BERHAMPUR UNIVERSITY
COURSES OF STUDIES

FOR
THE +3 BACHELOR OF SCIENCE
(Under Revised Structure)

First Year Examination - 2014
Second Year Examination- 2015
Final Year Examination, 2016
The Course structure and marks distribution for B. A. (Pass) shall be as follows:

<table>
<thead>
<tr>
<th>First year</th>
<th>Second Year</th>
<th>Final Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>50</td>
<td>Major Elective –II 100</td>
</tr>
<tr>
<td>Environmental studies -100</td>
<td>Pass –A – II 100</td>
<td>Pass – A – IV 100</td>
</tr>
<tr>
<td>Minor Elective</td>
<td>100</td>
<td>Pass - B-I 100</td>
</tr>
<tr>
<td>Major Elective</td>
<td>100</td>
<td>Pass –B -II 100</td>
</tr>
<tr>
<td>Total-</td>
<td>400</td>
<td>500</td>
</tr>
</tbody>
</table>
A candidate in B. Sc. (PASS) shall choose two pass subjects each carrying 400 marks besides compulsory and elective papers. Subject with practical shall have 25% Practical and 75% theory. There shall be two electives, one major carrying 200 marks with two papers of 100 marks each and one minor carrying 100 marks. In the pass subjects having practical components. Paper A-I and A-II or (B-I and B-II) will be broken up as 75 (Theory), 75 (Theory) and 50 (Practical). Similarly, A-III and A-IV or (B-III and B-IV) will be broken up as 75 (Theory), 75 (Theory) and 50 (Practical).

**B.A. (HONOURS.)**

The course structure and marks distribution for B. A. (Hons.) shall be as follows.

<table>
<thead>
<tr>
<th>First year</th>
<th>Second Year</th>
<th>Final Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 50</td>
<td>Major Elective-II 100</td>
<td>Indian Society and Culture – 100</td>
</tr>
<tr>
<td>Environmental Studies-100</td>
<td>Pass – A – II 100</td>
<td>Pass – A – IV 100</td>
</tr>
<tr>
<td>Minor Elective –100</td>
<td>Honours P-III 100</td>
<td>Honours Paper-VI 100</td>
</tr>
<tr>
<td>Major elective – I 100</td>
<td>Honours P-IV 100</td>
<td>Honours Paper-VII 100</td>
</tr>
<tr>
<td>Honours – P-I 100</td>
<td>Honours P-V 100</td>
<td>Honours Paper-VIII 100</td>
</tr>
<tr>
<td>Honours – P-II 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total- 600</td>
<td>600</td>
<td>600</td>
</tr>
</tbody>
</table>
A B. Sc. Honours candidate shall choose an Honours subject carrying 800 marks. One pass subject carrying 400 marks. One minor elective carrying 100 marks and one major elective carrying 200 marks. Consisting of two papers each carrying 100 marks. Besides Compulsory papers Subject(s) with practical shall carry 75% theories and 25% practical. In Honours subjects having practical components, Paper–V and Paper – VIII are practicals of 100 marks each. In Mathematics Paper – VIII is either practical or theory.

Minor Elective Paper; In Science (Both Honours and Pass) a student with Life Science (Botany, Zoology etc) as pass or Honours shall take one Minor Elective Paper on “Mathematics” or Statistics for Biology Students” carrying 100 marks where as the other student of Physical science) shall take “Biology for Physical Science students “ as minor Elective carrying 100 marks.

A B. Sc. (PASS) Student shall choose one subject as Major Elective form among the following subjects or other subject(s) to be decided by the University according to suitability and availability of subjects in the college, carrying 200 marks with two papers of 100 marks each (without any practical component).

Biotechnology (to be taught by Biology teachers). Non-conventional Energy Resources (to be taught by Physics and Biology Teachers). Remote Sensing (to be taught by Physics and Geology teachers). Polymer Science (to be taught by Chemistry Teachers) and Disaster Management (to be taught by all group of science teacher) Industrial Chemistry (to be taught by Chemistry Teacher) Conservation and Management of Natural Resources (to be taught by Physics and Biology teachers). Material Science (to be taught by Physics and Chemistry teachers) Pisciculture (to be taught by a Biology Teacher) Sustainable Agriculture practice (to be taught by Biology Teachers). Computer
Application (to be taught by teacher in Physics and mathematics or Computer Science where computer science teachers are available). Life Science (Covering Botany, Zoology, Microbiology, Biochemistry Environmental Biology, Genetics etc to be taught by Biology Teachers) (Physics, Chemistry, Mathematics, Statistics, Anthropology, Geography, Life Science, Phycology, Environmental Science). Provided that a student (Honours of Pass) choosing any of the subject like, Life Science, Physics, Chemistry, Mathematics, Statistics, Anthropology, Geography, Phycology, Environmental Science as Honours or Pass shall not be allowed to offer corresponding subject as a Major Elective paper.

**ENGLISH (COMPULSORY)**

First Year.  

Full Mark-50

There shall be one paper of 2 hours duration, carrying 50 marks. Alternative questions are to be set on each of the Units mentioned below.

**Unit-I**

One essay type question on the anthology of essays or One essay type question on the anthology of short stories.  

15 marks

**Unit-II**

Four short question on each of the text prescribed. (4 x 2.5 marks = 10 marks)

**Unit-III**

Five objective/multiple choice type questions to be set on an unknown prose passage, carrying 2 marks each.  

5 x 2 = 10 marks
Unit-IV

(Language Skills) (15 marks)

Objective / Multiple choice questions are to be set carrying 1 mark each.

(15 x 1)

Communicative Skills

Verbal and Non-Verbal: Spoken English

Language Function: Descriptive Expressive and Social.

Purpose of Speaking and writing: To instruct: To inform: To find out: To influence:
To Regulate: To entertain and to record.

Bias free and Plain English

Formal and informal English

Communicative Grammar:

Time, Tense and Aspect.

Verbs of State and events.

Statements, Questions and Responses.

Omission of information.

Expressing emotion and attitude: hope, pleasure, disappointment, regret, approval, surprise.
BOOKS PRESCRIBED:

1. English for students of Science
   Ed by Roy and Sharma, Topics: 2,4,9 and 10

2. Delight and Wisdom

Topics to be studied:

1. The Gift of Masgi: O Henry
2. The Kabuliwala: R. Tagore
3. The Gold Frame: R. K. Laxman
4. The Lion’s Skin: Somerset Mougham

3. Mastering Basic skills of communicative English & Business Communication
   By Dr. Mohajiteswar Das (New Age Publication)

4. Contemporary Communicative English
   S. Chand Publication by Dr. Shruti Das

M. I. L. (ODIA)
M. I. L. (HINDI)

FIRST EXAMINATION

UNIT-I

TIME – 2 HOURS

FULL MARKS – 50

Prose Text

( 15 marks)

One Long question – 10 marks

One annotation – 05 marks

Text Book; Nibedita Chayan: Ed. By

Dr. Sudhansu Kumar Nayak, Vidya Sagar, Manik Ghosh Bazar, Cuttack.

PIECES TO BE STUDIED.

1. Gram Laxmi Ki Upasana – Binoba Bhave
2. Bharatiya Sanskriti – Dr. Rajendra Prasad.

Unit-II

Standard Hindi Spelling ( 10 marks)

(One Long question)


Unit-III
**Translation (English to Hindi) (10 marks)**

**Unit-IV**

**(Précis Writing) (10 marks)**

**Unit-V**

**Sabda Suddhi (05 marks)**

**BOOKS FOR REFERENCE:**

2. Samanya Hindi – Dr. Sudhansu Kumar Nayak, vidya Sagar, Manika Ghosh Bazar, Cuttack.
3. Anuprayogik Hindi – Dr. Krishna Kumar Goswami, Arunodaya Prakasan, Delhi.

**M. I. L. (TELUGU)**

**FIRST YEAR EXAMINATION B. SC.**

There shall be one paper carrying 50 marks of 2 hours duration to be conducted at the end of first year B. Sc.

**Unit-I**

**Poetry:** 15 marks

1. Sakuntalo Pakhyanam – Nannaya Bhattu
2. Droupadi Paridevanam – Tikkana
3. Sri Krishnum Balakreedalu – Yeranna
4. Desabhakti – Gurajada Apparoa
5. Prabodhamu – Rayaprolu Subba Rao

Unit-II

Prose

1. Sweeya Charitra – Chllakamarti Lakshminarasimham
2. Andhra Kavita Prabandha Yugamu – Veturi Prabhakara Sastri
3. Tikkana Lenugu Teeru Lennulu – Timmavajhala Kodandaramayya
4. Seshendra Sahitya Vimarsa – Prof. Konka Yodagir
5. Annamayya Pada Sourabham – Dr. Singupuram Narayana Rao

Unit-III

Non Detail (10 marks)

Ekaveera

Unit- IV

General Essay (10 marks)

BOOKS PRESCRIBED:

1. Sahitya Lahari – by Dr. Singupuram Narayana Rao
2. Ekaveera – by Viswanadha Satyanarayana.

M. I. L. ( BENGALI)
FIRST YEAR EXAMINATION

2 Hours duration Full marks – 50

M. I. L (BENGALI)

Unit-I

There shall be one long question carrying 10 marks with alternative. There shall be one short question or an explanation carrying 5 marks with alternative.

Unit-II

There shall be one long question carrying 10 marks with alternatives. There shall be one short question or an explanation carrying 5 marks with alternative.

Unit-III

There shall be one essay carrying 20 marks with alternatives.

BOOKS RECOMMENDED

1. Kamalakanter Depter – Bankim Chandra Chatterjee. The following Piece to be studied:
   a) Manusya Phal
   b) Patanga
   c) Bada Bazar
   d) Amar Mon
   e) Bidal

   The following pieces are to be studied.
a) Sonar Tari  
b) Vaisnava Kavita  
c) Dut Pakhi  
d) Deul  
e) Basundhara  
f) Nirudesh Yatra  
g) Parash Pathar  
h) Daridra

Time – 2 hours  

M. I. L. (Urdu)  
Total Marks – 50

FIRST YEAR EXAMINATION

Unit-I (Prose) 15 marks

There shall be one long question carrying 15 marks with an alternative.

Unit-II (Poetry) (15 marks)

There shall be one long question carrying 10 marks with alternative and one explanation of 05 marks with alternative and one explanation of 5 marks with alternative

Unit-III (Non-detailed) (10 marks)

There shall be one long question carrying 10 marks with alternative.

Unit-IV (Grammar) (10 marks)

There shall be 2 questions each carrying 5 marks with alternative.

PROSE AND POETRY
BOOKS RECOMMENDED


POINTS TO BE STUDIED.

PROSE.


POETRY

Meer, Sauda, Dard, Dastan Shanzada Ke Ghaib, Honki Admi Name: Sabeh Shahadat, Ghazal Ghalib Nishate – e – Ummid, Ghazal (Shad), Ghazal (Hasrat) Aima mader Hindustan (Janual Mazheri) Ghazal (Mahiuddin) Ghazal (Jan Nasar) Akhter Ghazal (Nasir Kazmi).

NON-DETAILED STUDY

ZIDDI : (Novel) by Ismat CHUTAL

Publisher Educational Book House, Aligarh.

Or

Ibnul Wiqut by – Dr. Nazir Ahamed.


GRAMMAR
ALTERNATIVE ENGLISH

FIRST EXAMINATION (Full Marks – 50)

There shall be one paper of 2 hours duration, carrying 50 marks. Alternative questions are to be set on each of the units mentioned below:

Unit-I

One essay type question on the novel or one essay type question on the anthology of essays. 15 marks.

Unit-II

Four short questions on the Novel Or on the essays prescribed. (4x2.5=10 marks)

Unit-III

Paragraph writing on a given scientific topic. (10 marks)

Unit-IV

“Web designing on a scientific topic. (10 marks)

Or

Curriculum vitae, or Resume Bio-data (Chronological and Functional with a application for Job”. (10 marks)

Unit-V
(Language Skills) 05 marks

Re-writing sentence as directed, basing on transformation of sentences, correction of errors, word order etc.

BOOKS PRESCRIBED

1. The Old man and the Sea. – By Ernest Hemingway.

INDIAN SOCIETY AND CULTURE

Section – Indian Society:

Unit-I


Unit-II

Processes of Socio-Cultural change in India: Sanskritization, Secularization. Westernization, Modernization and Democratization.

Unit-III

Globalisation and its impact on Indian Society, Local response to globalisation and the role of civil society.

Section – II – Indian Culture:
Unit-I

Roots of Indian culture: Concept of Bharatavasha, religious faith and belief, Social Systems in vedic Age.

Characteristics of Indian Culture: Protestant Religious Movements during 6th century B. C. Culture attainments with reference to the Gupta period.

Unit-II

Cultural Expansion: Overseas trade and commerce and its impact on South-East Asia.

External impact on Indian Culture: Hellenistic impact on art and architecture, impact of Islam on Indian life, Socio-religions reform movements: Bhakti Movement, Brahmo Samaj and Arya Samaj.

Unit-III

Nationalism in India: Freedom struggle and the role of Gandhi, Nehru Subhas and Jinna.

BOOKS RECOMMENDED:

1. Indian Society and Culture by H. S. Patnaik, Kharavela Mohanty
2. Social and Economic History of India by S. C. Ray Choudhury
3. Indian Society and Culture by Prof. N. R. Patnaik
4. Evolution of Indian Culture by B. N. Lumiya
5. The wonder that was In India by A. L. Basham
6. Indian Society and Culture by S. K. Jena
7. Bharatiya Samaj and Sanskruti (Oriya) by Dr. Trilochan Mishra.
ENVIRONMENTAL STUDIES (COMPULSORY)

The theory paper shall carry 100 marks.
The Course is to be covered in 50 lectures.
The Examination shall be of 3 hours duration

Ten Essay type Question covering all units to be set, out of which the students will answer 5 questions.

Unit-I

Basic Concepts of Environmental Studies.

- The environment, Lithosphere, Hydrosphere, Atmosphere and Biosphere.
- Ecology, Ecosystem, Environmental factors; (Abiotic factor – Light, Temperature, Soil & Water) Biotic factor, Ecological adaptation (Plant and Animal)
- Scope and importance of Environmental Studies, Need for Public awareness and Environmental Education.

