomorphic and (vi) $\phi(K)$ is a subgroup if K is a subgroup. Cayley's Theorem (Ref.Ch.2-7[7]) [20 lectures]

Unit –IV**Matrices (15 Marks)**

Some types of Matrices, Elementary operations on matrices, Inverse of a matrix, Linear independence of row and column matrices, Row rank, Column rank and rank of a matrix, Equivalence of column and row ranks, Eigenvalues, eigenvectors and the characteristic equation of a matrix, Cayley Hamilton theorem and its use in finding inverse of a matrix.

[10 lectures]

Unit-V**Trigonometry (20 Marks)**

De Moivre's theorem and its applications, Expansion of trigonometric functions, Exponential values for circular functions, complex argument, Gregory's series, Hyperbolic functions, summation of series including $C + iS$ method, Infinite product. (Sin x and Cos x).

[15 lectures]

RECOMMENDED BOOKS

1. **Das and Mukherjee**- *Higher Trigonometry*, U.N.Dhur & Sons Pvt. Ltd., Kolkata
2. **Chandrika Prasad** - *Algebra and Theory of Equations*, Pothisala Pvt. Ltd.
3. **Burnside and Panton**- *The Theory of Equations*, S.Chand & Co., New Delhi
4. **I.N.Herstein** - *Topics in Algebra*, John Wiley & Sons, New Delhi
5. **Shanti Narayan & P.K.Mittal** : A Text Book of Matrices, S.Chand & Co., New Delhi
6. **J.G.Chakravorty & P.R.Ghosh** : Advanced Higher Algebra, U.N.Dhur & Sons Pvt.Ltd, Kolkata
7. **Joseph A. Gallan** : Contemporary Abstract Algebra, Narosa, 4e

REFERENCES

1. **John B.Fraleigh** – *A First course in Abstract Algebra*, Narosa Publishing House, New Delhi
2. **Surjeet Singh and Quazi Zameerudin**- *Modern Algebra*, VIKAS
3. **K.B.Dutta** - *Matrix and Linear Algebra*, Prentice Hall of India Pvt. Ltd, New Delhi
4. **P.B.Bhattacharya, S.K.Jain and S.R.Nagpaul**- *Basic Abstract Algebra*, CUP, Indian Edition
5. **P.B.Bhattacharya, S.K.Jain and S.R.Nagpaul** - *First Course in Linear Algebra*, Wiley Eastern, New Delhi
6. **H.S.Hall and S.R.Knight** - *Higher Algebra*, A.I.T.B.S. Publishers & Distributors, New Delhi
7. **S.L.Loney** - *Plane Trigonometry Part I and II*, Macmillan
8. **R.S.Varma and K.S.Shukla** - *Text Book on Trigonometry*, Pothisala Pvt. Ltd.
9. **S.K.Jain, A.Gunawardena and P.B.Bhattacharya**-*Basic Linear Algebra with MATLAB*, Kewy College Publishing (Springer-Verlag), 2001
10. **Frank Ayres(JR.)** – *Matrices*, Schaum Outline Series
11. **Madhumangal Pal** – *U.G. Mathematics*, Asian Books Pvt. Ltd, 2004
12. **S.Bernard & J.M.Child** : *Higher Algebra*, A.I.T.B.S. Publishers & Distributors, New Delhi
13. **Pranjal Rajkhowa** : Topics in Degree Mathematics, Book I and II, Asian Books Pvt Ltd., New Delhi
14. **Vijay K, Khanna; S.K.Bhambri** : A course in Abstract Algebra, VIKAS

(2)

BMath : 202 [SEMESTER-II]
CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS

Full Marks – 100

Unit-I

Differentiation: (6 Marks)

Limit and Continuity (using $\varepsilon - \delta$ definition) of the functions, Successive differentiation, Leibnitz's Theorem and its application. **[5 Lectures]**

Rules of differentiation: (14 Marks)

Rolle's Theorem, Lagrange's and Cauchy's Mean Value theorems, Taylor's and Maclaurin's theorem with Lagrange's and Cauchy's form of remainders, Indeterminate forms, L – Hospital's rule, Expansion of standard functions: $e^x, \sin x, \cos x, \log(1+x), (1+x)^m, \sin^{-1} x, \cos^{-1} x, \tan^{-1} x$. **[10 Lectures]**

Unit - II

Partial Differentiation: (10 Marks)

Function of Two and three variables, Limit and Continuity for functions of two and three variables, Partial differentiation, successive partial differentiations, Euler's theorem on Homogeneous functions of two and three variables, Maxima and Minima of functions of two variables. **[8 Lectures]**

Applications: (10 Marks)

Curvature, radius of curvature for the Cartesian, parametric, implicit and polar equations, Asymptotes. **[10 Lectures]**

Unit - III

Integration: (15 Marks)

Integration as the limit of a sum, Fundamental theorem of integral calculus, Definite integrals, Reduction formulae for indefinite and definite integrals.

Applications: Quadrature and Rectification.

[6 Lectures]

Unit - IV

Double Integrals: (15 Marks)

Working knowledge of double integrals, Jacobian, change of variable in double integrals, Application of double integral.

Applications: Volume and surface areas of solid of revolution

[15 Lectures]

Unit - V

Equations of First order and First degree (15 Marks)

Exact equations and integrating factors (Rules), Linear equations and equations reducible to linear form, Solutions of simultaneous equations of the form $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$, total differential equations of the form: $Pdx + Qdy + Rdz = 0$, method of solutions and their geometrical interpretations, orthogonal trajectory.

Equations of the First order but not of First Degree

Equations solvable for x, y, p and Clairaut's equation, Singular solutions

[15 lectures]

Linear Second Order Differential Equations (15 marks)

Second order linear differential equations with constant coefficients, Homogeneous linear equations, Complementary functions and particular integrals, Power Series solutions at ordinary and regular singular points.

[10 Lectures]

RECOMMENDED BOOKS

1. **Piaggio** – *An Elementary Treatise on Differential Equation and Their Applications*, C.B.S.Publishers & Distributors, New Delhi
2. **Das and Mukherjee** – *Differential Calculus*, U.N.Dhur & Sons, Kolkata
3. **Das and Mukherjee** – *Integral Calculus*, U.N..Dhur & Sons Pvt. Ltd., Kolkata.

REFERENCES

1. **Maity and Bagchi** – *Integral Calculus*, An Introduction to Analysis, New Central Book Agency, Calcutta.
2. **T.M. Apostol** – *Calculus, Volume I and II*, Willey Eastern Ltd., New Delhi.
3. **Shanti Narayan** – *Integral Calculus*, S. Chand & Co. Pvt. Ltd., New Delhi
4. **Gorakh Prasad** – *Integral Calculus*, Pothisala Pvt.Ltd., Allahabad.
5. **Gorakh Prasad** – *Differential Calculus*, Pothisala Pvt.Ltd., Allahabad.
6. **Erwin Kreyszig** - *Advanced Engineering Mathematics*, John Wiley & Sons.
7. **Boyce and Diprima** - *Elementary Differential Equations and Boundary Value Problems*, John Wiley & Sons
8. **Coddington** - *An Introduction to Ordinary Differential Equations and their Applications*, Prentice Hall of India., New Delhi
9. **G.F.Simmons** - *Differential Equations*, Tata McGraw Hill
10. **D.A.Murray** - *Introductory Course in Differential Equations*, Orient Longman(India).
11. **Jain and Kaushik** - *An Introduction to Real Analysis*, S,Chand & Co. Pvt. Ltd., New Delhi
12. **N.Piskunov** - *Differential and Integral Calculus*, Peace Publishers, Moscow.
13. **Murray R. Spiegel** - *Theory and Problems of Advanced Calculus*, Schaum's Outline series, Schaum Publishing Co., New York
14. **Gabriel Klambaucer** - *Mathematical Analysis*, Marcel Dekkar, Inc New York
15. **Maity and Ghosh** - *Integral Calculus*, New Central Book Agency, Kolkata
16. **Pranjal Rajhkowa** : *Topics in Degree Mathematics*, Book II, Asian Books Pvt. Ltd., New Delhi
17. **Bhamra KS & Ratna Bala** - *Ordinary Differential Equations*, Allied Publishers, Delhi

SECOND YEAR

BMath : 303 [SEMESTER - III] VECTOR, GEOMETRY AND PROBABILITY

Full Marks 100

Unit-I

Vector Analysis (20 Marks)

Scalar and vector product of three and four vectors, reciprocal vectors, Differentiation of vectors, Gradient, Divergence and Curl of a vector, vector integration, ordinary integrals of vectors, Line, Surface and Volume integrals, theorems of Gauss, Green, Stokes and related problems. [12 Lectures]

Unit-II

Two dimensional Geometry (30 Marks)

Change of axes: Change of origin without changing the direction of axes, Change of direction of axes of co-ordinates without changing the origin.

Pair of straight lines: Pair of straight lines, homogeneous equation of second degree, Angle between the pair of lines given by the homogeneous equation, Bisectors of the angles between the pair of lines, Condition for the general equation of second degree represents a pair of straight lines, Point of intersection, Equation of the pair of lines joining the origin to the points of intersection of the line and a curve.

System of Conics: Every general equation of second degree in two variables always represents a conic section, The centre of a conic, Reduction of the general second degree equation into a central and non-central conics, Condition that a line is a tangent to a conic, Chord of contact, pole and polar, Diameter, conjugate diameters, feet of normals, Intersection of two conics, Pair of tangents.

Confocal Conics and their Properties

Polar equation of conics: Polar equation of a conic with respect to focus as pole, equation of a chord, tangent and normal. [21 Lectures]

Unit-III

Three Dimensional Geometry (20 Marks)

Sphere: Equations of sphere, condition for the general equation of second degree to represent a sphere, plane section of sphere, intersection of a plane and a sphere, intersection of two spheres, power of a point, equation of a tangent plane, condition for a plane to be a tangent plane to a sphere, plane of contact, polar plane, pole of a plane.

Cone: Equation of a cone with a conic as guiding curve, enveloping cone of a sphere, quadratic cones with vertex at origin, condition for the general equation of second degree to represent a cone, reciprocal cone right circular cone.

Cylinder: Equation of cylinder, enveloping cylinder, right circular cylinder.

Central conicoids: Equations and properties of conicoids, intersection of a line with a conicoid, Tangent line and plane, normal, number of normals from a given point, plane of contact. Polar plane of a point, enveloping cone and cylinder, chord, conjugate diameters.

Paraboloids: Equations and simple properties.

4
Confocal conicoids: Equations and simple properties.

[18 Lectures]

Unit-IV

Theory of Probability (30 Marks)

Random variables, probability distribution: Poisson, Geometric, rectangular, exponential, normal. Expectation and moments, marginal and conditional distributions, characteristic functions, probability inequalities (Tchebychev), Weak and strong convergence of random variables, convergence in probability.

Chebychev's inequality, weak law of large number, Idea of central limit theorem, De Moivre's, Laplace theorem, Liapunov's theorem (without proof) and application of CLT.

[24 Lectures]

RECOMMENDED BOOKS

1. **B. Das**-Analytical Geometry with Vector Analysis, Orient Book Company, Kolkata.
2. **Shanti Narayan and P.K. Mittal**-Analytical Solid Geometry, S. Chand.
3. **M.R. Spiegel**-Vector analysis and an introduction to tensor analysis-Schaum series.
- 4.

REFERENCES

1. **S.L. Loney**: Co-ordinate geometry of twodimension, Macmillan and Sons Pvt. Ltd.
2. **R.J.T. Bell**: Co-ordinate geometry of three dimensions, Macmillan and Sons Pvt. Ltd.
3. **Ross S.M.**(2007): Introduction to Probability Models, 9th edition, Indian Reprint, Academic Press.
4. **Goon A.M., Gupta M.K. and Dasgupta B.**(2003): An outline of statistical theory, vol.1. 4th edition, World Press, Kolkata.
5. **Rohatgi V.K. and Sahel A.M.** (2009): An introduction to probability and statistics, 2nd ed, John Wiley and Sons.
6. **Hogg K.V., Craig A.T. and Mekean J.N.**(2009): Introduction to mathematical statistics, 6th ed, Pearson Education.
7. **Johnson N.L., Kotz S. and Balakrishnan N**(1994): Discrete univariates Distributions, John Wiley.

BMATH : 404 [SEMESTER – IV]

MECHANICS [DYNAMICS, STATICS, RIGID DYNAMICS]

Full Marks 100

UNIT-I

DYNAMICS (35 Marks)

Components of velocities and accelerations along, radial and transverse, along tangential and normal (Art' 48, 49, 87, 88) Simple Harmonic motions (Art¹ 22-25, Art² 17.1 - 17.4, 17.6, 17.7)

[7 Lectures]

Dynamics of a particle, Motion on smooth and rough plane curves (Art¹ 14.1, 14.2, 15.1, 15.2, 16.1, 16.2) Motion in resisting medium including projectile, Motion of varying mass (Art' 104-i 12) central orbit, Kepler's Law (Art' 53-55, 57, 60, 64-67, 69-70)

[15 Lectures]

Acceleration in different Coordinate system (Art¹ 125-127)

[4 Lectures]

UNIT-II

STATICS (35 marks)

Equilibrium condition of coplanar forces (Art² 81., 8.3), Equilibrium of strings, common catenary, catenary of uniform strength (Art³ 141-145. Art⁵ 12.2, 12.21, 12.22, 12.5)

[14 Lectures]

Force in 3-dimension, Poinso's Central axis (Art¹ 154-157, 162-165, Art⁴ 184-186, 188-190), Wrenches Null lines and planes (Art⁴ 206-208) stable and unstable equilibrium (Art⁴ 158) Art¹ 11.5, 11.6, 11.62, 11.7)

[12 Lectures]

UNIT-III

DYNAMICS OF RIGID BODIES (Marks 30)

Moments and products of inertia (Art¹ 144-149), Momental Ellipsoid (Art¹ 151) Equipmomental systems, Principal Axis (Art¹ 154, 155)

[7 Lectures]

D'Alembert's Principle, Equations of motion of rigid bodies, Motion of centre of inertia, Motion relative to centre of inertia (Art¹ 162)

[7 Lectures]