Unit-II (Ecosystem Dynamics)

- Concept of Ecosystem: Ecosystem structure (Biotic and Abiotic Components) Functions of Ecosystem: Energy Flow within Ecosystem, food chain, food web, Ecological Pyramids, Bio-Geochemical cycles.
- Types of Ecosystem: Aquatic ecosystem (Fresh water, Marine and Wetland), terrestrial ecosystem (Grassland and forest)
- Population Ecology: Population density, Natality, Mortality, Population age structure, Population growth forms, carrying capacity,
- Community Ecology, Ecological Succession: Hydrosere & Xerosere.
Unit-III (Biodiversity and conservation ecology)

- Biodiversity: Definition, Genetics, Species, and Ecosystem diversity, value of Biodiversity, Hot-spots of Biodiversity
- Threats to Biodiversity: Habitat loss, poaching of wild life, Endangered and endemic species of India.
- Sustainable Development: Meaning and Implication.
- Water conservation: Rain water harvesting, Watershed management
- Soil Conservation.

Unit-IV (Environmental Pollution and control)

- Definition of Pollution, Air Pollution, Water Pollution, Terrestrial pollution, Noise pollution, Radiation Pollution, Bio-concentration & Biomagnification.
- Sewage and Sewerage treatment
- Solid Waste management: Cause, effects and control measures of Urban and Industrial wastes.
- Disaster Management: Flood, earthquakes, cyclones and landslides,
- Climate change, global warming, acid rain, ozone layer depletion,
**Unit-V (Natural Resources, Human Population and Environment)**

- **Types** of Natural resources, Forest as a renewable resource: Need of forest, use and over exploitation of forest, Deforestation and their effects on tribal people, Afforestation & Social forestry.
- **Water resources**: Use and over utilisation of surface and ground water.
- **Energy resources**: Growing energy needs, renewable and non-renewable energy resources, use of alternate energy source.
- **Land Resources**: Land degradation, Soil erosion and desertification.
- **Population Explosion**
- **Environment and Human Health.**

**BOOKS RECOMMENDED**

1. Text Book of Environmental Studies (+3 Arts, Science, Commerce) Ashok Kumar Panigrahi and Alaka Sahu. (Giribala Publication, Berhampur)
2. Parivesh Bigyan (+3 Arts, Science, Commerce) Alaka Sahu and Ashok Kumar Panigrahi. (Giribala Publication, Berhampur)

**Further Reading**

5. Fundamentals Air Pollution: P. C. Mishra
6. Concept of Env. Studies. Dr. R. N. Mishra
7. Fundamental of Env. Studies Dr. N. K. Tripathy.
8. Man and Environment Dr. M. C. Dash.

MINOR ELECTIVE

MATHEMATICS FOR BIOLOGY STUDENTS (100 Marks)

1. a) Calculus 75 marks

Limits continuity and differentiability

Derivation of functions

Higher order Derivations

Partial order derivative

Tangent and normal maxima and minima.

Indeterminate forms, Integration and Definite Integrates, Differential Equations (1st order and 1st Degree linear equations. Homogeneous Equations) linear Equation with high order.

b) Statistics 25 marks

Average, Mode, Median, central Tendency Measurements of dispersion.

BOOKS RECOMMENDED

G. Samal, Higher Secondary Mathematics Vol. 1 – Bidyapuri Prakasan

Vol – II – Bidyapuri Prakasan.

STATISTICS FOR BIOLOGY STUDENTS (100 Marks)
Unit-I

Definition of functions- simples of different kinds of functions Ex ponetial and logarithmic functions and their graphs solving problems using log tables.

Principle of counting, formula for permutation and combination with and without repetition (derivation of formula is not required). Statement of Binomial theorem with application to simple problems.

Unit-II Calculus


b) Anti Derivative : Definition of anti derivative, anti derivative of simple functions, integration as the reverse process of differentiation, integration by parts, simple problems of integration and solution of differential equation of type \( \frac{dy}{dx} – Kf \(X) \) and \( \frac{dy}{dx} – f \(X) g \(Y) \).

Unit-III


b) Ideas of Population and sample, moment, skewness and kurtosis, concepts of random variable, Univariate distribution: Binomial Poisson, Exponential and Normal distribution, Their means and variances, Area under Normal Curves.
Unit-IV

Bivariate distribution, scatter diagram, regression lines, regression coefficients, fitting of curves by least square principle, (Polynomial Exponential and logarithmic).

Correlation coefficient, rank correlation, correlation ratio, infraclass correlation coefficient, partial and multiple correlations, Regression plane (three variables only)

Theory of attributes: Consistency of data, interdependence of attributes, measures of association.

Unit-V

Test of significance, Null and Alternative hypotheses, level of significance, Type-I error and Type – II error. Description of chi-square, t and F statistics, (without derivation of distribution functions), test of mean and variance of normal population, test of equality of two means and tests of equality of two variances of two normal populations, other uses of chi-square t and F. Statistics, large sample tests.

Each Unit carries 20 marks.

BOOKS RECOMMENDED

1. Topics in Mathematics: By G. Das and others
2. Theory of Matrices by B. S Vatasa
3. Statistical Methods and concepts by M. N. Das (Wiley Eastern Ltd.)

BIOLOGY FOR PHYSICAL SCIENCE STUDENTS (100 Marks)

Unit-I Cell Biology
Unit-II Diversity of Plants and animals

Unit-III Environmental Biology and pollution.

Unit-IV Physiology & Biochemistry

Unit-V Biodiversity and conservating of Bio resources.

Unit-I


Unit-II

Virus, Bacteria, Economic importance of Algal, Lichen and microbes and fungi (Yeast, Pancillium), Amoeba, malarial parasite, earthworm, Human health (Air & Water borne diseases) Sanitation.

Unit-III

Structure and function of Ecosystem, Ecological factors, (climatic, edaphic, biotic) Primary production, Energy flow and BGC cycles, Environmental Pollution (Soil, Air, Water), Environmental awareness and Education, Ozone depletion, Green house effect.

Unit-IV

Metabolism of carbohydrate and protein, enzyme classification and function, Fat metabolism, Photosynthesis, Respiration. Nitrogen metabolism.

Unit-V
Conservation of bio resources (Forest, wild-life, etc) Economic importance of locally available, medicinal plants, forest plants, Fibre Yielding plants, Beneficial insects, Silk molts, Honey Bee.

FIRST YEAR EXAMINATION

MAJOR ELECTIVE

PAPER – I

BIOTECHNOLOGY (Full marks – 100)

Unit-I

Biotechnology – a historical perspective, scope of biotechnology in developing countries, application of biotechnology in agriculture, pharmaceutical health, food, energy and industry.

Unit-II

Plant tissue culture: Plant Cell, Cellular differentiation and totipotency, Organogenesis, Embryogenesis application of tissue culture in horticulture and forestry, germplasm conservation.

Unit-III

Animal biotechnology: animal cell culture lines and cloning in vitro fertilization, embryo transfer and test tube babies genetic and ethical problems or cell culture human genome project, gene therapy.

Unit-IV
Basics of microbiology: Prokaryotic Cell structure, similarly ad difference with eukaryotic cell some common bacteria and viruses, lytic and lysogenic phases of vitas, HIV.

Unit-V

Basic of biotechnology: Eukaryotic cell structure and function. Nucleus, chromosome, nucleic and (DNA and RNA) and proteins, Gene concept, gene expression, DNA replication. RNA- Transcription and protein translation: Gene regulation.

SECOND YEAR EXAMINATION

Elective Paper – II Full Marks-100

Unit-I

Microbial Genetics: Bacterial conjugation, transformation and transduction plasmid: Ti Plasmid. Antibiotic resistance.

Unit-II

DNA techniques Technique, denaturation of DNA Polymerase chain reaction. Nucleic acid hybridization, use of labelling techniques (Southern and northern blotting).

Unit-III

Genetics engineering: Plasmid as vectors and cloning, Restriction enzymes, Molecular markers (RAPD, RFLP, AFLP).
Unit-IV

Recombinants DNA technology preparation of C-DNA, Construction of CDNA and genomic libraries, gene mapping, Oncogenes.

Unit-V

Application of r-DNA technology: DNA fingerprinting techniques, application in forensic science and molecular phylogeny, transgenic bacteria, plants animals, intellectual property right, patenting.

MAJOR ELECTIVE

NON-CONVENTIONAL ENERGY RESOURCES

FIRST YEAR EXAMINATION

Time – 3 hours  PAPER-I  Full marks-100


With energy : Basic principles of wind energy conversion, wind data and energy estimation, Basic components of a WECS (Wind Energy Conversion system)
Classification of WECS, Elementary ideas on wind energy collectors and wind electric generator-applications of wind energy.


Additional alternate energy resources and improved energy utilisation.

Principles of Magneto Hydro Dynamic (MHD) power generation, voltage and power output of Thermoelectric power generation, Thermoelectric power generator, Basic thermionic generator (The basic diode), Nuclear fusion and functions, requirements of nuclear fusion, plasma confinement, Magnetic-confinement fusion.

SECOND YEAR EXAMINATION

Time – 3 hours PAPER – II Full Marks-100


Energy from the oceans: Ocean thermal Electric conversion (OTEC) Methods of ocean thermal electric power generation, open and closed OTYEC cycle, site selection
and energy utilisation, prospects of OTEC in India, Energy from the tides, Basic principle of tidal power, Components of tidal power plants, operational methods of utilisation of tidal energy, Prospects of tidal energy in India.

Ocean waves, energy and power from the waves, wave energy conversion devices (Elementary description), Small scale hydro electric power station.


**BOOKS RECOMMENDED.**

1. Non-conversional sources of energy: By G. D. Rai (Khanna Publisher, Delhi)
2. Energy Technology: Non-Conversional, Renewable and conversional by – S. Rao and Dr. B. B. Parulekar (Khanna Publisher, Delhi-110 006)

**REMOTE SENSING (Major Elective)**

**First year Examination**

**Paper-I (Full Marks – 100)**

**Unit-I**

Fundamentals of basic principles of Remote Sensing –Introduction Components of Remote Sensing system. Electromagnetic spectrum, radiation laws, black body and real body radiation, interaction of visible NIR, middle IR wave length with earth surface feature (such as vegetation, water, soil, rock, etc).
Unit-II

Platform: Role of platform in Remote Sensing various types of platform-Balloon. Aircraft and satellite, Sensors: Fundamental properties of sensors, classification (Passive and Active, imaging and non-imaging) thermal scanners, sensor used in IRS series, Radar Imaging system SLAR system, Ground resolution, Synthesis Aperture Radar, Radar Image Characteristics.

Unit-III

Fundamentals of Aerial Photography – principal characteristics of aircrafts, different types cameras, basic information and specifications, planning and execution of photographs (Side lap, overlap, vertical exaggeration).

Unit-IV

Instruments user for Aerial Photographs – Stereoscopes, Parallax bar, Kelyx Plotter, Remote Sensing data products – B/W panchromatic imageries FCC, Digital image, Photo interpretation elements-size, form shape, texture tone shadow, contrast, colour, drainage pattern, relief feature, etc.

SECOND YEAR EXAMINATION

PAPER-II (Full marks-100)

Unit-I

Thermal radiation and thermal imagery – Introduction, IR region of Em spectrum Thermal properties of materials, Radiant temperature vs kinetic temperature, Thermal signature of water, vegetation and soil, Advantages of thermal imagery.
Unit-II

Introduction to GIS-definition, components of GIS, Geographical data, representation of topological data, Comparison of Vector and raster methods, Data input/output.

Unit-III

Radiometric and geometric correction-Sources of errors, radiometric errors and correction, geometric errors and correction.

Digital image Processing – Introduction. Structure of a digital image, image enhancement techniques, Rationing, Filtering techniques and Edge detection.

Unit-IV

Remote Sensing Application:

1) Land use / Land cover
2) Perspective of Environmental application
3) Oceanography – PFZ, Ocean colour, CZM.

FIRST YEAR EXAMINATION

DISASTER MANAGEMENT

PAPER-I (100 MARKS)

Fundamentals of Disaster Management
Unit-I


Unit-II


Unit-III

Hydrological disasters - Floods and droughts and their vulnerability, factors promoting draught and floods in India, vulnerable places of floods and droughts. Forest related disasters - forest fire, deforestation and Loss of biological diversity.

Population disaster - Atmospheric: Marine, soil, oil and noise, sound pollution.

Unit-IV

Hydrological, Coastal, Marine & Atmospheric disaster - Cyclones, Super cyclones, Tornadoes, Thunder, light ring and hail storms, storm serves tidal bares, Tsunamis, Flooding in the deltas, Beach Erosion and deposition in Coastal places, ENSO and Monsoon vagaries and its impact on agriculture in India. Sea level rise and its impact, Green house effect and global climate.
SECOND YEAR EXAMINATION

DISASTER FORECASTING, MITIGATION AND MANAGEMENT

Paper – II (Full Marks – 100)

Unit-I

Disaster forecasting – Forecasting of Cyclones, storm surges, floods, droughts, avalanches, Earthquakes and fires, Use of different instrument methods and techniques in disaster forecasting.

Unit-II

Disaster Mitigation – Accuracy of warning, expeditions dissemination of warning and effective utilisation of warning, Awareness of community and cooperation with Govt., uses and control of epidemics-plague, Malaria, Cholera, etc. Risk assessment and disaster management.

Unit-III

Unit-IV

Man Made disasters – Methods of Management and control towards different types pollutions (Rule of Central/ State Pollution Control Boards.

Warfare – Use of Nuclear, Biological and Chemical weapons and their after effects.

Role of UNO and other organisations in maintaining World peace and Harmony, Road, Rail, air accident in Indian and measures of their control, UNCLOSE-III Law of sea convention.

SUGGESTED REFERENCES: Disaster Management:

2. Community base3d disaster Management: Jayant Kumar, 1995
5. Disaster Mitigation in Asia and Pacific- 1991 – ADB, Manila


**FIRST YEAR EXAMINATION**

**PISCICULTURE**

**PAPER-I (100 MARKS)**

**GENERAL FISHERIES**

**Unit-I**

Habits of fishes: Major fisheries of India:- Reverie, Estuarine and marine fishery resources of India. Food chain, Primary production and its methods of estimation, secondary production.

**Unit-II**

Movement of fish, colouration, electric organ, swim bladder and its function, Osmo-regulation.

**Unit-III**

Parental care in fishes, food and feeding habits fishy, migration, life cycle of fish. Growth and Age determination.
Unit-IV

Fish population, Recent development in the field of stock assessment, Mortality, recruitment, Fish tagging, Hydro biological factors relation to fisheries and schooling in fishes.

Unit-V

Hydrographical factors of Chilika Lagon and its fisher, commercial improvement of marine fisher found along east cost of India especially on Orissa Coast.