Motion about a fixed axis (Art¹ 168 -171), Compound Pendulum (Art¹ 173-175), Motion in 2 dimension under finite and impulsive forces (Art¹ 187-190), Conservation of momentum and Energy. (Art¹ 235, 236, 238, 239, 242)

[9 Lectures]

RECOMMENDED BOOKS

- 1 **S.L. LONEY** : An elementary treatise on, dynamics of particle and of rigid bodies. Cambridge university press 1956, reprinted by S.Chand & Company (P) Ltd. 1988.
- 2 **DAS & MUKHERJEE**: Dynamics published by S. Chand & company (p) Ltd, 2010 ISBN-81-85624-96-8.
- 3 **DAS & MUKHERJEE**: Statics published by S.Chand & company (p) Ltd.2010, ISBN-81-85624-18-6.
- 4 **S.L. LONEY** : An Elementary treatise on Statics published by A.I.T.B.S., New Delhi, 2004 ISBN-81-7473-123-7.
- 5 **A.S. RAMSEY**: Statics, CBS Publishers and Distributors, Shahdara, New Delhi-110032, India

REFERENCES

- 6 **M. RAY and G.C. SHARMA**: A Textbook of dynamics published by S. Chand & company (p) Ltd., 2008(Chapter 1,2,6,8,9,11,12), ISBN-81-219-0342-4.
- 7 **R.S. VERMA**: A Text Book on Statics Pothishala Pvt Ltd., Allahabad.
- 8 **A.S. RAMSEY**: Dynamics Part-I, Cambridge University Press, 1973.

THIRD YEAR

BMath : 505 [SEMESTER – V] ABSTRACT ALGEBRA AND LINEAR ALGEBRA

Full Marks - 100

UNIT- I

GROUPS: (25 Marks)

Normal subgroups, Quotient Groups, Homomorphism and Isomorphism of groups, Kernel of a homomorphism, Isomorphism Theorems, Auto-morphisms, Inner Auto-morphism, Auto-morphism groups, Cayley's Theorem, Conjugacy Relation, Conjugate class, Counting Principle and Class Equation of a finite group, Centre of a group, Normalizer, Centralizer and related Theorems, Cauchy's Theorem, Sylow Theorems, p-Sylow subgroups.

(Ref. Chapter 2[1])

[20 Lectures]

UNIT - II

RINGS: (25 Marks)

Rings, Elementary Properties of Rings, Integral Domains, Division Rings, Fields and related Theorems, Ideals and Quotient Rings, Ideals generated by a subset, Sum of two ideals, Homomorphism and Isomorphism of Rings, Kernel of a homomorphism, Isomorphism Theorems, Maximal Ideal, Prime Ideal, Principal Ideal, Euclidean Rings, Polynomial Rings, Polynomials over the Rational Field, Eisenstein's Irreducibility criterion, Polynomial Rings over Commutative Rings, Unique Factorization Domain.

(Ref. Chapter 3[1])

[20 Lectures]

UNIT - III

VECTOR SPACES: (35 Marks)

Concept of Vector Space over a Field K , n -tuple space, Subspaces, Necessary and sufficient condition for being a Subspace, Subspace generated by a Subset, Sum as Direct sum of Subspaces, Linear Span, Linear Dependence, Linear Independence and their basic properties, Basis, Dimensions, Finite Dimensional Vector Spaces, Existence Theorem for Basis, Complement of a Subspace and Existence of a Complement of a Subspace of a Finite Dimensional Vector Space, Dimension of sum of Subspaces, Quotient Space and its Dimension, Linear Transformation, Kernel of a Linear Transformation, Isomorphism, Isomorphism Theorem, Representation of Linear Transformation as matrices, Algebra of Linear Transformations, Rank and Nullity of a Linear Transformation, Rank-Nullity Theorem, Change of Basis, Dual Space, Annihilator of a Subspace, Quadratic and Hermitian Forms. (Ref Chapter 4[1], Chapter 9 and 10[3], Chapter 8 and 9[2])

[30 Lectures]

UNIT-IV

INNER PRODUCT SPACES: (15 Marks)

Inner Product Spaces, Cauchy-Schwarz Inequality, Orthogonal Vectors, Orthogonal Complements, Orthonormal sets and Orthonormal Basis, Bessel's inequality for Finite Dimensional Vector Spaces, Gram-Schmidt Orthogonalization process.

(Ref. Chapter 9[3])

[10 Lectures]

RECOMMENDED BOOKS

1. **I.N.Herstein**: Topics in Algebra, John Wiley & Sons, New Delhi.
2. **Kenneth Hoffman and Ray Kunze**: Linear Algebra, Pearson.
3. **V.K. Khanna & S.K. Bhambri**: A Course in Abstract Algebra, Vikas Publishing House Pvt. Ltd., New Delhi.

REFERENCES

1. **S. Kumaresan**: Linear Algebra, Prentice Hall of India.
2. **Vivek Sahai and Vikas Bist**: Linear Algebra, Narosa Publishing House, New Delhi.
3. **Shanti Narayan & P.K. Mittal**: A Text Book of Matrices, S Chand & Co., New Delhi.
4. **Joseph A. Gallan**: Contemporary Algebra, Narosa Publishing House, New Delhi.
5. **Surjeet Singh and Qazi Zameerudin**: Modern Algebra, Vikas.
6. **P.B.Bhattacharya, S.K.Jain and S.R.Nagpaul**: Basic Abstract Algebra, CUP.
7. **John F. Fraleigh**: A First Course in Abstract Algebra, Addison Wesley.
8. **J.G. Chakravorty and P.R. Ghosh**: Advanced Higher Algebra, U.N.Dhur & Sons Pvt. Ltd., Kolkata.
9. **Michael Artin**: Algebra, Prentice Hall of India Ltd.
10. **N.Jacobson**: Basic Algebra Vol. I & II, Hindustan Publishing Corporation, New Delhi.
11. **K.B.Dutta**: Matrix And Linear Algebra, Prentice Hall of India Pvt. Ltd.
12. **I.S.Luthar, I.B. Passi**: Algebra Vol-I(Group), Vol-II(Rings) and Vol-III(Modules), Narosa Publishing House, New Delhi.
13. **D.S. Malik, J.N.Moderson & M.K.Sen**: Fundamentals of Abstract Algebra, Mc-Graw Hill International Edition.
14. **David S. Dummit, Richard M. Foote**: Abstract Algebra, John Wiley and Sons(Asia) Pte Ltd, Singapore.
15. **S.Lipschutz**: Theory And Problems Of Linear Algebra, SI(metric) edn., Schaum's Out Series, Mc Graw Hill.
16. **Frank Ayres**: Modern Algebra, Schaum Outline Series, Mc Graw Hill.

BMath : 506 [SEMESTER – V] ANALYSIS – I [REAL ANALYSIS]

Full Marks – 100

Unit-I

Real Number System (sets) (10 Marks)

Order completeness in \mathbb{R} (statement only); Archimedean property [Ref:- Ch - 4- 4.1, 4.2 [1]] ; Bounded sets and their bounds; Limit points; Bolzano-Weierstrass theorem; open and closed sets and related properties/theorems; Concept of compactness; Heine-Borel theorem [Ref :- Ch. 2 - 1, 1.1 to 3.5, Th. 12[1]]; [Ch 4[2]]; [Ch. 2[3]].

[8 Lectures]

Real Sequence (10 Marks)

Bounded sequences, Limit points, Bolzano-Weierstrass theorem, Cauchy sequence; Cauchy's general principle of convergence, convergent sequences and their properties, monotonic sequence and their properties.

Subsequences, $\lim \sup$., $\lim \inf$., Nested interval theorem; [Ref :- Ch. 3[1]]; [Ch.5[2]]; [Ch. 3 - 3.1 to 3.7[3]]

[7 Lectures]

Continuity (10 Marks)

Types of discontinuities; Properties of continuous functions on a closed interval.

Uniform continuity; [Ref :- Ch. 5[1]]; [Ch. 8[2]]; [Ch. 4 - 4.1 to 4.4[3]]. [7 Lectures]

Unit - II

Riemann Integration (20 Marks)

Upper and lower Riemann Integrals (R.I.); Darboux's theorems; Integrability conditions, R.I. as a limit of a sum; Properties; Inequalities for Integrals; Integral function; Mean value theorems. [Ref :- Ch. 9 - 1 to 13, th. 23[1]]; [Ch. 8[2]]; [Ch. 6 - 6.1 to 6.9.2[3]]

[14 Lectures]

Unit - III

Improper Integrals (15 Marks)

Different types of improper integrals; Evaluation, convergence of improper integrals; Beta function, Gamma function; Abel's test and Dirichlet's test, Frullani's Integral.

[Ref :- Ch. 11[1]]; [Ch. 11[2]]; [Ch. 9[3]] [13 Lectures]

Unit - IV

Functions of Several Variables (15 Marks)

Differentiability and differential, Partial derivatives of higher order, Young's and Schwarz's theorems, Differentials of higher order, Functions of Functions, Differentials of higher order of a function of functions; Derivation of composite functions (the chain rules); Change of variables, [Ref :- Ch. 15 [1]; (Ch. 13 - 13.9, 13.10, 13.13[2]] [13 Lectures]

Unit - V

Multiple Integrals (20 Marks)

Concept of line integrals; Double and repeated integrals; Green's theorem in the plane, evaluation of area, Change of order of integration.

Surface areas; surface integrals; Stoke's Theorem; Volume integrals, Triple integrals; Gauss divergence Theorem and its application. [Ref :- Ch. 17 and 18[1]]; [Ch. 20[2]]; [Ch. 16, 17, 18[3]] [13 Lectures]

RECOMMENDED BOOKS

1. **S.C. Malik and Savita Arora** - Mathematical Analysis, New Age International (P) Limited; Publishers, New Delhi.
2. **K.C. Maity & R.K. Ghosh** - An Introduction to Analysis, Differential Calculus Part I & II, Integral Calculus, Books and Allied (P) Ltd., Kolkata 700009.
3. **Shanti Narayan and P.K. Mittal** - A Course of Mathematical Analysis, S Chand & Company Ltd. Ram Nagar, New Delhi - 110055.

REFERENCES

1. **Shanti Narayan and Md. Raisinghanian** - Elements of Real Analysis, S. Chand & Company Ltd., Ram Nagar, New Delhi - 110055.
2. **S.L. Gupta & N.R. Gupta** - Principles of Real Analysis, Pearson Education (Singapore) Pte. Ltd., Indian Branch, 482 F.I.E. Patparganj N.D. - 110092.
3. **S.K. Jain & S.K. Kaushik** - Introduction to Real Analysis, S. Chand & Company Ltd., Ram Nagar, N.D. - 110055.
4. **S.K. Sinha** - Real Analysis, P.C. Dwadash Shreni & Co (P) Ltd. Publisher & Book Seller's, Bara Bazar, Aligarh - 202001.

5. **V.K. Krishnan** - Fundamentals of Real Analysis, Pearson Education (Singapore) Pte. Ltd, Indian Branch.
6. **K.K. Jha** - Honours Course in Real Analysis and Convergence, Navbharat Prakashan Patna - 4, Delhi - 6.
7. **D. Somasundaram & B. Choudhury** - A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi.
8. **R.G. Bartle & D.R. Sharbert** - Introduction to Real Analysis, John Wiley and Sons (Asia) Pte. Ltd, Singapore.
9. **R.R. Goldberg** - Method of Real Analysis, Oxford and INH Publishing Co.
10. **Murray R Spiegel** - Theory and Problems of Advanced Calculus, Schaum Out Line Series Mc Graw Hill Book Company.
11. **Frak Aryer Jr.** - Theory & Problem of Calculus, Schaum Out Line Series Mc Graw Hill Book Company.

BMath : 507 [SEMESTER – V]

NUMERICAL ANALYSIS AND COMPUTER PROGRAMMING IN C

[THEORY – 80 (DURATION – THREE HOURS)]

[PRACTICAL – 20 (DURATION – ONE HOUR)]

Full Marks – 100

Unit I (Marks 20)

Finite difference, relation between the operators, ordinary and divided differences, Newton's forward and Backward interpolation formulae, Newton's divided difference formulae and their properties.

Lagrange's and Hermite's interpolation formulae, Least square polynomial approximation.

[15 - Lectures]

Unit II (Marks 20)

Numerical differentiation, numerical integration, quadrature formulae, Trapezoidal rule, Simpson's rule.

Numerical solution of ODEs using Picard, Euler, Eurler's modified, Runge-Kutta methods. Solution of algebric and transcendental equation using method of iteration and Newton-Raphson method. System of linear algebraic equation using Gauss elimination method.

[15 - Lectures]

Unit – III (Marks – 20)

Introduction to C-programming: Basic model of a computer, Algorithm, Flow Chart, programming language, Compilers and operating system, character set, identifiers and keyword, Constant, variables and data type, operations and expressions, operator precedence and associativity, Basic input/output statements, simple C-programs.

Conditional statements and loops: Decision making with a program, logical and conditional operators, if statement, nested if else statement, loops, while loop, do-while loop, for loop, nested loops, break statement, switch statement, continue statement, goto statement, the comma operator.

[15 - Lectures]

Unit – IV (Marks – 20)

Arrays: One dimensional arrays, declaration and initialization of one dimensional arrays, searching, insertion and deletion of an element from an array, sorting an array. Two dimensional arrays.

Function: Defining a function, accessing a function, function declaration/prototype, function parameters, return values, passing arguments to a function, call by a reference, call by value, function calls, recursion, passing arrays to function.

[15 - Lectures]

Unit – V (Marks - 20)

Programs for practical (any one)

1. To calculate the compound interest accepting the necessary data from the keyboard.
2. To find the value $\frac{x}{1!} - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots$
3. That will read a positive number from the keyboard and check the number is prime or not.
4. To convert octal to decimal number.
5. To generate prime numbers up to n terms.
6. To find GCD of two given numbers.
7. To find GCD of two given numbers using recursion.
8. To arrange numbers in ascending order and decreasing order.
9. To generate Fibonacci series of numbers up to n terms.
10. To implement selection sort.
11. To implement insertion sort.
12. To find the solution of non-linear equation by (i) Bisection (ii) Secant and (iii) Newton-Raphson method.
13. To find the solution of linear equation by Gauss Elimination method.
14. Numerical Integration (i) Trapezoidal rule and (ii) Simpson's 1/3 rule.
15. Ordinary differential equation (i) Euler's method and (ii) Runge-Kutta method.