SECOND YEAR EXAMINATION

PAPER-II

UNIT-I

Present status of Aquaculture, production levels and role of aquaculture in food supply, varieties of aquaculture practices with emphasis on recent technological advances, Aquaculture economics, selection of species for cultivation, selection of site of ponds, construction, management of different types of ponds.

Unit-II

Procurement of seeds aquaculture, Identification of seeds, Induced breeding of Indian Major corp., Intensive culture Indian Major Corp. Culture of air breathing fishes, culture of exotic species especially common corp. Tilapias gourami and salmon etc. culture of fresh water prawn, culture of eel. Fresh water composite culture.

Unit-III
Culture of brackish water fishes. Culture of shrimps, Hatchery management, present status of shrimp hatcheries in India Culture of Milk fish and mullets.

Unit-IV

Status of mericulture in India, seaweed culture and its use, Farming of important Marine species- Yellow tail, flat fishes, pacific salmon, turtle resources of India. Crocodile culture.

Unit-V

Culture of pearl oyster, Fisheries co-operative extension education in the field of fisheries, Role of Women in Aquaculture, composite brackish water fish culture, Diseases of cultured fishes. A general account of incidence of infectious and non infectious diseases, Viral bacterial fungal and algal infections and their control measures.

BOOKS RECOMMENDED

1. A. History of Fisheries – by J. R. Norman
2. Ichthityology – By Lagler etal.
3. Fish and Fisheries of Indi: - By Jhing
5. Fishery Science , Its methods and application-BY Rounsefles, G. A. & Everhert W.H
6. Fish Physiology – Hoar W. S. Etal
10. Prawn and Prawn fisheries of India: Sebastian V. O
11. Recent trend in Aquaculture – Nayak L.

**FIRST YEAR EXAMINATION**

**ELECTIVE : INDUSTRIAL CHEMISTRY**

**PAPER – I ( FULL MARKS – 100) ( time – 3 hours)**

**Unit-I**

Phase rule: Water system, two immiscible liquids, solution solid-liquid mixture-
Pb-Ag system, Distribution Law, Solvent extraction method.

**Unit-II**

Catalysis introduction, Types of catalysis, Homogeneous, heterogeneous basic
principles, mechanisms. Factors affecting catalytic processes, phase transfer catalysis –
enzyme catalysed reactions.

Surface Chemistry: Adsorption isotherm, gels emulsions, micelles.

**Unit-III**

Renewable Natural resources: Cellulose, starch, properties and modifications-
important industrial chemical derived from the Alcohol and alcohol based chemicals.

**Unit-IV**
Fermentations- introduction: Conditions favourable for formation, characteristics of enzymes short account of some fermentation process, manufacture of Beer, Wine, Spirits and Vinegar.

Unit-V

Waxes, Classification, qualitative solubility of Waxes, analysis of oils, fats and waxes, saponification values, iodine values manufacture of candles, hydrogenation of oils, soaps and its manufacture, cleaning action of soaps, Detergent-clarification of surface active agents and anionic cationic and non-ionic detergents, manufacture of Shampoos.

SECOND YEAR EXAMINATION

Time – 3 hours  Paper –II  Full Marks-100

Unit-I

Refractories:  

Introduction, classification of refractories, properties and manufacture of refractories, fire clay and silica brick: manufacture, properties and uses of silicon carbide and graphite refractories.

Glass: Introduction, physical properties Raw materials methods facture Annealing, special glasses, optical glass, coloured glass.

Portland Cement:
Introduction, Types of Cement, Pozzolana Cement, Types of Portland cement, setting of cement, function of compounds, factory affecting quality, economy in cement industry.

**Paint and Pigments:**

Introduction, Characteristics of pigments, uses and manufacture process-white lead, zinc oxide, Titanium dioxide, Blue pigments, ultra marine blue, red pigment.

Paints: Classification, constituents and manufacture of paints requirement of a good paints.

**Varnishes:**

Spirit Varnishes, manufacture of Varnishes.

**Unit-III**

A. Synthetic fibres and plastics:

Introduction important requirements of a fibre , difference between natural fibres and artificial fibres, properties, preparation and applications of synthetic fibres, rayon, Nylon – 6.6, Nylon -6 , Teflon.

Plastic introduction:

Classification, differences between thermosetting plastics and thermo plastics, properties and formation of plastics.

B. Pulp and paper:

Introduction, manufacture of Pulp and paper, Beating, refining, filling, sizing and colouring, manufacture of paper.

**Unit-IV**
Explosive:

Introduction, classification, characteristics of explosives Nitro cellulose, T. N. T., picric acid and Dynamite cordite, gun powder and black powder, RDX.

Insecticides: Inorganic and organic insectivores, Dinitro phenol, DDT, BHC, Gammexene attractants and repeuants, rodenticides, fungicides, herbicides.

Unit-V

Drugs and Dyes:

Introduction: Important drugs like Sulpha drugs, antibacterial antipyretics and analgesics, aspirin, Penicillin and Broad spectrum antibiotics, introduction and classification of dyes, acid dyes, basic dyes, azo dyes and vat dyes.

SUGGESTED BOOKS

1. Industrial Chemistry: B. K. sharam (Gfoel Publishing House, Meerut).

FIRST YEAR EXAMINATION

ELECTIVE: MATERIAL SCIENCE

Time – 3 hours Paper – I Full Marks – 100
1. Inter-atomic bonding: Introduction, bonding in solids, bonding forces and energies, ionic, covalent and metallic bonding Vander Waal’s forces of linkages. 
Crystal structure: Fundamentals concepts, crystal directions and planes, Unit cell, space lattice, crystal systems, cubic and non-cubic crystal structure, elementary idea on poly crystalline and non-crystalline solids.

2. Imperfections in solids: Elementary ideas, point defects, Schottky, Frenkel, atom-interchange, f-centre, defects line defects and dislocation, edge and screw dislocations, planar and surface imperfections, internal and external stacking faults.
X-ray diffraction (XRD) : Elementary idea, description and fundamental principles, Bragg’s equation, interplanar distance, use of XRD for identifying cubic structure in simple crystals.

3. Magnetic properties of materials: Origin of magnetism types of magnetic behaviour (Qualitative) diamagnetism, paramagnetism, ferromagnetism, anti-ferromagnetism, ferrimagnetism, temperature dependence of magnetic behaviour: domains and hysteresis, hard and soft magnetic materials with examples and uses.
Optical properties of materials: Elementary ideas, optical scattering, absorption and transmission, refractive index, colour, luminescence, photo conductivity, optoelectronic properties (Qualitative).

4. Mechanical properties of materials: Concepts of stress and strain, true stress and strain, elastic and inelastic deformations, elastic module, plastic deformations (elementary ideas).
Thermal properties of materials: Heat capacity, specific heat of solids, thermal conductivity, thermal expansion, thermal shock resistance.

5. Dielectric properties of materials: Elementary ideas, capacitance, polarisation and types, frequency dependence of electric constant, ferroelectric and piezoelectric materials and their uses.

Electrical properties of materials: Elementary ideas, electrical conductivity, energy band structure in solids, metals insulators and semi conductors, electron mobility, resistivity of metals, intrinsic and extrinsic semiconductors.

**SECOND YEAR EXAMINATION**

**PAPER-II (100 MARKS)**

1. Synthetic techniques: Qualitative ideas, ceramic Methods, grinding and fixing.
   Thermal decomposition, wet chemical routes precipitation, co-precipitation, precursor, synthesis, sol-gel techniques, powder preparation and purification.
   Semiconductor processing: Qualitative idea on crystal growth, epitaxial growth, doping, intercalation, insertion, diffusion, sputtering.

2. Phase and thermal transformations, Elementary ideas on phase/thermal transformation in solids (Qualitative) nucleation, growth solidification, grain and grain boundaries, roasting, calcinations, annealing, sintering, culling, curve for pure iron.
   Technological properties of materials: Elementary idea hardness, malleability, ductility, brittleness, metal corrosion and its control (qualitative).

Phase properties: Elementary ideas, phase rules and phase diagram sunary and binary isomorphous systems, interpretation of phase diagram.

4. Industrial polymers: Elementary ideas, concepts of polymer materials, Polymer synthesis and manufacture, steps involved in polymer preparation; Copolymerisation, Crystallisability of polymers, Types of polymers based on theology; need for eco-friendly and biodegradable polymers.
Ceramic material: Elementary ideas, classification of ceramics- potteries, white wares and stone wares, refractories and abrasives, cements and concrete, silicate glasses (Qualitative descriptions only), silicate bonds in ceramics, layered silica to structure.

5. Some special materials and techniques; Elementary ideas qualitative structure of diamond, graphic, liquid crystals fullerenes, Materials characterisation testing and service performance: Elementary ideas only, destructive and non-destructive characterisation, tensile tests, service performance of materials and their optimisation.

TEXT BOOKS:


BOOKS FOR REFERENCE:

4. Introduction to solids: L. V. Azaroff.

FIRST YEAR EXAMINATION

ELECTIVE POLYMER SCIENCE

PAPER-I (Time – 3 hours: Full Marks-100)

1. GENESIS OF POLYMERS: Definition of polymers, classifications, description of some useful industrial polymers.
2. CHEMISTRY OF POLYMERISATION: Types of polymerisation-Chain, condensation polymerisations, miscellaneous polymerisations, polymerisation techniques, steps in a polymerisation reaction, emulsion polymerisation as an eco-friendly technique in industry.
3. Molecular weight and size of Polymers: Average molecular weight-number averaged and weight averaged, methods of determination of molecular weight of polymers; degree of polymerisation and molecular weight: Molecular weight and size practical significance of molecular weight of polymers.
4. Chemical and Geometrical structure of Polymers: Elementary ideas, polymer micro structure based on chemical structure and geometrical arrangement.

5. Crystallisability of Polymers: Elementary ideas, crystallinies in polymers, crystallisability, degree, polydispersity index and nature of polymers, crystallisation.

SECOND YEAR EXAMINATION

Time – 3 hours Paper-II Full Marks-100

1. Co-polymerisation: Definition, types of copolymerisation- free vaidosal, ionic, practical importance of copolymerisation.

2. Polymer Reactions: Different types of Polymer reactions Hydrolysis. Acidolysis, aminolysis, hydrogenation, addition and substitution reactions.

3. Polymer Degradation: Definition, types of degradation-thermal, mechanical, photo-induced, (ultrasonic wave induceds radiation induced, degradations, chemical, Hydrolytic and oxidative) degradations, importance of polymer degradation.


SUGGESTED TEXT BOOKS:

**MAJOR ELECTIVE**

**COMPUTER APPLICATION**

Paper – I  Computer Organisation and Discrete mathematics  100

Paper-II  Data Structure and C- Programming  100

**PAPER-I**

**Unit-I**

Binary numbers, octal numbers, Hexadecimal numbers, Radix decimal, octal, hexadecimal-conversion from one to another, Representation of decimal, octal hexadecimal numbers, fractional numbers and signed numbers 1’s compliment, 2’s compliment forms, Binary arithmetic-Addition, Subtraction, Multiplication, division.

Codes, Weighted and Non-weighted binary codes-errors detecting codes, error correcting codes, alphanumeric codes-ASCII, 8-bit EBCDIC.
**Unit-II**

Boolean Algebra: Representation of values and complements, AND, OR, NOT operators, KARNOUGH MPA, De-Morgan’s theorem, combinational logic circuits for expression using NAND and NOR gates, Half Address, Full Add Half Substract, Full Substract.

**Unit-III**


**Unit-IV**


**Unit-V**

Relations and ordering, functions, recursion, algebraic systems, semi groups of monoids, groups, subgroups co-sets and Lagrange’s theorem, normal subgroup.

Residue arithmetic, its operations, its applications to computer communication, group codes, Generation of codes by using parity cheeks, Error recovery in Group Codes.
BOOKS:

1. Digital Computer Fundamentals by Thomas Bartee
2. Fundamentals of Computer by V Rajarmman
5. Computers To-day by D. S. Sanders.

SECOND YEAR EXAMINATION

PAPER – II (FULL MARKS – 100)

DATA STRUCTURE AND C PROGRAMMING

Unit-I

Data type Data object-Abstract Data Type Data structure, Nation of an algorithm-
Complexity measures: Rate of growth, Basic time analysis of an algorithm. Order nation-
detailed; timing analysis space complexity.

Unit-II

Arrays, arrays and their representation-single and multidimensional arrays. Row
major and ordering-Address calculation. Singly and Double linked lists-Insertion and
Deletion Operation on lists- representation of sparse matrices and polynomials using
lists. Stacks and Queues-Representation and manipulation – Uses of stacks and Queues-
Recursion.
Unit-III

C. Language Programming:

An overview of C Language, History of C Language, the structure of a C program, data types, variables and constants, Integer constants, character constants, Floating Constants, Logical constants, string constants, variables, integer variables, real variables, character variable. Floating variable, logical variable, string variables, declaration, Scope of variables, Local variables and Global variables.

Type Modification:


Unit-IV

Control statement If General forms, Nested if. The if-else-if ladder. The ? as an alternative to if, switch general form. Type conversion in assignments, variable initialisations, nested switch statement for while, do-while, break, continue, it ( ) function, go to and legal declarations, console I/O, unformatted console I/O, Print f ( ), Sprint f ( ), scan f ( ) Arrays, declaration, single dimensional arrays, Two dimensional arrays and Multi dimensional array.

Unit-V
General form, declaration and prototypes, Function arguments. The return statement, Returning values from a function, function call, call by reference, scope rules of functions, calling functions with array and Recursion.

Pointers the & and * Operators, pointer expressions, pointer assignments, pointer arithmetic, pointer comparison, The dynamic allocation functions malloc and alloc. Structure and Unions and User defined variable, Structures, Basic structures, Declaring a structure, Referencing structure elements Array of structures, passing structures to functions.

Unions : Declaration, Uses, Enumerated data types and typed of the C. Processor.

The C processor # define, # include and C Standard Library and Header files.

BOOKS FOR REFERENCE

2. A. M. Tannenbaum and others: Data Structure using C-PHI, 1992

MATHEMATICS

PAPER – I (100 MARKS)

MAJOR ELECTIVE (MATHEMATICS)

There shall be two theoretical Papers. The duration of theoretical papers is three hours. Paper –I in 1st year and Paper-II will be taught in second year.