[15 – Practicals]

INSTRUCTIONS FOR PRACTICAL

Duration – One Hour. [a) 5 marks Program writing, b) 10 Marks Output c) 5 Marks Viva Voce]

RECOMMENDED BOOKS

1. **M.K. Jain, S.R.K. Iyenger, R.K. Jain** – Numerical methods for scientific and engineering computation, New Age international (p) Ltd.
2. **James B. Scarborough** – Numerical mathematical analysis, Oxford and IBH publishing Co. pvt. Ltd.
3. **H.C. Saxena** – Finite differences and numerical analysis, S Chand & Co. Ltd., New Delhi.
4. **Byron Gottfried**, Programming with C, Tata McGraw Hill
5. **E. Balaguruswami**, Programming with ANSI-C Tata McGraw Hill
6. **RG Dromey**, How to solve it by computer, Prentice Hall of India.
7. **Venugopal & Prasad**, Programming with C, Tata McGraw Hill.

REFERENCES

1. **K.E. Atkinson** – An introduction to numerical analysis, John Wiley and Sons.

2. **M.K. Jain, S.R.K. Iyenger, R.K. Jain** – Numerical method for problems and Solutions, New Age international (p) Ltd.
3. **R.Y. Robistein** – Simulation and Montecarlo method, John Wiley.
4. **C.E. Froberg** – Introduction to numerical analysis, Addison Wesley, 1979.
5. **A. Kamtham**, Programming with ANSI & Turbo C, Pearson Education
6. **B.W. Kernighan and D.M. Ritchie**, The Programming Language, Prentice Hall of India.
7. **V. Rajaraman**, Programming in C, Prentice Hall of India.
8. **Robert C Hutchison and Steven B. Just**, Programming using C language, Tata McGraw Hill.

BMATH : 605 [SEMESTER – VI]
PARTIAL DIFFERENTIAL EQUATIONS, LAPLACE TRANSFORM,
CALCULUS OF VARIATION

Full Marks – 100

Unit – I

First order PDE: (20 Marks)

Origin of 1st order PDE, Formation of PDE by eliminating arbitrary constants and arbitrary functions. Cauchy's problem of First order equation [Ref. Ch-2 (1)]. Definitions of (i) Complete Integral (ii) Particular Integral (iii) Singular Integral (iv) General Integral. Equations of 1st order but not of 1st degree (i) Solvable for p (ii) Solvable for y (iii) Solvable for x [Ref. Ch - V (2)].

Lagrange's method of solving the linear PDE of order one namely $Pp + Qq = R$, where P, Q, R are functions of x, y, z. Its Geometrical Interpretation. Linear equation with n independent variables [Ref. Ch - XII (2)]

[15 Lectures]

Unit – II

Non-linear PDE of order one (20 Marks)

Different Standard Forms (i) Only p and q present (ii) Only p, q and z present (iii) $f(x, p) = F(y, q)$ (iv) Analogous to Clairaut's form. [Ref. Ch – XII (2)] .

Partial differential equations of 1st order but of any degree (i) Two independent variables. Charpit's Method (ii) Three or more independent variables. Jacobi's method [Ref. Ch – XIII (2)].

[15 Lectures]

Unit – III

PDE of second order (20 Marks)

Introduction to Higher order PDEs (constant coefficients only): Origin of second order equations [Ref. Ch – 3 (1)]. Solution of Linear Homogenous PDE with constant coefficients. To find the complete solution of the equations namely (i) $f(D, D^1)z = 0$ and (ii) $f(D, D^1)z = F(x, y)$. Equations reducible to linear form with constant coefficients [Ref. Ch – 2.9 (4)].

Monge's method of integrating (i) $Rr + Ss + Tt = V$ (ii) $Rr + Ss + Tt + U(rt - s^2) = V$ [Ref. Ch – XIV (2)].

[15 Lectures]

Unit – IV

Laplace Transformation (20 Marks)

Definition of Laplace Transformations. Kernel of the Integral transformation [Ref. Ch – 6 (3)] . Existence of Laplace Transformation [Ref. Ch – 8.1 (4)] . Transformations of some elementary functions such as $f(t) = e^{-at}$, $\cos at$, $\sin at$, $\cosh at$, $\sinh at$, t^n etc. [Ref. Ch – 6 (3)].

Properties of Laplace Transformation [Ref. Ch – 6 (3)] . First Translation or Shifting Theorem . Second Translation or Heaviside's shifting Theorem [Ref. Ch – 8.5 (4)] . Differentiation property [Ref. Ch – 6 (3)]. Change of scale property with examples [Ref. Ch – 8.5 (4)] . Laplace Transformation of Derivatives of order n with Theorems [Ref. Ch – 13.6 (5)] .

Inverse Laplace transformations. Theorems on multiplication by s and $1/s$. First and Second Shifting properties with examples [Ref. Ch – 13.20 (5)]. Convolution Theorem. Properties of Convolution, examples of Convolution [Ref. Ch – 8.16 (4)] .

Application of Laplace Transformation in solving PDE [Ref. Ch – 8.19 (4)] .

[15 Lectures]

Unit – V

Calculus of Variation (20 Marks)

Fundamental Theorem on Calculus of Variation. Definition, Euler's equations, particular cases of Euler's equation [Ref. Ch – 17 (5)]. Necessary condition for extremums . Sufficient condition for extremums of higher order variations [Ref. Ch – 10 (4)] . Legendre condition for extremum (Sufficient condition for extremum with problems) [Ref. Ch – 10.7 (4)] . Brachistochron problems. Extension of the variational case (several dependent variables) with examples.

[15 Lectures]

RECOMMENDED BOOKS

1. *Elements of partial differential equations* by **IAN SNEDDON** : Mc-Graw Hill International editions.
2. *An elementary treatise on differential equations and their applications* by **H.T.H. PIAGGIO**.
3. *Introduction to partial differential equations* by **K. Krishna Rao**.
4. *Advanced partial differential equations (with Boundary value problems)* by Pundir & Pundir.
5. *Advanced engineering Mathematics* by **H.K. Dass** .
6. *Partial Differential Equations* by **KS Bhamra**, PHI Learning Pvt. Ltd, New Delhi, 2010

REFERENCES

1. **W.E. Williams**: *Partial differential equations*, Oxford.
2. **Phoolan Prasad**: *Partial differential equations*, Wiley Eastern, New Delhi (and Renuka Ravindran) .
3. **Spiegel**: *Laplace Transform*, Schaum Outlines Series.
4. **I.N. Sneddon** : *The use of Integral Transform* , Mc-Graw Hill , New York 1972 .
5. *An Introduction to Transform Theory*, Academic Press, New York by D.V. Widder .
6. **I.N. Sneddon** : *Partial differential equations* , Mc-Graw Hill , New York .
7. **KS Bhamra & Ratna Bala** *Ordinary Differential Equations*, Allied Publishers, Delhi, 2003

BMath : 606 [SEMESTER – VI]
ANALYSIS – II [METRIC SPACE & COMPLEX ANALYSIS]
FULL MARKS – 100

UNIT-I

Metric Spaces (25 Marks)

Definition and example of a metric space, Diameter and boundedness of sets, Distance between two subsets of a Metric space, Fundamental inequalities (Holder and Minkowski), some function spaces, Subspace of a metric space. Open spheres/balls, Open sets and properties, closed sets, neighbourhood of a point, limit points, adherent Point, Interior, Exterior and Frontier points, closure of a set, Dense subsets. [Ref: CH.2 [1]]

[18 Lectures]

UNIT- II

Complete Metric Spaces (20 Marks)

Convergent sequences, Cauchy sequences, Convergence of a Cauchy Sequence, Complete spaces, Examples of complete and in-complete metric spaces, Cantor's intersection theorem. Continuous functions: Characterization of continuous functions, Uniform Continuity, Homeomorphism. [Ref: CH 3, 4 [1]]

[13 Lectures]

UNIT- III

Compactness (20 Marks)

Compact metric spaces, Sequential Compactness, Bolzano Weirstrass property, Totally boundedness, Finite intersection property, equivalence among the kinds of compactness, Continuous functions and compact sets. [CH: 5 [1]]

[14 Lectures]

UNIT- IV

Complex Analysis (20 Marks)

Limits and Continuity, Differentiability, The necessary and sufficient condition for a function $f(z)$ to be analytic, Method of constructing a regular function, Polar form of Cauchy-Riemann equations, Complex equations of a straight line and circle. [CH : 2, 5 [2]]

[18 Lectures]

UNIT –V

Conformal Mappings (15 Marks)

Definition, Jacobian of transformation, Necessary and sufficient condition for $w = f(z)$ to represent conformal mapping, Bilinear transformation and fixed points, Types of bilinear transformation, Preservance of cross ratio, Family of circles and straight lines under bilinear transformation. [CH : 7, 8 [2]]

[12 Lectures]

RECOMMENDED BOOKS

1. **P. K. Jain and K. Ahmad:** metric spaces, Narosa Publishing House, New Delhi

2. **R.V. Churchill & J.W. Brown:** Complex variables and Application (5th Edition) Mc Graw Hill International Editions.

REFERENCES

1. **G.F. Simmons:** Introduction to Topology and Modern analysis, Tata Mc Graw Hill Education Private Limited, New Delhi.
2. **S.Lipchut:** General Topology, Schaum's Outline Series, Mc Graw Hill Book Company.
3. **S.C.Malik, Savita Arora:** Mathematical Analysis, New Age International (P) Ltd.:(Chapter 19)
4. **E.T. Copson:** Metric Spaces, Universal Book Stall, 5 Ansari Road, New Delhi-11
5. **H.S.Kasana:** Complex Variables(Theory and Applications), Prentice Hall of India, P. Ltd, New Delhi
6. **John B. Conway:** Functions of One Complex Variable, Narosa Publishing House.
7. **L.V.Ahlfors:** Complex Analysis, Mc Graw Hill Book Company.
8. **Murray R. Spiegel:** Complex Variables, Schaum's Outline Series, Mc Graw Hill Book company.
9. **Shanti Narayan and P. K. Mittal:** Theory of Complex Variables: S Chand And Company Ltd. Ram Nagar, New Delhi.
10. **R.K.Ghosh & K.C.Maity:** Differential Calculus(an introduction to analysis)Part-II(including Metric Spaces and Complex Analysis) New Central Book Agency(p) Ltd. Kolkata.

OPTIONAL PAPER – BMath - 607

BMATH : 60701 [SEMESTER – VI] HIGHER MECHANICS [OPTIONAL PAPER]

Full Marks – 100

UNIT-I

System of Particles (8 Marks)

Centre of mass, centre of gravity, momentum, conservation of Linear momentum, Angular momentum, kinetic Energy, conservation of Energy for a system of particles.

[6 Lectures]

UNIT-II

Motion of rigid bodies (30 Marks)

Generalized coordinates for rigid body, translational and rotational motion Angular momentum, moments and products of inertia, Kinetic Energy due to rotation, kinetic energy in terms of inertia tensor, principal axes, Principal moments of inertia, Euler's angle, Euler's geometrical equations, rate of change of vector, coriolis forces, Euler's equation of motions,

[20 Lectures]

UNIT-III

Lagrangian Mechanics (25 Marks)

Generalized Coordinates, degrees of freedom, generalized force, generalized momenta. Holonomic, non-holonomic, Scleronomic and Rheonomic systems, virtual works, D'Alembert's principle, Kinetic Energy as quadratic functions of generalized velocities, Lagrangian of a force system, Lagrange's Equations of motion. Applications to S.H.M. Compound pendulum, projectile, central orbit, motion of a particle on the Earth's surface.

[20 Lectures]

UNIT-IV

Hamiltonian Mechanics (25 Marks)

Configuration space, system point, Hamiltonian of a force system, relation between Lagrangian and Hamiltonian of a system, Hamilton's Principle, Physical significances of Hamiltonian, Derivation of Hamilton's Principle from Lagrange's Equations and Vice-Versa, Derivation from D'Alembert's Principle, Hamilton's Canonical Equation of motion, advantages of Hamiltonian approach over Lagrangian approach, meaning of Action in Hamiltonian sense, Least action Principle.

[20 Lectures]

UNIT-V

Canonical Transformation (12 Marks)

Meaning and conditions for a transformation to be canonical, Examples, Lagrange's bracket, Poisson's bracket and their elementary properties, equations of motion in Poisson's bracket.

[10 Lectures]

RECOMMENDED BOOKS

1. **S.L Loney** : An Elementary treatise on Dynamics of a particles and rigid bodies.
2. **G.Aruldas** : Classical Mechanics, Prentice Hall of India, Private Limited, New-Delhi-2008.
3. **H. Goldstein** : Classical Mechanics Narosa Publishing House, New Delhi-1985
4. **C.R. Mondal**: Classical Mechanics, Prentice hall of India New Delhi.

REFERENCES

1. **Murray R. Spiegel**: Theoretical Mechanics Mc Graw Hill Book Company, New Delhi.
2. **K. Shankara Rao**: Classical Mechanics Prentice Hall of India.
3. **R.G. Takwale** and **P.S. Puranik**: Introduction to Classical Mechanics, Tata Mc Graw Hill Publishing Company, New Delhi

BMATH : 60702 [SEMESTER-VI] FLUID MECHANICS [OPTIONAL PAPER]

Full Marks: 100

Unit I

Kinetics (30 Marks)

Eulerian and Lagrangian description of fluid motion. Concept of local and convective accelerations. Steady and Non-Steady flows. Stream lines and path lines. Equation of continuity in different forms. Irrotational and Rotational flows. Controlled volume analysis for mass, momentum and energy. Velocity potential.

[25 Lectures]

Unit II

Equation of Motion (30 Marks)

Equations of motion-Eulerian and Lagrangian. Pressure equation, Bernoulli's equation and its applications, Cauchy's integrals. Motion under the action of impulsive forces. Sources, Sinks, Doublets and their Images.