PAPER-I (100 MARKS)

A. Differential Equation: 50 marks
B. Discrete mathematics 50 marks
Paper-II (100 marks)

a) Statistics and Probability 50 marks
b) Numerical Analysis 50 marks

FIRST YEAR EXAMINATION

(At the end of first year)

Paper –I (100 marks)

(A) DIFFERENTIAL EQUATION (50 MARKS)

UNIT-I

Introduction and basic concept of differential equations. Exact differential equations, First order differential equations but not of first Degree. Solution of Higher order Linear differential equations with constant co-efficients and equations with variable co-efficients.

Unit-II

Power series solutions about ordinary point, Legendre’s Equation and its simple properties.

Unit-III

Power Series solutions about singular points, Bessel’s Equation and Bessel Function.

BOOKS PRESCRIBED

1. Text Book of Differential Equations: N. M. Kapoor, Chapter-4,5,13,14,15

BOOKS FOR REFERENCE
1. Introductory Course in differential equation: D. A. Marry
2. Elements of Ordinary Differential Equations and special functions – A. Chakravarty, (New Age International)

**DISCRETE MATHEMATICS (50 MARKS)**

**Unit-IV**

Mathematical Logic except (Predicate Calculus) Propositions and Logical operators, Construction of Truth Tables, Tautologies and contradictions, Equivalence and Implication, NAND and NOR. Functionally Complete sets, Two state Devices and Statement Logic , Normal Forms.

**Unit-V**

Matrix Algebra (except Diagonalisation of Matrix): Types of Matrices, Matrices Associated with a given Matrix, Sub Matrix, Equality of Matrices, Adition of Matrices with properties, Scalar Multiple of a Matrix, Matrix multiplication and its properties, Determinants and its properties, Singular and non-singular Matrices, Adjoint of a Matrix and properties, Inverse of a Matrix and its properties, Integral powers of Matrices, Orthogonal Matrix, Unitary Matrix, Rank of a Matrix, Consistency of a system of Algebraic Linear Equations, Eigen values and Eigen vectors, Cayley-Hamiltons Theorem.

**Unit-VI**
Algebraic System: Binary operations and general properties, Subgroups and Cyclic Groups, Permutation Groups, Cossets and Lagrange’s theorem, Normal subgroups and factor Groups, Simple idea about Homomorphism and Isomorphism.

BOOKS PRESCRIBED:


BOOKS FOR REFERENCE

Fundamentals Approach to Discrete mathematics D. P. Acharya & Sreekumar
(New Age International)

SECOND YEAR EXAMINATION

AT THE END OF SECOND YEAR

PAPER-II

(A)STATISTICS AND PROBABILITY (50 MARKS)

Unit-I

Classification and Tabulation of Data, Measures of Central value, Measures of variation, Skewness, Moments, and Kurtosis.

Unit-II

Probability: Definition of probability (Classical, Relative frequency theory, Axiomatic approach) Addition theorem and multiplication theorem of probability,
condional probability, Bayes theorem, Theoretical distributions: Binomial distribution and its properties, Poisson Distribution, Constants of binomial and Poisson Distributions, Fitting of Binomial and Poisson Distributions.

Unit-III

Correlation Analysis, Different methods of finding out correlation, Properties of the coefficient of correlation, Rank Correlation, Regression Analysis: Linear regression, Regression lines and equations, regression, Coefficients and its properties.

BOOKS PRESCRIBED

Statistical Methods: S. P. Gupta (Sultan Chand and Sons.) relevant chapter of prescribed books.

BOOKS REFERENCE

Business Statistics: Shenoy, Srivastva and Sharma (New Age International)

(B) NUMERICAL ANALYSIS (50 MARKS)

Unit-IV

Numerical Analysis and errors, Interpolation.

Unit-V

Numerical Integration, solution of Algebraic and transcendental equation.

Unit-VI

Solution of system of linear equations, numerical solution of ordinary differential equations. (Examinees are allowed to use pocket calculator)
BOOKS PRESCRIBED

Introductory Numerical Analysis – R. N. Jana and N. Dutta (Sridhar Prakashini)

Chapter – I, II (2.1 to 2.9 and 2.13 to 2.16)

III (3.7 to 3.14 and IV (4.1 to 4.7)

V (5.1 to 5.3) VI (6.1 to 6.3)

BOOKS FOR REFERENCE

1. Fundamentals of Numerical Analysis - Akshay Kumar Ojha (Multisoft Publication)


STATISTICS

There shall be two theoretical papers each carrying 100 marks and each of 3 hours duration.

ELECTIVE SUBJECT

PSYCHOLOGY

Psychology is included one of the elective subject in B. A/ B. Sc. TDC Course, which shall be carrying 200 marks equally distributed in two papers. Only the non-pass/non-honours Psychology students can choose Psychology as their elective subject. The marks distribution of the elective subject of B. A./B. Sc. TDC examination is as follow:
<table>
<thead>
<tr>
<th>Examination</th>
<th>Paper</th>
<th>Course subject</th>
<th>Marks</th>
<th>Examination duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>First TDC</td>
<td>Paper-1</td>
<td>Psychology and Social Issues</td>
<td>100</td>
<td>3 hours</td>
</tr>
<tr>
<td>Second TDC</td>
<td>Paper-2</td>
<td>Psychology and Health</td>
<td>100</td>
<td>3 hours</td>
</tr>
</tbody>
</table>

**PAPER-I (100 MARKS)**

**PSYCHOLOGY AND SOCIAL ISSUES**

1. Nature of Social issues:


2. Social inequality, poverty and deprivation.

   Social Psychological analysis of deprivation; Consequences of deprivation:
   
   Poverty: Theories of poverty; concomitants of poverty; Inequality sources of deprivation; Social Justification.

3. Antisocial Behaviour :

   a) Corruption
   
   b) Juvenile delinquency

4. Violence

   Nature and categories of violence; Violence in families and marriage, work place violence.

5. a) Interpersonal Attraction: the basis of liking and disliking.
b) Managing socio-cultural diversity and multiculturalism.

REFERENCE:


PAPER – II

PSYCHOLOGY AND HEALTH

1. Meaning of Health and Socio-Cultural contexts.

2. Models of Health:
   Bio-Psycho-Social and cultural models: Health Belief Models.

3. Health damaging and Health Promoting life styles/behaviour.
   Type A Behaviour pattern and cardiovascular diseases and role of CVD illness.

4. Stress and Health
   Nature and types of stress causes ad consequences of stress, stress management, role of social support.


REFERENCE:


FIRST YEAR EXAMINATION

LIFE SCIENCE (ELECTIVE)

PAPER-I (100 MARKS)
(Cell Biology, Cytogenetic, Biochemistry, Environmental Biology)


Cell Biology: Ultra structure of cell and Functions of Major cell organelles (Mitochondria, Ribosome, Chloroplast, Centrosome, Golgiocomplex) Membrane structure, structure and functions of chromosomes, cell multiplication and its significance, Cell Cycle.

Genetics and its application – Mendelism, Neo-mendelism, Recombination of Genetics material, Sex determination, Sex linked inheritance, Genetic – diseases.

Principles of Biochemistry- Basic Macromolecules of life (carbohydrates, Proteins, Fats and Nucleic acids) Enzymes, Vitamins and Hormones, Phosphorylation and energy molecules.

Environmental Biology: environment Ecosystem-structure and function, Environmental Pollution, Biomagnifications and Bio concentration of Metal/ Pesticides, Ozone layer depletion, Green-house gases, Environmental awareness and Education. Environmental protection, Management and Auditing Forest conservation.

SECOND YEAR EXAMINATION

PAPER – II (100 MARKS)

(Microbiology its application, Biodiversity & conservation Human Population growth and control. Human Health & Diseases, Crop. And Live Stock Improvement).
Microbiology and its application – Micro organisations (Bacteria and Viruses). Industrial Microbiology, Microbes in Medicines, in waste management, in Fermentation & decomposition, Biological Warfare, Agricultural microbiology: Nitrogen cycle and Soil Fertility.

Biodiversity and conservation – Hirarchy of Biodiversity, distribution of biodiversity, value of biodiversity, Conservation of Biodiversity( in situ and ex situ) Sanctuaries, National Parks, Biosphere Reserves, priority for conservation (Endangered species, Rare Species, hot spots), Economical important plants ( Cereals, Pulses, oil, wood and medicinal plants).

Human population Growth and control – Population growth through ages, population explosion and problems, sex-ratio, Maintenance, Birth control measures, polygamy and polyandry and its implications.

Human Health & Disease – Sexually transmitted diseases, AIDS, Water (Hepatitis & Cholera) and Air (Chicken pox and Anthrax) – Borne diseases and their control. Sanitation – Malaria. Filaria.

Corp and live stock improvement – Genetic engineering, Transgenic plants (diseases , Drought & insect resistant plants) and animals Poultry, Dairy) Animal & Plant Tissue, Animal & Plant breeding Hybridisation and Grafting.

BOOKS RECOMMENDED

3. Environmental Studies – Ranganath Mishra, Kitab Mahal
4. Introduction to Mycology – G. J. Aloxoponics (John Willey Sons in N. Y)
10. Microbiology – Prescott
11. Microbiology – Pelzar, Chan & Kreig.
13. Cellular Molecular Biology – Baltimore et al.
14. Molecular Biology – Wattson
15. Paribesha Bigyan – Ranganath Mishra
16. Paribesha Bigyan – Ashok Panigrahy, Alka Sahu
17. Fundamentals of Env. Studies – Prof. N. K. Tripathy
18. Biochemistry – Strayer

**ELECTIVE STATISTICS**

There shall be two theoretical papers each carrying 100 marks and each of 3 hours duration.

**FIRST YEART EXAMINATION**

**STATISTICS – PAPER-I (100 MARKS)**
Elective – I

a) Probability Theory 20 marks
b) Statistical Methods 60 marks
c) Time Series 20 marks

SECOND YEAR EXAMINATION

Paper – II (100 MARKS)

a) Design and Analysis of Experiments 40 marks
b) Sampling Techniques 40 marks
c) Vital Statistics 20 marks

DETAILED SYLLABUS

STATISTICS – I (100 marks)

(A) PROBABILITY THEORY

Unit-I (20 marks)

Definition of probability, classical and axiomatic approach, laws of addition and multiplication of probability, conditional probability, Independent events, pair wise independence.

Random variable, distribution function, Mathematical expectation, addition and multiplication theorem of expectation, moment generating functions.
Standard univariate distributions and properties.

Discrete: Binomial and Poisson distribution and their properties.

Continuous: Normal distribution and its properties.

**BOOKS RECOMMENDED:**


**(B) STATISTICAL METHODS (60 MARKS)**

**Unit-II**

Ideas of Population and sample, measures of central tendency. Mean, Median, Mode, partition values, measures of dispersion, moments, skewness and kurtosis.

Bivariate distribution, scatter diagram, regression lines, regression coefficients, fitting of curves by least square principle, (Polynomial Exponential and logarithmic).

**Unit-III**

Correlation coefficient, rank correlation, correlation ratio, infraclass correlation coefficient, partial and multiple correlations, Regression plane (three variables only) Theory of attributes: Consistency of data, interdependence of attributes, measures of association.

**Unit-IV**

Test of significance, Null and Alternative hypotheses, level of significance, Type-I error and Type – II error. Description of chi-square, t and F statistics, test of mean and
variance of normal population, test of equality of two means and tests of equality of two variances of two normal populations, other uses of chi-square t and F. Statistics, large sample tests.

**BOOKS RECOMMENDED:**


**(C) TIME SERIES ANALYSIS (20 MARKS)**

**UNIT-V**


Methods of iterated averages, Approximation moving averages, Measurement of seasonal indices – Methods of simple average, Ratio to trend Ratio to moving Average and link relatives, methods of trend elimination by fitting mathematical curves, determination of cyclical component(without harmonic analysis).

**BOOKS RECOMMENDED:**


**Paper - II**

**Full Marks-100**

(A) Design and Analysis of Experiments (40 marks)
Unit-I

Analysis of variance: one way and two-way classification for one observation per cell for fixed effect model. Basic principles of design of experiments.

Unit-II


(B) SAMPLING TECHNIQUES (40 MARKS)

Unit-III

Concepts of population and samples, need for sampling complete survey and sampling survey, Basic concepts of sampling, organisational aspects of survey, sampling, methods of sample selection, use of Random Number Tables, basic sampling, methods. Sampling and non-sampling errors.

Unit-IV

Simple random sampling, with and without replacement stratified random sampling, proportional and optional allocation systematic sampling; comparison of sampling methods; Estimation of population mean and population total with standard error.

(C) VITAL STATISTICS

Unit-V

Vital statistics: Vital rates and ratios: Crude death rate infront mortality rate, specific death rate, standardized death rates, crude and specific birth rates,
general fertility rate: Total fertility rate, gross and net reproduction rates, elements of life table and uses, abridged life table.

BOOKS RECOMMENDED:

2. Design of Experiment: M. N. Das and N. C. Giri
5. Basic Demographic Techniques and application: K. Srinivasan

ELECTRONICS (MAJOR ELECTIVE)

FIRST YEAR EXAMINATION

There shall be a total of two theory papers in the subject consisting of 100 marks each, as mentioned below:

1st Examination Paper – I of 100 marks (Theory) Duration 3 hours

2nd Examination Paper-II of 100 marks (Theory) Duration 3 hours.

PAPER – I (100 MARKS)

Unit-I

Semiconductor Diode:
Energy bands effect of heat on energy bands, classification of solid in terms of energy bands. Types of semiconductors, conductor process in the p & n type semiconductors. P-N junction-construction, operation characteristics, capacitive effect of the junction, under various biasing conditions (Diffusion & Transition Capacitance), Avalanche and Zener breakdown, Zener Diode and its characteristic, zener diode as voltage stabilizer.

**Unit-II**

Bipolar Transistor:  
NPN & PNP transistors and their operations, transistor leads, C-B, C-E, C-C configuration and their characteristics, current amplification factors in different configurations and their relations, transistor load line analysis, operating point, cut-off and saturation states, faithful amplification, stabilization of operating point, Methods of transistor biasing-base resistor, Feedback Resistor, Voltage divider methods.

**Unit-III**

Field Effect Transistor:  
Basic Principles and construction of JEET, Operation and Characteristic curves of JEET, Effect of drain to source voltage on channel conductivity. Characteristics parameters of FET, Advantages and disadvantages of FET, MOSFET: Depletion type and Enhancement type, Characteristics curves of MOSFET, Difference between FET and MOSFET.