[25 Lectures]

Unit III

Dimensional Analysis (25 Marks)

Concept of Geometric, Kinematic and Dynamic Similarities, Concept of Fluid rotation, Vorticity, Stream function and Potential function, Potential flows, Elementary flow fields and Principle of superposition.

[15 Lectures]

Unit IV

Vortex Motion (15 Marks)

General theorem (vortex motion and its properties), Rectilinear vortices, Motion under circular and rectilinear vortices.

[10 Lectures]

RECOMMENDED BOOKS

1. **G.K. Batchelor**, An introduction to Fluid Mechanics, Cambridge Univ. Press 1967.
2. **F.Chorlton**, Text Book of Fluid Dynamics, CBS Publication, Delhi 1985.

REFERENCES

1. **AJ Chorin & JF Mursden**, mathematical introduction to Fluid dynamics 1993
2. **L.D. Landau and F. M. Lifshitz**, Fluid Mechanics, Pregmon Press 1985.
3. **O'Neil and F. Chorlton**, Ideal and incompressible Fluid Dynamics, Ellis Horwood Ltd. 1986

BMath : 60703/[SEMESTER – VI]

PROBABILITY THEORY [OPTIONAL PAPER]

FULL MARKS - 100

Unit-1

Continuous probability distributions (22 Marks)

Continuous probability distributions - uniform, exponential, rectangular, beta gamma distributions, probability generating functions.

[17 Lectures]

Unit-2

Generating functions & Convergence (22 Marks)

Moment inequalities-Holder, Minkowsky, Schwarz: Weak and strong convergence of random variables, almost sure convergence, Convergence in r 'th mean.

[16 Lectures]

Unit-3

Convergence of distribution functions (18 Marks)

weak and complete convergence of distribution functions: probability inequalities: Chebyshev, Markov and Jensen.

[14 Lectures]

Unit-4

Normal distribution (20 Marks)

Normal distribution as limiting case of binomial distribution, properties of normal distribution, normal probability curve, area under normal curve, Characteristic functions and its properties.

[15 Lectures]

Unit-5

Central Limit Theorem (18 Marks)

Univariate distribution, Transformation, Bivariate normal distribution and its properties. De Moivre Laplace limit theorem, Liapunov theorem (without proof) and applications of central limit theorem.

[13 Lectures]

RECOMMENDED BOOKS

1. **B.R Bhatt**, Modern Probability Theory, Wiley Eastern Ltd, 1989
2. **P. Mukhopadhyay** Theory of Probability, New Central Book Agency, Kolkata, 2002
3. **Kai Lai Chung**, A Course in Probability Theory, 3/e. Academic Press, 2001

REFERENCES

4. **M. H. DeGroot, M. J. Schervish** : Probability and Statistics, Addison Wesley, 2001
5. **Sheldon Ross**, A First Course in Probability, Prentice Hall, New Jersey, 2002
6. **William Feller**, An Introduction to Probability Theory and Its Applications, Volume 1, John Wiley and Sons, Inc., New York, 1971
7. **A. N. Kolmogorov**, Foundations of the Theory of Probability, 2nd ed., AMS, 1997
8. **Richard Durrett**, Probability: Theory and Examples 2/e, Duxbury Press, 1995
9. **J N Kapur & H C Saxena**, Mathematical Statistics, S. Chand, 1961

BMATH : 60704 [SEMESTER – VI]

CRYPTOGRAPHY [OPTIONAL PAPER]

FULL MARKS - 100

Unit -1

Prerequisites of Number theory (22 Marks)

Prime numbers, Fermat's theorem (without proof), Euler's theorem; Primality test- Methods of Naïve, Fermat, Miller- Rabin, Leonard Adleman and Huang, probability, fast deterministic, number theoretic tests. Chinese Remainder Theorem, discrete logarithms.

[17 Lectures]

Unit-2

Cryptography & Information Security (18 Marks)

Information security, security attacks, services and mechanisms, conventional encryption techniques, substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers.

[12 Lectures]

Unit-3

Block Ciphers and DES (21 Marks)

Block cipher principles, Data Encryption Standards (DES), strength of DES, differential and linear cryptanalysis of DES, block ciphers models of operation, triple DES, IDEA encryption and decryption, traffic confidentiality, key distribution, random number generation.

[16 Lectures]

Unit-4

Public Key Cryptography (20 Marks)

principles of public key cryptography, prime and related prime numbers, modular arithmetic, key management, authentication, key length and encryption strength, RSA algorithm, security of RSA key management.

[15 Lectures]

Unit-5

DSS & IP Security (20 Marks)

Authentication functions, and message authentication codes, digital signatures, authentication protocols, digital signature standards (DSS) digital signature algorithm. IP security and its overview, intruders, viruses and related threats, firewall design principles

[15 Lectures]

RECOMMENDED BOOKS

1. **William Stallings**, Cryptography and Network Security, Principles and Practice, Prentice Hall of India, New Delhi, 2007
2. **V. K Pachghare**, Cryptography and Information Security, PHI Learning (P) Ltd, New Delhi, 2009

REFERENCES

3. **Johannes A. Buchman**, Introduction to cryptography, Spiringer Verlag
4. **Bruce Schneier**, Applied Cryptography, Addison Wesley, 2001

BMATH :60705 [SEMESTER - VI] SPHERICAL TRIGONOMETRY AND ASTRONOMY [OPTIONAL PAPER]

Unit I

Spherical Trigonometry (30 marks)

Spherical triangle, Polar triangle, properties of Polar and Spherical triangles. Sine formula, Cosine formula, Four parts formula, Sine cosine formula, Cotangent formula, Napier's analogies, Delambre's analogies.

Right angled spherical triangle. Formulae relating to the right spherical triangles. Area of a spherical triangle. Area of a spherical polygon.

[20 Lectures]

Unit II

Celestial sphere (20 marks)

Three systems of celestial coordinates. Rectangular coordinates. Sidereal time. Rising and setting of stars. Circumpolar stars. Rate of change of zenith distance and azimuth. Twilight. Motion of the Sun. Vernal and Autumnal Equinox. Summer and Winter Solstice. Different kinds of time. Seasons.

[17 Lectures]

Unit III

Refraction, Precession and Nutation (20 marks)

Laws of Refraction. Cassini's hypothesis. Simpson's hypothesis. Bradely's formula. Effect of refraction on (1) sunrise and sunset (2) the right ascension and declination of a star (3) in the distance between two neighbouring stars (4) on the shape of the disc of the sun.

Precession on the right ascension and declination of a star. Nutation in the right ascension and declination of a star. Precession and nutation both on the right ascension declination of a star.

[16 Lectures]

Unit IV

Aberration, Parallax (20 marks)

Annual and diurnal aberration. Annual aberration in (1) ecliptic longitude and latitude (2) right ascension and declination of a star. Diurnal aberration in (1) hour angle and declination (2) zenith distance and azimuth.

Geocentric parallax and Annual parallax. Geocentric parallax in (1) right ascension and declination (2) the distance between two planets (3) azimuth and zenith distance. Annual parallax in (1) latitude and longitude (2) right ascension and declination.