Integrated circuits, classification of ICs, basic ideas of monolithic ICs, Different stages of Monolithic preparation.
Unit – IV

Power Electronics:

Silicon controller rectifier (SCR) working principle, characteristics, application as half-wave and full wave rectifiers, Triac diae-construction, working, characteristics and their uses, unijunction transistor (UJT) construction, working characteristics, use of UJT as relaxation oscillator.

Unit-V

Electronic Instruments:

Construction and working of Multi-meter, YTVM Advantage, disadvantage and application construction and operation of CROCRT and its different parts, application of CRO.

SECOND YEAR EXAMINATION

PAPER – II (Full Marks-100)

Unit-I

Application of Semiconductor Diode:

Principles of rectification junction diode as half – wave rectifier. Full-wave rectifier and bridge rectifiers, calculation of efficiency and ripple factors in the half-wave rectifiers-Filters-Shunt capacitor, Series inductor, L-section, PI-Section filters.

Unit-II

Application of Transistor (Amplifiers)

Unit-III

Oscillators:

Feedback principle, positive and negative feedback, effect of positive and negative feedback. Sinusoidal Oscillators, Barkhausen Criterion, Types of OSCILLATORS-Hartely, Colpitt’s R=C Phase Shift and Crystal Oscillator.

Unit-IV

Number System and Logic Gates:


Computer Fundamentals:


Unit-V

BOOKS RECOMMENDED

1. Hand Book of Electronics: by Gupta Kumar
3. Principle of Electronics- By V. K. Mehta
4. Electronics Devices and Circuits – By A. Mottershed.

PHYSICS

ELEMENTARY BIOPHYSICS AND ELEMENTARY ASTROPHYSICS

FIRST YEAR EXAMINATION

Time – 3 hours

Paper – I 

Full Marks-100

ELEMENTARY BIOPHYSICS
Proteins: Amino Acids, dissociation characteristics of amino acids, characteristics of amino acids, structural organisation of proteins the sources proteins, the secondary sources of proteins, the tertiary source of proteins, the quaternary structure of proteins.  

Nucleic acids: Nucleic acids, bases, sugars, the phosphate group, the ribose-phosphate back bone, principles of base pairing/base-stacking, the Watson-Crick hypothesis of DNA structure, nucleic acid families (A. B. And Z).  


Nuclear Magnetic Resonance (NMR): One dimensional NMR spectroscopy, Applications, Biomedical NMR.  

Electron Microscopy:  

X-ray diffraction: Diffraction of X-rays, structure determination, phase determination procedure, structure refinement structure and function.  

Lasers, Reversible thermodynamics, irreversible thermodynamics, Radiation biophysics, ionising radiation, interaction of radiation with matter, measurement of radiation (dosimetry) radioactive isotopes, biological effects of radiation, radiation protection and therapy.  

**TEXT BOOK:**  

Essential of biophysics, P. Narayanan, New Age International.  

**REFERENE:**
SECOND YEAR EXAMINATION

Time – 3 hours  Paper – II  Full Marks-100

ELEMENTARY ASTROPHYSICS

Spectral classification of stars: Boltzmann’s formula, Saha’s equation of thermal ionization, Harvard system of spectral classification, the Nenry-Draper catalogue, the luminosity effect on stellar spectra, importance of ionization theory in astrophysics. The Sun: Sun a typical star, the photosphere, solar granulation, faculae, the chromospheres, solar corona, prominences, theory of sun spots, solar flares.

Binary and multiple stars: Visual binary, spectroscopic binary eclipsing binary, multiple stars, origin of binary stars.

Variable stars: Classification of variable stars, the Cepheid group of variables.

Erupting and exploding stars. Distribution of novae in our galaxy determination of distance and luminosity of novae, light variation of novae, spectra of novae, cause of novae, cause of nova outburst, supernova, SN 1987A.

Clusters and association of stars, Galactic clusters, globular clusters, stellar association, star formation.

Galactic nebulae: Classification and galactic distribution of nebulae, dark nebulae, reflection nebulae.

Neutron star and black holes: Discovery of pulsars, rotating neutron star model of pulsars, Gold’s model of pulsars, binary pulsars, black holes.
Galaxies: Classification of galaxies, distribution of galaxies spectra of galaxies, distance of galaxies, theories of spiral structure of dist galaxies.

Quasars: discovery, radio properties, optical properties, the red shift of quasars.

Cosmology: Red-shift and the expansion of the universe, matter density in the universe and the deceleration parameter. Hubble law, some important theories of the universe.

TEXT BOOK

An introduction to astrophysics by Baidyanath Basu, Prentice Hall of India.

REFERENCE


SECOND YEAR EXAMINATION

STATISTICS (PASS)

PAPER-I

(75 MARKS)

Unit-I

Determinants, Matrices, Matrix-operations, Inverse and rank of matrix, solution of linear equations.

Unit-II

Limit, continuity of function, Differentiation of functions, Integration by Substitutions and Integration by parts. Definite Integral.

Unit-III
Linear Programming problems (formulation and graphical solution), convex sets and related problems.

Unit-IV

Simplex method, duality in linear programming

Unit-V

Transportation and Assignment problems.

BOOKS PRESCRIBED.

1. Text Book Matrices : Shantinarayana
2. Mathematical Analysis “Shantinarayana

BOOKS FOR REFERENCE:

1. Theory of Matrices: : B. S. Vatsa
2. Differential Calculus and Integral Calculus : B. C. Das and Mukherjee.

SECOND YEAR EXAMINATION

PAPER-II

(75 MARKS)

UNIT-I

Operation E and \( \Delta \) and their operation, Factorial notation. Interpolation with equal and unequal interval, Newton’s Forward and Backward formula. Divided difference, Lagrangian formula.
Unit-II

Frequency, distribution, measurement of central tendency, measure of dispersion, moments, measures of skewness and kurtosis.

Unit-III

Simple correlation and regression, curve fitting by the methods of least square (Polynomial, exponential, Logarithmic), Multiple and partial correlation and regression (three variable only) Association of attributes.

Unit-IV

Definition of probability, laws of addition and multiplication of probability, conditional probability, Independent events, Bayesian Rule.

Unit-V

Random variable, Density function, mass function distribution function, joint distribution of the variable, Mathematical expection, Addition and Multiplication theorem, moment generating function.

BOOKS PRESCRIBED


BOOKS FOR REFERENCE:

2. Numerical Analysis; Dutta and Jana

PAPER – III

( 50 MARKS)

a. Practical 30 marks
i. Construction of frequency distribution, histogram and frequency polygon.

ii. Calculation of different measure of location, dispersion, skewness and kurtosis from grouped and ungrouped data.

iii. Construction of Bivariate frequency distribution, calculation of simple correlation and regression lines and their interpretation.

iv. Calculation of multiple and partial correlation and regression.

v. Fitting of Polynomials, exponential and logarithmic curves.

vi. Association of attributes.

vii. Interpolation with equal and unequal intervals.

b. Viva-voce and record. 20 marks.

**FINAL YEAR EXAMINATION**

**PAPER-IV**

**(75 MARKS)**

**UNIT-I**

Probability Distribution: Binomial, Poisson, Normal, Beta, Gamma, Chi-square, t and F.

**Unit-II**

Sampling distribution – Large sample theory and small sample theory, tests of significance based on normal, ‘t’, ‘F’ and $X^2$ distribution.
Unit-III

Meaning and concept of tests, simple and composite hypothesis, critical region, error in tests.

Unit-IV


Unit-V

Parametric and non-parametric test, the sign test, median test, run test, Mann-Whitney U–test.

Population Projection

BOOK PRESCRIBED

2. Sampling technique : W.G.Chochran

BOOK FOR REFERENCE

1. Fundamental of statistics (VI-II): Goon. Gupata, Dasgupta
2. Design of Experiment: M.N. Das and N. Giri

PAPER-V

Unit-I

Analysis of Variance, one way and two-way classification, principle of experimental design.

Unit-II

Description of analysis of CRD, RBD, LST, Missing plot technique.

Unit-III
Population and sample, sampling unit, sample survey vs complete enumeration, steps involved in large scale sample survey, sampling and non-sampling errors.

**Unit-IV**

Methods of drawing sample—use of Random Number table, SRS, with replacement stratified random sampling, systematic sampling, two stage sampling.

**Unit-V**

Methods of obtaining vital statistics, measurement of population of rates and ratio of vital events, measurement of mortality C.D.R., S.P.D.R. standardized death rates comparatives mortality index, mortality rate, integral, mortality rate.

**PAPER-VI**

(50 MARKS)

A. **Practical:**

i. Analysis CRD, RBD and LSD

ii. Missing plot techniques in RBD and LSD

iii. Calculation of mortality and fertility and reproduction rates.


v. Drawing of single random sample and estimation of population total proportion with S.E


vii. Drawing of statematic sample and comparison of its efficiency with simple random sampling and stratified random sampling.

B. **Record and Viva-voce.**
STATISTICS HONOURS:

There shall be three examination, one at the end of first year. One at the end of second year and one at the end Final year. There shall be two theoretical paper each carrying 100 marks in the first examination. In the Second Examination two theoretical papers and one practical paper each carrying 100 marks. Similarly in he Final Examination, there shall be two theoretical papers and one practical paper.

FIRST YEAR EXAMINATION

(At the end of first year)

PAPER-I

(100 MARKS)

A) Matrices

Determinants. Matrix operations, Inverse of matrix, rank of matrix, solutions of simultaneous linear equation, characteristics equations and roots, quadratic form, positive definite form.

B) Calculus and Differential Equation.

50 marks.

Unit-II
Limit, continuity, Differentiation, Successive differentiation, tangent normal.  

(17 marks)

Unit-III

Integration by substitution and by parts definite integrals, Simple problems on area under curve.  

(17 marks)

Unit-IV

Differential equation of 1st order and of 1st Degree  

(16 marks)

C) Analysis.  

(34 marks)

Unit-V

Limit of a sequence and convergence of infinite series, simple tests of convergence Absolute convergence.  

(17 marks)

Unit – VI

Convergence of improper integrals, Beta, Gamma Integrals, Definition and evaluation of Double integrals.

PAPER-II

(100 MARKS)

a) Numerical Analysis.  

(50 marks)

Unit-I

Operation E and Δ and their operations, factorial notation, Interpolation with equal and unequal intervals, Lagrange Newton forward and back ward, divided differenced interpolation formula.  

(17 marks)

Unit-II

(17 marks)
Numerical Integration, Trapezoidal and Simpsons one third rule. Numerical solution of simple first order first degree differential equations by Picard’s method and Euler’s method.

**Unit-III**

(16 marks)

Simple problems on approximate solution of algebraic and transcendental equations by bisection method, regula falsi method, Newton Raphson’s method and iteration method.

b) **Statistical Methods – I**

(17 marks)

**Unit-IV**


c) **Probability:**

(33 marks)

**Unit-V (16 marks)**

Classical and axiomatic definition of probability Laws of addition and multiplication of probability, conditional probability, independent events, Bayes rule.

**Unit-VI (17 marks)**

Random variable, density function, mass function, distribution function. Mathematical expectation, moments, moment generating function, Binomial, Poisson, normal, Beta, Gamma, Cauchy distributions, Marginal conditional and joint distribution.
BOOKS RECOMMENDED:

1. Text Book of matrices – Shantinarayan
3. Integral Calculus – Shantinarayan

PAPER-II

1. Finite difference and Numerical Analysis – H. C. Saxena

SECOND YEAR EXAMINATION

(At the end of Second Year)

Paper-III

(100 marks)

a) Probability – II 33 marks

Unit-I (16 marks)

Unit-II (17 marks)

Weal laws of large numbers, Chebyehev’s theorem, Bernoulli’s theorem, Central limit theorem, Lindeburg Levy theorem.

b) Statistical Method – II 17 marks

Unit- III (17 marks)

Concept of population, sample, parameter, statistic and sampling distribution standard error, sampling distribution of sample mean and Variance, t, F and Chi-square distribution. Tests of significance based on normal, t, F, $X^2$ distribution.

c) Testing of Hypothesis 50 marks

Unit-IV (16 marks)

Meaning and concept of tests, simple and composite hypothesis critical region, error in tests.

Unit-V (17 marks)

M. P. T. Neyman Person Lemma and its application UMPT. Likelihood ratio test and its application.

Unit-VI (17 marks)

Parametric Vs non-parametric test, the sign test, Median test Run test, Mann – Whitney U-test.

PAPER-IV (100 MARKS)

a) Operation Research: (50 marks)

Unit-I (17 marks)

Linear Programming problems (Formulation and graphical solution) convex sets and related problems.

Unit-II (17 marks)
Simplex method, duality in linear programming.

Unit-III (16 marks)

Transportation and Assignment problems.

Computer Programming: (50 marks)

Unit-IV (17 marks)

Understanding the computer flow charts, basics of the basic programming.

Unit-V (17 marks)

Writing programs to find mean, S. D. Correlation coefficients of given number (simple data).

Unit-VI (16 marks)

Introduction to appear sheet (lotus / Excel) using spread sheet to calculate mean, S. D. And correlation.

PAPER-V

(100 marks)

A) Practical 80 marks.

a) Construction of frequency distribution, histogram, frequency Polygon, ogine.

ii) Calculation different measures of location, dispersion, skewness and kurtosis from grouped data.

iii) Calculation of simple correlation and regression lines.

iv) Calculation of multiple and partial correlation and regression.
v) Fitting of polynomials, exponential and logarithmic curves.
vi) Fitting of Binomial, poisson and normal distribution.
vii) Test of significance based on t, f, X² distribution.
viii) Interpolation with equal and unequal intervals.
ix) Numerical Integration – Use of Simpson's one third rule, Trapezoidal rule.
x) Solution of algebraic and transcendental equation by Regula-Falsi and Newton Raphson's method.

B) Viva and Record. 20 marks.

BOOKS RECOMMENDED

PAPER-III

PAPER-IV
1. Operation Research: S. D. Sharma

FINAL YEAR EXAMINATION

PAPER-VI (FULL MARKS – 100)
a) Theory of estimation 34 marks

Unit-I (17 marks)

Problem of estimation, Estimation and its properties unbiasedness, consistency, efficiency, and sufficiency, consistent estimators, Likelihood function, Raw-Cramer inequality and applications.

Unit-II (17 marks)

b) **Statistical quality control:** 34 marks.

**Unit-III (17 marks)**

Introduction, process, control charts, S. O Control limits, tools for SQC, control charts for variables X and R charts, control chart for attributes.

**Unit – IV (17 marks)**

P – chart, D – Charts, C- charts, acceptance sampling by attributes, AQL, LTPD, PAFD, consumers Risk, Producers Risk. AOQ, AOQL, O. C curve.

c) **Demography:** 32 marks

**Unit-V (16 marks)**

Methods of obtaining vital and use of Abridged life table. Measurement of fertility, CBR. GFR, SFR, TFR, measurement of mortality CDR, SDR standardised DR, Comparative mortality index, Maternal mortality rate.

**Unit-VI (16 marks)**

Life table-contribution and use of Abridged life table. Measurement of fertility, CBR, GFR, SFR, TFR, Measurement of population growth, Crude rate of Natural increase and Pearle’s vital Index GRR, NRR.

**Paper-VII (100 marks)**

a) **Design and Analysis of Experiment:** 50 marks

**Unit-I (17 marks)**
Analysis of Variance, one and two way classification, principles of experimental design. Randomisation and Local Control, Replication.

**Unit-II (17 marks)**

Statistical Analysis of CRD, RBD, LSD Missing value in LSD. Factorial Experiments.

**Unit-III (16 marks)**

$2^s$ and $2^n$ factorial experiments, Confounding in factorial Designs and experiments.

Partial Confounding, BIBD.

b) **Sampling Technique:**

**Unit-IV (16 marks)**

Population and sample, sampling Vs census, steps involved in a sample survey, sampling and sampling errors.

**Unit – V (17 marks)**

Sample random sampling. Restricted random sampling, Stratified sampling, systematic sampling, non-random sampling methods.

**Unit-VI (17 marks)**

Estimation of population value and SE with respect to above methods of sampling. Ratio and regression Estimation, Estimation of population means, Total properties with respect to above methods of sampling.

**PAPER-VIII (100 MARKS)**

A) **Practical:**

1. Conversion of Physical Problem to L. P. Problem.
2. Solution L. P. P. By graphical method.


4. Analysis of CRD, RBD, LSD

5. Missing plot techniques in RBD and LSD


8. Drawing of simple random sample and estimation of population

9. Drawing of systematic sample comparison of efficiency SRS and ST. RS.

B) Viva and Record. 20 marks.

BOOKS RECOMMENDED

PAPER-VI


PAPER-VII

1. Sampling Technique: W. G. Chochran


ANTHROPOLOGY (PASS)

There shall be four theory and two practical papers for three years degree course.

Two theory and one practical paper shall taught in the Second year and two theory and one practical shall taught in the third year.

SECOND YEAR EXAMINATION

Paper – 1 (Theory): Prehistoric Archaeology 75 marks
Paper-II (Theory)  Physical Anthropology  75 marks
Practical  50 marks

FINAL YEAR EXAMINATION

Paper – III (Theory)  Social and Cultural Anthropology  75 marks
Paper-IV ( Theory)  Applied Anthropology  75 marks
Practical  50 marks

DETAILLED SYLLABUS

PAPER-I (THEORY)

3 HOURS  75 MARKS

(PREHISTORIC ARCHAEOLOGY)

Unit-I(15 marks)
Definition, Scope and methods of study of prehistoric archaeology, Relations of prehistoric archaeology with other disciplines.

Unit-II(15 marks)
Geological time scale with special reference to climatic fluctuation during Ice Age.

Unit-III( 15 marks)
Typology, techniques and functions of lithic tools.

Unit-IV((15 marks)
Lithic cultures in India: Introduction, Lower Palaeolithic, Upper Palaeolithic and Mesolithic,

Unit-V(15 marks)
Neolithic age in India, Indus valley Civilisation in India.
BOOKS PRESCRIBED


2. Sankalia H. D. - Stone Age Tools (Decan College, Post Graduate and Research Institute, Poona)

3. Sankalia H. D - Indian Archaeology Today

4. Krishnaswamy V. D - Stone Age India (in Ancient India No. 3 January, 1947)

BOOKS FOR REFERENCE

1. Burkitt, M. C - Old Stone age.

2. Braidwood R. J. - Prehistoric Mon.


PAPER-II (THEORY)( 75 MARKS)

(PHYSICAL ANTHROPOLOGY)

UNIT-I(15 MARKS)

Physical Anthropology: Definition, scope and various branches, relationship with other sciences.

Unit-II(15 marks)

Meaning, evidences and theories (Lamarckism and Darwinism).
**Unit – III(15 marks)**

Genetics: The structure and function of cell, Cell division. Mendel’s laws in inheritance.

**Unit-IV(15 marks)**


**Unit-V(15 marks)**

The concept of race, mechanisms of race formation, racial criteria (metric and non-metric) major racial divisions of mankind and their distribution.

**PRACTICAL(50 MARKS)**

*(Prehistoric Archaeology and Physics Anthropology)*

Typology, Drawing and Description of Lithic tools.

The Students shall draw to scale and describe the tools

Minimum of three tools in each Section shall be drawn.

1. a) Palaeolithic - (5 tools) 
   b) Mesolithic - (5 tools) 
   c) Neolithic - (3 tools) 
   (10 marks)

2. Practical Record. 05 marks.

3. a) Somato metry 10 marks
    b) Somato Scopy 05 marks
    c) Craniometry 10 marks
    d) Mandibulometry 05 marks

4. Practical Record. 05 marks.
A. Somatometry:

Candidates shall be familiar with the procedure adopted and descriptive terms used in making observations. Measurement of the following external characters and take measurements on adults.

1. Height
2. Sitting Height
3. Weight
4. Maximum Head Length
5. Maximum Head Breadth
6. Minimum Frontal Diameter
7. Bizygomatic Breadth
8. Bigonial Diameter
9. Nasal Height
10. Nasal Breadth
11. Morphological Facial Height
12. Horizontal Circumference of Head.

B. Somatoscopy:

Candidates shall be familiar with the procedure adopted and descriptive terms used in making observations on the following.

1. Skin – Colour
2. Eye – Colour, Fold, Eye, Brow
3. Hair – Form, Texture
4. Super – Orbital ridges
5. Nose – Depression, Bridge, Septum
6. Face – Prognathism
7. Lips – Shape of Lips
8. Earlobe – Size and attachment

C. Craniometry:

Candidates shall be familiar with procedure adopted and descriptive terms used in the following measurement and take measurement on 10 skulls.

1. Maximum Cranial Length
2. Maximum Cranial Breadth
3. Least Frontal Breadth.
4. Bizygomatic Breadth
3. Glabellas Inions Length

D. Mandibalometry:

Candidate shall be familiar with procedure adopted and descriptive terms used in the following measurements and take measurement on 10 mandibles.

1. Bicondylar Breadth
2. Bigonial Breadth
3. Mandibular Length
4. Height of Ramus
5. Breadth of Ramus

BOOKS FOR PRACTICAL


PAPER –III

Time – 3 hours SOCIAL ANTHROPOLOGY AND CULTURAL ANTHROPOLOGY

Full Marks-75

Unit-I(15 marks)

Society and Social Anthropology, Meaning and importance of association and institutions.

Concept of family, features, types and functions of family meaning and types of marriage rules, mating and marriage.

Unit-II(15 marks)

Concept of Kinship, Kin types and kinship terminology, kinship usages, meaning and functions of lineage, clan moiety and phratry, primitive sodalities and their functions.
Unit-III (15 marks)

Unit-IV (15 marks)
Concept of culture and society, scope of cultural anthropology, study on culture-trait, culture complex, culture-area.

Unit-V (15 marks)
Theoretical ideas on culture growth: Evolutionism, diffusion and diffusionism.

BOOKS RECOMMENDED
1. Majumdar and Madan – Introduction to Social Anthropology
2. Beals and Hoijer – Introduction to Social Anthropology
3. Herskovit M. J. – Cultural Anthropology

BOOKS FOR REFERENCE
1. Bohanan P – Social Anthropology
2. Lowie R. H – Social Organisation
3. Merdock G. P. – Social Structure

PAPER - IV
APPLIED ANTHROPOLOGY
(Full Marks – 75)

Unit-I

Unit-II
Tribe: Definition geographical distribution of different tribes in Orissa. Tribe and caste differentiation, Scheduled caste and scheduled tribe, major problems of Tribes. Various approaches and strategic.

**Unit-III**

Population study as a science: Scope and methods of population study, its relationship with Anthropology, Geography, Economic and Ecology. Important landmarks in development of population study.

**Unit-IV**

Applied physical Anthropology: Medico legal problems, Forensic Anthropology, Ergonomics Applications of Anthropological Knowledge to problems of Public Health, Disease fertility and mortality in India.

**Unit-V**

Research Methodology: Tools of data collection: Observation schedule, Questionnaire, Case study, Interviews sampling.

**BOOKS RECOMMENDED**

1. Mason, Philip (ed) : India & Ceylon, Unity and Diversity
2. Cohen B. S. India : Social Anthropology of Civilization
3. Kopadia, K. M., : Marriage and family in India
4. Moriott Mc.Kim (Ed.) : Village India
5. Srinivas,M.N. : Social Change in Modern India
6. Srinivas, M.N. : Caste in Modern India and other Essays
8. Singh Y. : Modernization of Indian Tradition

**PRACTICAL (50 MARKS)**
A) Technology – 15 marks

B) Methodology – 10 marks

C) Statistics – 15 marks

   Practical Record – ( 5 marks + 5 marks) = 10 marks

A. **Primitive Technology:**

   The candidate shall draw to scale and described implements or models of food-gathering, hunting, fishing, agriculture and items of baskets and transport devices, They also be familiar with their identification labelling of various parts and drawing of neat sketches.

B. **Methodology:**

   The candidates shall be familiar with the following field methods and techniques: Observations, Interview, Questionnaire, Case Studies and Sampling.

C. **Statistics:**

   The candidates shall calculate the following measurement:

   a) Mean  b) Mode  c) Median  d) Standard Deviation.

**BOOKS FOR REFERENCE**

1. Royal Anthropology : Note and Queries and Anthropology Institute.
2. Houng P. V. Scientific Social Surveys and Social Research
3. Das R. R. Statistics
4. Eihence D. H. Elementary Statistics

**BOOKS FOR REFERENCE:**

1. Royal Anthropology : Note and Queries on Anthropology Institute
2. Gooda and Hatt  Scientific Methods Research
3. Ghosh B. N. Scientific Methods and Social Research
4. Sharma B. A. V. Etial Research Methods in Social Science
5. Young P. V. Scientific Social Survey and Research.

ANTHROPOLOGY (HONLURS)

FIRST YEAR EXAMINATION

Paper – 1 (Theory) Prehistoric Archaeology 100 marks
Paper-2 (Theory) Physical Anthropology 100 marks

SECOND YEAR EXAMINATION

Paper – 3 (Theory) Social Anthropology 100 marks
Paper – 4 (Theory) Human Genetics 100 marks
Paper – 5 (Practical) 100 marks

FINAL YEAR EXAMINATION

Paper – 6 (Theory) Indian Society 100 marks
Paper – 7 (Theory) Cultural and Applied Anthropology 100 marks
Paper – 8 (Practical) 100 marks

DETAILED SYLLABUS

FIRST YEAR EXAMINATION

PAPER – 1 (THEORY)

Time 3 hours

PREHISTORIC ARCHAEOLOGY

Unit-I
Definition, Scope and methods of study of prehistoric archaeology, Relations of prehistoric archaeology with other disciplines. Geological time scale with special reference to Pleistocene, great Ice Age of Europe in brief.

**Unit-II**

Dating methods (a) Absolute dating: Radio, Carbon methods, Dendrochronology, Pollen analysis, Thermoluminiscene, Potassium argon test (b) Relative dating: Stratigraphy Glacial Verve, river terrace, typological similarity state of preservation.

**Unit-III**

Classification of tools, Typology, techniques and functions of Lithic tools – with reference to prehistoric periods.

**Unit-IV**

Lithic cultures in India: Introduction and nomenclature problems. Lower, Middle and Upper Paleolithic age in India Mesolithic in India.

**Unit-V**

Chalolithic period in India: Indus Valley Civilisation. Iron Age in India.

**BOOKS RECOMMENDED**


2. Sankalia, H. D. : Indian Archaeology Today
3. Sankalia, H. D:  Stone Age Tool (Deccan College, Post Graduate and Research Institute, Poona.

4. Krishnaswamy V. D: Stone Age India (In Ancient India. No.3 January, 1947)

BOOK FOR REFERENCE

1. Burkitt, M. C. Old Stone Age
2. Braidwood, R. J. Prehistoric Men
3. Sankalia, H. D Prehistory and Protohistory and India & Pakistan

PAPER – II (Theory)

PHYSICAL ANTHROPOLOGY

(100 Marks) Unit-I

Definition, Scope and development of Physical Anthropology and its Relation with other branches of Anthropology and other Sciences.

Unit-II

The concept of organic evolution, Theories of organic evolution, Lamarckism, Darwinism, Neo-Darwinism, Synthetic theory, Micro and Macro Evolution, Adaptation, Isolation, Mutation, Selection and Speciation.
Unit-III

Important stages of human evolution in different geological terms from propopithecus to Homo Sapien Stage.

Unit-V

Human variation and Biological concept of Race: Race and Ethnic group, Role of heredity and environment in the formation of race: Racial criteria: Major race of the world and their distribution, Racial classification of Indian Population (Risley, Guha, Sarkar).

BOOKS RECOMMENDED:

2. Stein and Rowe: Physical Anthropology
4. Das B. M. Outlines of Physical Anthropology.
5. Jpptpm. E.A Up from the Ape.
6. Das B. M. Micro Evolution
7. Ashley Montague, M. F. Men’s Evolution Introduction to Physical Anthropology.

BOOKS FOR REFERENCE:

1. Donson, E. O. Evolution, Process and Procedure
2. Lasker, G Physical Anthropology
3. Comas. J Manuals of Physical Anthropology
4. Eckant, R. E The Study of Human Evolution
5. Hules, F The Human Species, An Introduction to Physical Anthropology.
6. Buettner, Janush, J  
   Physical Anthropology, A Prospective.

SECOND YEAR EXAMINATION

PAPER-III (THEORY)

Time – 3 hours  
Full Marks – 100

SOCIAL ANTHROPOLOGY

Unit-I

Scope of social Anthropology, Relationship of Social Anthropology with other branches of Anthropology.

Community and Society, Nature and Features of group, Meaning and importance of association and institution.

Unit-II

Concept of family and its Universality, features, types of marriage, marriage rules, mating and marriage.

Unit-III

Concept of Kinship kintype and kinship terminology, Kinship usages, Kin categories meaning and function of Lineage, clan moiety and pharatry.