[16 Lectures]

Unit V

Planetary motion (10 marks)

Synodic and orbital Period. Kepler's laws. Deduction of Kepler's laws from Newton's laws of Gravitation.

[6 Lectures]

RECOMMENDED BOOKS

1. **M. Ray** : *Spherical Trigonometry*
2. **M. Ray** : *Spherical Astronomy*
3. **K.K. De** : *Text Book of Astronomy*, Book Syndicate Pvt. Ltd., Kolkata

REFERENCES

1. **W.M. Smart** : *Text Book of Spherical Astronomy*, CUP-VIKAS Student's Edition
2. **W.M. Smart** : *Foundation of Astronomy*, CUP-VIKAS Student's Edition
3. **Gorakh Prasad** : *Text Book on Spherical Astronomy*, Pothisala Pvt. Ltd., Allahabad
4. **Standy P. Wyatt** : *Principles of Astronomy* : Allyn and Bacon, Inc

**BMath : 60706 [SEMESTER – VI]
COMPUTATIONAL MATHEMATICS LABORATORY
[OPTIONAL PAPER]**

FULL MARKS 100

[THEORY – 50 (DURATION – TWO HOURS)]
[PRACTICAL – 50 (DURATION – TWO HOURS)]

UNIT-I

(20 Marks)

Simple arithmetical operations, variables, round-off errors, formatting printing, common mathematical functions, script M-files, File Input-Output. Two-dimensional graphics, three-dimensional graphics **[15 Lectures]**

UNIT-II

(10 Marks)

Generating matrices, colon operator, manipulating matrices, simple arithmetical operations, operator procedure, common mathematical functions, data manipulation commands, sparse matrices **[10 Lectures]**

UNIT-III

(10 Marks)

Solving linear system of equations-square linear system, Catastrophic round-off error, over determined and undetermined linear system, Initial-valued ordinary differential equations.

[12 Lectures]

UNIT-IV

(10 Marks)

Programming in MATHLAB-Flow control and logic variables, matrix relational operators and logical operators, function M-files.

[8 Lectures]

UNIT - V

PRACTICAL - 50 MARKS (List of practical topics based on MATLAB)

[30 Lectures]

1. Plotting of functions
2. Matrix operations, vector and matrix manipulation, matrix function
3. Data analysis and curve fitting
4. Use of FFT algorithm
5. Numerical Integration
6. Differential equations
7. 2-D graphics and 3-D graphics-general purpose graphic functions, colour maps and colour functions
8. Sparse matrices-iterative methods for sparse linear equations, eigenvalues of sparse matrices.

Instructions for Practical [**Two Programs Only** a) Program writing 10 marks, b) Output – 30 marks c) Viva Voce 5 marks d) Note book 5 marks]

RECOMENDED BOOKS:

1. **MATHLAB**-High performance numeric computation and visualisation software: User's guide
2. **A MATHLAB Tutorial**-Ed Doverman, Dept. Of Math., Ohio State University.

BMath : 60707 [SEMESTER – VI]
SPECIAL THEORY OF RELATIVITY & TENSORS
[OPTIONAL PAPER]

FULL MARKS 100

Unit-I

Basic Aspects of STR (10 Marks)

Inertial frames, Galilean transformation, Michelson – Morley' experiment. The relativistic concept of space and time, Postulates of special theory of relativity,

[10 Lectures]

Unit-II

Relativistic Kinematics (20 Marks)

Lorentz transformation equations, the general Lorentz transformation equations, Consequences of Lorentz transformation equations like Relativity of simultaneity, Einstein's time distillation or apparent retardation of clocks, Relativity of space - Lorentz – Fitzgerald contraction and related problems.

[18 Lectures]

Unit-III

Relativistic Dynamics (25 Marks)

Redefined momentum, The relativistic force Law and the Dynamics of a single particle, Equivalence of Mass and Energy, $E = mc^2$ and its consequences.

[15 Lectures]

Unit-IV

Relativistic Mechanics (15 Marks)

Transformation properties of Momentum, Energy, Mass and Force.

[10 Lectures]

Unit-V

Tensors (30 Marks)

Space of N-dimension, Transformation of co-ordinates, contravariant and covariant vectors (Tensor of first order), Tensor of second order (or of rank two), Tensors of higher rank (or higher orders), Mixed tensors, Kronecker delta symbol, Invariant or scalar, Algebraic operations with tensors, Addition & subtraction of tensors, contraction, product of tensors, Inner Product, symmetric and Skew symmetric tensor.

[22 Lectures]

RECOMMENDED BOOKS

1. **M. Ray** : Special Theory of Relativity.
2. **A. Das** : The Special Theory of relativity.
3. **Banerjee and Banerjee** : The Special Theory of relativity, Prentice Hall of India, New Delhi.
4. **Resnick**: Special Theory of relativity, John Wiley.

REFERENCES

1. **Dirac** : General Theory of Relativity, Prentice Hall of India, New Delhi.
2. **S.K. Bose**: General Theory of Relativity, Wiley Eastern Ltd.

BMath - 60708 [SEMESTER-VI]
ALGEBRAIC CODING THEORY [OPTIONAL PAPER]

FULL MARKS - 100

UNIT 1

(Mark-20)

Elements of Coding Theory, Introduction, Encoding and Decoding messages, Binary Symmetric Channel, Block Codes, Parity Check Code, Hamming Code, Hamming Distance, Linear Codes, Hamming and Lee Matrices, Parity Check and Generator Matrices.

[15 Lecture]

UNIT 2

(Mark-20)

Description of Linear Codes by Matrices, Coset decomposition of Linear Codes, Step by Step Decoding, Modular Representation, Linear Code Equivalence, Dual code.

[15 Lecture]

UNIT 3

(Mark-25)

Weight Distribution and Mac-Williams Identities, Maximum-Distance separable(MDS) Codes, Generator and Parity check matrices of MDS Codes, Weight distribution of MDS Code, Necessary and sufficient condition for a linear code to be an MDS code. (Lecture-20)

UNIT 4

(Mark-20)

Bounds for Burst error detecting and correcting Linear Codes, Perfect and Quasi-perfect Codes, Binary Hamming Codes, Golay Codes, Cyclic Codes, Matrix Description of a systematic cyclic code, Error Detection, Shorten Cyclic code, Code Symmetry,

[15 Lecture]

UNIT 5

(Mark-15)

Reed-Muller Codes, Hadamard Matrices and Hadamard Codes, Product Codes, Low-Density Codes, Concatenated Codes.

[10 Lecture]

RECOMMENDED BOOKS

1. Error-correcting codes by **F.J.Mac Williams** and **N.J.A Sloane**, North Holland Publishing Company, 1977
2. Error-Correcting Codes by **W.W.Peterson** and **E.J Weldon, Jr.** MIT press, Cambridge, Massachusetts, 1972

REFERENCES

1. Algebraic Coding Theory by **E.R.Berlekamp**, McGraw Hill Book Co, New York, 1968

2. **Juergen Bierbraver**, Introduction to Coding Theory, Chapman and Hall/CRC, London, New York, 2008
3. **Roberto Togneri** and **Christopher J. de Silva**, Fundamentals of Information Theory and Coding Design, Chapman And Hall/CRC, London, New York, 2008