Unit-IV

Sodalities and their function, Nature and features of primitive economy, Primitive modes of exchange, barter and ceremonial exchange Rank and Status.

Unit-V

Primitive law and justice. Theories on religion, types of magic relationship of religion with magic and Science.

BOOKS RECOMMENDED
1. Beals and Joijer  
   Introduction to Anthropology

2. Hoebel, E. A  
   Man in the Primitive world

3. Majumdar and Madan  
   Introduction to Social Anthropology

4. Majumdar D. N  
   Races and culture of India.

**BOOKS FOR REFERENCE;**

1. Beattie, J. M.  
   Other Culture

2. Bobannan P  
   Social Anthropology

3. Linton R.  
   The Study of Man

4. Lowie, R. H  
   Social organisation

5. Murdock G. P.  
   Social Structure

6. Radeliffe Brown A. R  
   Structure and function in Primitive Society.

7. Evaus Pritchard E. H  
   The Neur

8. For, Robin  
   Kinship and marriage

9. Goode, J.  
   Family

10. Mair, Lucy  
    An Introduction to Social Anthropology

11. Herskovits, M. J  
    Economic Anthropology


---

**PAPER-IV (THEORY)**

**Time – 3 hours**

**Full Marks – 100**

(Human Genetics)

**Unit-I**
Development and scope of human genetics.

Unit-II

Structure and function of human cell, Mitotic and Meiotic type of cell division. Human Chromosome; Karotypes, Structure and functions of D. N. A. And R. N. A.

Unit-III

Mendel’s Law of inheritance and its application to human population, mode of inheritance of autosomal, dominant, recessive, sex-linked lethal and suitable genes and abnormal alleles, sex determination.

Unit-IV

Polygenetic inheritance in man, multiple alleles ABO, Rh and MN Blood Group.

Unit-V

Application of Human Genetics, Genetic Engineering and Gene Therapy.

BOOKS RECOMMENDED:

1. Stern, C  
   Principles of Human Genetics
2. Shull and Neel J. V  
   Human Heredity
3. Harrison, G. A Barnicnot  
   Weiner, J. S. Tuner Human Biology
4. Periasamy, K  
   An Introduction of Cytology, Genetics of Evolution.
5. Clellrge, E. J  
   An Introduction to Biology.

BOOKS FOR REFERENCE

1. Buras G. N.  
   Science of Genetics, An Introduction to Heredity
2. Gates, R. R.  
   Human Genetics Vol. I and II
3. Grow and Kinura  
   An Introduction to Population Genetic Theory.
PAPER- V
(100 MARKS)
PRACTICA – A (50 MARKS)

1. Prehistory – 12 marks
2. Technology – 10 marks
3. Musicology and Museum Management – 05 marks
4. Practical Note Book – 08 marks
5. Serology – 10 marks

A. Prehistory: 12 marks

The candidates shall draw to scale and describe ten prehistoric tools i.e. Palaeolithic, Mesolithic and Neolithic tools. They shall also be familiar with identification, labelling and drawing of prehistoric tools sketches.

B. Technology 10 marks

The candidate shall draw to scale and describe implements (or models) of food gathering, hunting, fishing, agriculture and transport devices. They shall also be familiar with the identification and labelling of various parts of the above implements.

C. Museology and Museum Management: 05 marks

The candidates shall pressure the organic and inorganic materials (Wood, Bamboo, Leather, Feather, fibre, books and manuscripts, iron, and classification of specimens in anthropological museum and the management of museums.
BOOKS FOR REFERENCE:


PRACTICAL (B)

( 50 MARKS)

a) Somatometry and Somatoscopy – (10 + 5 ) = 15 marks

b) Indices – 02 marks

c) Craniometry and Madibulometry ( 10 + 5 ) = 15 marks

d) Record – 08 marks

e) P. T. C. – 05 marks

f) Viva- voce. - 05 marks.

A) Somatometry and Samotoscopy

Candidates shall be familiar with the procedure adopted descriptive terms used in making observations, measurements of the following external characters and take measurements on five adults.

1. Height Vertex

2. Height Acromion

3. Height Tragus

4. Sitting height

5. Height Radius

6. Chest Breadth

7. Chest Depth

8. Maximum Head Length

9. Maximum Head Breadth

10. Minimum Frontal Diameter
11. Bizygomatic Oneler
12. Bigonial Diameter
13. Nasal Height
14. Nasal Breadth
15. Morphological Facial Height
16. Uppers Facial Height

**Somatoscopy.**

Candidate shall be familiar with the procedure adopted and descriptive terms used in making observation on the following:

1. Skin Colour
2. Eye Colour, Fold, Eye word
3. Hair form, Texture
4. Nose
5) Lip
6) Chin
7) Prognathism
8) Spra-orbital ridges

**Indices:**

1. Cephalic or Length Breadth Index
2. Length – Height Index
3. Breadth – Height Index
4. Morphological Facial Index

**Craniometry and Mandibulometry:**

C) **Craniometry**

Candidates shall be familiar with procedure adopted and descriptive terms used in the following measurements. They will take measurements 5 skulls.
1. Maximum Cranial Length
2. Maximum Cranial Breadth
3. Glabella inion length
4. Nasion inion length
5. Nimastoidal Breadth
6. Last frontal Breadth
7. Bizygomatic Breadth
8. Breadth of Upper Jaw
9. Basion – Bregona Height
10. Nasal breadth
11. Nasal height

Frontal Choral
Parietal Choral

**Mandibulometry:**

Candidate shall be familiar with procedure adopted and descriptive terms used in the following measurements and take measurements on five mandibles.

1. Bicondylar Breadth
2. Bingonial Breadth
3. Mandibular Length
4. Height of Ramus
5. Breadth of Ramus.

**BOOKS RECOMMENDED**

1. Single. I and Bhasin - Anthropology
2. Sen. Tulike - Anthropology
3. Das B. M. And Rajan Deku - Practical Anthropology

FINAL YEAR EXAMINATION
PAPER-VI

Time – hours
Full Marks – 100

INDIAN SOCIETY
UNIT-I

India: Unity in diversity, race, language and culture.

Unit-II

Indian Social System: Varna, Caste, joint family, village communities

Unit-III

Study of tribal, peasant and urban societies, great tradition and little tradition.

Unit-IV

Sacred complex, universalization and parochialization Sanskritization and Westernization.

Unit-V

Dominant caste, tribe, caste integration and continuum urbanization and industrialization process in India:

BOOKS RECOMMENDED:
1. Mason. Phillip (ed.) Indian and Ceylon: Unity and diversity
2. Cohen B. S. India Social Anthropology of Civilization.
3. Kapadia K. M. Marriage and Family in India
4. Mariott Mc. Kin (ed.) Village India
5. Srinivas M. N. Social change in Modern India.

BOOKS FOR REFERENCE:

1. Srinivas M. N. Caste in Modern India and Others
2. Dube, S. C Essays

PAPER-VII

(100 MARKS)

CULTURAL AND APPLIED ANTHROPOLOGY

UNIT – I

Concept of culture, Culture and Societies, Scope of cultural Anthropology, universal aspect of culture, study on cultural trait, culture complex, culture area, culture pattern.

Unit-II

Evolutionary School or thought: Evolution and Evolutionism, contribution of E. B. Tylor, James Frazer, Maine, McLennan, Herbert Spancer, L. H. Morgan and Bachofen Neo-evolutionism and Neo-evolutionist, contributions of V. Gordon Clhilde, Julian, HSsteward and Leslie A. White.

Unit-III

Diffusionists school of thought: Diffusion and Diffusionism, Contributions of British, German and American Diffusionists.

Unit-IV
Nature and scope of Applied Anthropology, action anthropology role of Anthropology in tribal Development.

**Unit-V**

Distribution of tribal population in India with reference to Orissa constitutional safeguards for scheduled caste and scheduled tribes and back ward classes.

Applied Physical Anthropology: Medicolegal application of Genetics Forensic Anthropology, Medical Anthropology, Applications of Anthropological Knowledge to problems of public Health, disease, fertility and mortality in India.

**BOOKS FOR REFERENCE:**

2. Elwin, V : A new Deal for Trivial India
3. Herskovits, M. J. : Man and his Works
4. Sharma, B. D : Trival Development
5. Keesing and Keesing : New Perspective in Cultural Anthropology

**BOOKS RECOMMENDED:**

1. Keesing M. F : Cultural Anthropology
2. Hoebal and Forst : Social and Cultural Anthropology
3. Herskovit, M. J. : Cultural Anthropology
4. Bose, N. K : Society and Culture in India
5. Vidyarathi L. P. (Ed.) : Applied Anthropology in India
1. Jha Makhan : An Introduction to Anthropological Thought
2. Herskovits : Cultural Anthropology
4. Radcliffe Brown : Structure and Function in Primitive Society
5. Upadhyay and Pandey : History of Anthropological Thought

BOOKS FOR REFERENCE

Benedict, Ruth : Patterns of Culture.
White, L. A : The Science and Culture.
Kuper, Adam : Anthropology and Anthropologist.

BOOKS RECOMMENDED

1. Kothari C. R. : Research Methodology
2. Bajpai : Methods of Social Research

BOOKS FOR REFERENCE

1. Young P. V : Scientific Social Survey and Research
2. Govde and Hatt : Scientific Methods in Research.
FIELD WORK

(100 MARKS)

The candidate shall submit an illustrated field report basing on 15 days field work on a community or tribe selected by the Head of the Department. The report shall cover all important aspects of Socio-cultural and physical features of the people selected for study by the Head of the Department from time to time.

The distribution of marks shall be as follows:

1. Field Report 60 marks
2. Viva Voce 20 marks
3. Statistics 20 marks

BOOKS FOR REFERENCE

1. Royal Anthropology : Note and Queries on Anthropology institute
2. Gooda and Hatt : Scientific Methods Research
3. Ghosh B. N : Scientific Methods and Social Research
4. Sharma, B. A. V. Btial : Research Methods in Social Science
5. Young. P. G : Scientific Social Survey and Research

PSYCHOLOGY (General)

The B. A./ B. Sc. TDC course will have examination in 2nd year and Final Year. The T. D. C. Psychology (Pass) course shall be carrying 400 marks and the marks distribution of Course structure for the two examination shall be as follows:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Paper</th>
<th>Course, Subject</th>
<th>Marks</th>
<th>Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDC</td>
<td>Paper</td>
<td>Course</td>
<td>Marks</td>
<td>Duration</td>
</tr>
<tr>
<td>--------------</td>
<td>---------</td>
<td>---------------------------------------------</td>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td>First TDC</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>Second TDC</td>
<td>Paper-1</td>
<td>General Psychology</td>
<td>75</td>
<td>3 hours</td>
</tr>
<tr>
<td></td>
<td>Paper-II</td>
<td>Psychology Statistics</td>
<td>75</td>
<td>3 hours</td>
</tr>
<tr>
<td></td>
<td>Paper-III</td>
<td>Practical (General)50 marks</td>
<td>50</td>
<td>3 hours</td>
</tr>
<tr>
<td>Final TDC</td>
<td>Paper-IV</td>
<td>Fundamentals of Educational Psychology</td>
<td>75</td>
<td>3 hours</td>
</tr>
<tr>
<td></td>
<td>Paper-V</td>
<td>Applied Educational Psychology</td>
<td>75</td>
<td>3 hours</td>
</tr>
<tr>
<td></td>
<td>Paper-VI</td>
<td>Practical (Testing)</td>
<td>50</td>
<td>3 hours</td>
</tr>
</tbody>
</table>

**PAPER-I**

**GENERAL PSYCHOLOGY**

*(75 MARKS)*

I. **Introduction to Psychology:**

Definition and goals of Psychology: Approaches; Biological, Psycho-dynamic, behaviourist, cognitive, humanist and evolutionary: Experiment, Observation, Interview, questionnaire and case study.

II. **Biological basis of Behaviour:**

Nervous system: the Neuroa. The central Nervous system (Spinal Cord and brain) cerebral hemispheres, cerebral localisation, split-brain studies, Autonomic Nervous system, Endocrine glands.

III. **Perceptual Process:**
Definition, perceptual organisation, Functional determinants of perception, perceptual constancies and illusions, Extrasensory perception (ESP).

IV. **Learning:**

Classical and operant conditioning: Basic process; Extinction, Spontaneous recovery, Generalisation and discrimination, Reinforcement schedules, Tolman’s sign learning, observational learning.

V. **Memories and Forgetting:**

Encoding, storage and retrieval, processing sensory, Short-term and Long-term memories, Forgetting: Decay, interference retrieval, failure, motivated forgetting and amnesia, state dependent forgetting.

VI. **Motivation and Emotion:**

Indicators of motivation, Biogenic and Socio-genic motives, need hierarchy model, techniques of assessment of motivation.


VII. **Personality** – Definition, Trait and type approaches, Biological and Socio-cultural determinants, techniques of assessment Psychometric and Projective.

VIII. Thinking of Intelligence:

Concept of thinking, creative thinking. Influenced of heredity and environment on intelligence, Intelligence tests.

**READING:**


PAPER-II

PSYCHOLOGICAL STATISTICS

( 75 MARKS)

1. **Nature of Psychological data and measurement:**
   Levels of measurement: Scales; discrete and continuous; scores, application of statistics in psychology.

2. **Measures of Central Tendency:**
   Characteristics and computation of mean, median and mode, Uses of various measures of central tendency.

3. **Measures of variability.**
   Concept of variability; Range and semi-inter quartile range, Mean deviation, standard deviation.

4. **Normal distribution;**
   Properties of Normal probability curve; Deviation from NPC-Skewness & Kurtosis, Application of NPC.

5. **Correlation:**
Concept of correlation; Peason’s Product-moment correlation, Spearman’s Rank-Order correlation.

6. **Sampling and Tests of significance:**
   a) Types Sampling, Sampling distribution; standard error of mean.
   b) ‘t’ tests for independent and dependent samples; interpretation ‘t’ values – level of significance. Errors in inference making.

7. **Analysis of variance (ANOVA), One way analysis of variance.**

**READING**


**PAPER-III**

(PRACTICAL (GENERAL)

(50 MARKS)

1. Special learning:
2. Paired associate e learning (Learning and Saving method)
3. Bilateral Transfer of training
4. Phenomenon of Retroactive inhibition.
5. Recognition of nonsense materials in similar and dissimilar context.
READING

1. Mushin, Experiments in Psychology, (O.L BOMBAY)
2. Wood Worth and Schlosberg, Experimental Psychology: (Oxford & I. B. H)
3. Underwood, Experimental Psychology : (Times of India)

PAPER – IV

(FUNDAMENTALS OF EDUCATIONAL PSYCHOLOGY)

(75 MARKS)


2. Learning:

   Definition, Learning Event, Basic conditions of learning, contiguity, practice, reinforcement, generalization and discrimination.

   The nature of verbal learning, conditions of verbal learning, conditions of verbal learning,
   a) Internal conditions: meaningfulness and verbal mediation.
   b) External condition: Instructions to learn, practice, reinforcement interference and methods of measurement.

3. Skill learning:

   The nature of skill learning: phases of skill learning, basic conditions of skill learning, contiguity, practice Feedback.

   Transfer of training/learning, types of transfer; positive, negative, specific and non-specific, theories of transfer, theory of mental discipline theory of identical elements, theory of generalisation, transposition theory.
4. **Creativity:**

   Nature of creativity, creativity and learning, creativity and learning, Instructions for fostering creativity.

5. **Achievement Tests:**

   a) Objective and essay type of tests – merits and demerits, construction of objective tests.

   b) Concept of aptitude; Types of aptitude and measures of aptitude.

**PAPER-V**

**APPLIED EDUCATIONAL PSYCHOLOGY**

(75 MARKS)

1. **General Themes:**
   
   a) Psychological assessment of the child

   b) Psychological management of childhood problems.

2. **Education of the Exceptional Children.**

   Meaning and definition of concept of gifted children Nature and characteristics of gifted children, assessment of exceptional children.

3. **Education of mentally retarded children:**

   Definition and concept of mental retardation, levels of mental retardation, causes of mental retardation, training and prevention of mentally retarded children.

4. **Educational of the Juvenile delinquent children.**

   Definition, etiological factors of juvenile delinquency education, Management and prevention of juvenile delinquency.
5. **Guidance and counselling:**

   Meaning, definition, nature, need and functions of guidance and counselling, areas of counselling and guidance, techniques of guidance.

**READINGS**

2. Advanced Educational Psychology – S. K. Mangal
3. Educational Psychology – Dr. S. S. Mathur (13th Revised edition)
4. Mental health of Indian Children – Malvika Kapur (Sage Publication)
5. Exceptional Children – Howard and Omlansky

**PAPER – VI**

**PRACTICAL ( TESTING)**

( 50 MARKS)

1. Non-verbal Intelligence Test (Raven’s progressive matrices/ Bhatia Battery of Intelligence Test)
2. Eysenck’s personality test (EPI).
3. Word association test (Jung/Kent Rosanoff)
4. Differential Aptitude Test (DAPT)
5. Weschler’s memory scale / PGT

**READINGS**

2. Mohanty G. B., Experiments in Psychology
PSYCHOLOGY (HONOURS)

The B. A/ B. Sc. TDC will have examination in every year as 1st TDC, 2nd TDC and Final TDC. The T. D. C. Psychology (Honours) course shall be carrying 800 marks and the marks distribution of course structure for three examination shall be as follows:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Paper</th>
<th>Course Subject</th>
<th>Marks</th>
<th>Examination duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>First TDC</td>
<td>I</td>
<td>General Psychology</td>
<td>100</td>
<td>3 hours</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>Psychology Statistics</td>
<td>100</td>
<td>3 hours</td>
</tr>
<tr>
<td>Second TDC</td>
<td>III</td>
<td>Organisational Behaviour</td>
<td>100</td>
<td>3 hours</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>Educational Psychology</td>
<td>100</td>
<td>3 hours</td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>Practical General Psychophysics</td>
<td>50</td>
<td>6 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Final TDC</td>
<td>VI</td>
<td>Psychopathology</td>
<td>100</td>
<td>3 hours</td>
</tr>
<tr>
<td></td>
<td>VII</td>
<td>Social Psychology</td>
<td>100</td>
<td>3 hours</td>
</tr>
<tr>
<td></td>
<td>VIII</td>
<td>Practical Testing or case report</td>
<td>100</td>
<td>6 hours</td>
</tr>
</tbody>
</table>

PAPER – I

(General Psychology)

(100 marks)

1. Introduction to Psychology:
Definition and development of Psychology, Current Psychological Perspectives, Behavioural, cognitive, Psychodynamic Humanistic Neuroscience, Evolutionary, Socio-Cultural, Multicultural, Methods of Psychology—experiment, observation, interview questionnaire and case study.

2. **Biological basis of Behaviour:**

   Structure and function of neurons, synaptic transmission, Neurotransmitters.

   The Central Nervous system (Spinal cord and brain)

   Structure of brain, Lashley’s studies of brain localisation, Autonomic Nervous system, Endocrine glands.

3. **States of mind**:

   Nature of conscious, changes in conscious consciousness, day dreaming, sleep and dream, extended states of consciousness, Hypnosis, Meditation and hallucination psychoactive drugs.

4. **Perception**.

   Definition of perception, key perceptual processes, perceptual organisation, functional determinants of perception, extrasensory perception.

5. **Learning**:

   Classical and operant conditioning: Nature and basic Principles, Tolman’s sign learning, Observational learning:

6. **Memory**:

   The information processing approach, sensory memory, short term memory, Long-term memory, Forgetting from LTM. Improving your memory.

7. **Motivation of Emotion**:
Theories of motivation. Biogenic and Sociogenic motives. Intrinsic motivation.


8. **Intelligence:**


9. **Personality:**

   Trait and type approaches, Freud’s Theory of Personality, Humanistic Theories of Personality.

   Assessment of personality – Psychometric and projective techniques.

10. **Thinking:**

   Thinking of reasoning. Thinking as problem solving behaviour, creative thinking.

**REFERENCE:**


Freeman, F. S, (1972) psychology Testing:


**PAPER – II**

**(PSYCHOLOGICAL STATISTICS)**

**(100 MARKS)**

1. **Nature of psychological data and measurement.**
Levels of measurement: discrete and continuous variables application of statistics in psychology.

2. **Measures of Central tendency:**
   Concept and measures of central tendency – Characteristics of mean, median and mode; Computation of mean, median and mode and used in statistical measurements.

3. **Measures of variability:**
   Concept of measures of variability, computation and uses of range, semi-interquartile range, Average deviation and standard deviation.

4. **Normal Distribution:**
   Properties and application of Normal probability curve, Deviation from NPC, Skewness and Kurtosis.

5. **Correlation:**
   Concept of correlation, Pearson’s product-moment correlation Spearman’s Rank-order (rho) correlation.

6. **Hypothesis testing and making inferences:**
   a) Population and sample: Random sampling: sampling distribution, standard error of mean.
      b) Students “t” test, level of significance, Type – I and Type – II error in inference making.

7. **ANOVA:**
   Purpose and assumptions of ANOVA; One way and two-way analysis of variance.

8. **Non-parametric Statistics:**
Difference between parametric and non-parametric statistics, chi-square, Kruskal-Welli (One way ANOVA), Friedman’s Two way ANOVA – for Testing the difference between several Group means.

REFERENCES

PAPER-III
(100 MARKS)
ORGANISATION BEHAVIOUR
1. Introduction to organisational Behaviour.
   Historical context of OB, Definition of OB; challenges, scope and opportunities for OB.

2. Perspectives for understanding OB:
   Open system approach, Human relations perspective, socio-technical approach.

3. Person in the organisation:
Biographical characteristics, Major personality attributes affecting OB, measurement of personality in OB context. Matching personality and job, personality and culture.

4. **The individual and organisation.**


5. **The individual in the organisation:**

Concept and early theories of motivation-need hierarchy theory; Theory X and Y and two factor theory. Skills involved in motivating workers, MBO, Employee involvement programmes.

6. **The group of organisation.**

Nature, types and stage of group development, conditions affecting group functioning, group structure: Sociometry, group Decision Making.

7. **Communication in Organisation:**

Communication Model, Barriers to effective communication, Direction and network of communication, communication and decision making, skills involved in communication and listening.

8. **Leadership in Organisation:**

Nature and types, behavioural theories, contingency theories and contemporary issues in leadership. Leadership and power, Base of power and power in action, skills involved in meaning politicking.

10. Organisational change and development, nature, forces and approaches to change management, organisational development techniques, cultural issues in change and development skill in managing change in individual level.

**REFERENCE:***


**PAPER-IV**

**(FULL MARKS -100)**

**EDUCATIONAL PSYCHOLOGY**

1. Introduction to Educational Psychology, aims and objective of Educational Psychology, Basic teaching model, Theory of teaching and Theories of Learning.

2. **Learning:**

Definition, basic conditions of learning – contiguity, practice reinforcement, generalisation discrimination verbal learning – Nature of verbal learning, conditions of verbal learning.

   a. Internal conditions of verbal learning
      i) Meaningfulness   ii) Verbal mediation

   b. External conditions of verbal learning
Instruction to learn, practice, reinforcement, interference and methods of measurement.

3. **Skill learning:**

   Nature of skill learning, basic conditions of skill learning, contiguity, practice and feedback.

   Transfer of Training/learning, types of transfer; positive negative, specific and non-specific, theories of transfer of training. Theory of mental discipline, theory of identical elements theory of generalisation, transposition theory.

4. Creativity – nature of creativity, creativity and learning, creativity and intelligence, Instructions for fostering creativity.

5. **General Themes:**

   a) Psychological assessment of the child.
   
   b) Psychological management of the child.

6. **Education of Exceptional Children.**

   Education of the gifted children:

   Meaning and definition of concept of gifted children, Nature and characteristics of gifted children, Assessment of gifted children and education of gifted children.

7. Education of the mentally retarded children

   Definition and concept of mental retardation, levels of mental retardation, causes of mental retardation, training and prevention of mental retardation.

8. **Guidance and counselling:**

   Meaning and definition, Nature, Need and function of guidance and counselling, techniques of counselling.
9. The child in the community:
   a) The child in the community
   b) The child in the family
   c) The child at risk in the community

READINGS
1. Psychology of learning and instructions – Deucce and Crawford,
2. Educational Psychology – Dr. S. S. Mathur
3. Advanced Educational Psychology – S. Chauhan
5. Guidance in Indian Universities – S. K. Kochhar

PAPER – V
(FULL MARKS – 100)
PRACTICAL (GENERAL)
1. Serial Learning
2. Bilateral transfer of training.
3. Phenomenon of Retroactive inhibition
4. Recognition of NS in similar and dissimilar context
5. Retention and amount of materials
6. Knowledge of result in Muller Lyer-illusion
7. R. L. By method of limits
8. R. L. By method of constant stimuli
9. D. L. By method of limits
10. D. L. By method of constant stimuli
READINGS


REFERENCE:


PAPER – VI

(FULL MARKS – 100)

Psychopathology

1. Introduction to Psychopathology:

   The concept of normality and abnormality, criteria for defining abnormality.
   Psychological Assessment of Psychopathology: Diagnostic Tests, Rating Scales:
   History taking interview orientation to projective tests.

2. Psychological model of psychopathology:

   Psycho-dynamics, Behavioural, Cognitive, Humanistic and Existential.

3. Anxiety Disorders:

   Panic disorder and Agoraphobia, specific phobias, social phobia, obsessive compulsive disorder, generalized anxiety disorder.

4. Somatoform Disorder:

   Dissociative disorders conversion disorder.
5. **Mood Disorder:**

Manic episode, Depressive episode, bipolar affective disorder.

6. **Schizophrenia:**

Definition and clinical symptoms of schizophrenia
Diagnostic types of schizophrenia
Etiology of schizophrenia
Therapies of schizophrenia

7. **Disorder due to psychoactive substance use**

Alcohol and drug dependence.

8. **Stress:**

Definition, nature and types of stress, stress management.

9. **Psychotherapies:**

General goals of Psychotherapy, Psycho-analytic therapy, Humanistic and existential therapy, Gestalt therapy cognitive and behaviour therapy.

10. **Community psychology and community mental health.**

   a) Crisis intervention
   b) Consultation
   c) Non-professional community
   d) Mental Health Education

**BOOKS FOR REFERENCE:**

PAPER – VII

SOCIAL PSYCHOLOGY

(FULL MARKS – 100)

1. **Introduction.**
   
   Nature, goal and scope of social Psychology, social psychology and other social sciences: Methods of social Psychology: Experimental and non-experimental methods, correlational approach.

2. **Attitudes:**
   
   Attitude and function of attitudes, Attitudes and behaviour: Formation, change and measurement of attitude.

3. **Prejudices and Discrimination.**
   
   Nature and components of prejudice: Acquisition of prejudice, Reduction of Prejudice.

4. **Groups and leadership:**
   
   Group structure and function, Groups cohesiveness, norms and decision making, leadership- Definition and function: Traits situational, interactional and contingency approaches to leadership; Leadership effectiveness, the characteristic leadership.

5. **Communication:**
   
   Communication models: Verbal and nonverbal communication language and social interaction, Barriers in communication.
6. **Aggression: Its Nature, Causes and control:**

   Theoretical perspectives – Trait, Situational and Social learning approaches; Social and personal determinants of aggression; prevention and control of aggression.

7. **Environmental influence on behaviour:**

   The Urban environmental stress: Noise, Pollution and atmospheric conditions, density and crowding, avoiding the effects of crowding, intervention for environmental management.

**REFERENCES:**


Kretck, Crutchfield and Ballachy – Individual in Society.


Lindgreen, Social Psychology.

**PAPER – VIII**  
(100 MARKS)  
(PRACTICAL (TESTING) Time – 6 hours.

A. 1. Non-verbal Intelligence Test (Raven’s Progressive Matrices/ Bhatia Battery Intelligence Test.

2. Eysenck’s Personality Inventory (SPI)

3. Word – Association Test (Jung/Kent Rosanaff)

4. Differential Aptitude Test (DAPT)

5. Weachter’s Memory Scale / PGI Memory scale.
Advanced case study report on a client in the field of clinical psychology/organisational psychology/Educational Psychology/ Social Psychology.

or

1. Bell’s Adjustment Inventory.
2. Cattell’s 16 PF.
3. Spielberge’s anxiety trait and State inventory
4. Back’s Deparession inventory (BDI)
5. Thematic Apperception Test (TAT)
   Children Apperception Test (CAT)

READINGS;

B.A./B.Sc. (GENERAL)

2011-14

MATHEMATICS

There shall be two theory papers 100 Marks each and of three hours duration at the end of Second year.

PAPER-I

Analysis 100 Marks

PAPER-II

Differential Equation 50 Marks
Discrete Mathematics 50 Marks

There shall be two theory papers 100 marks each and of three hours duration at the end of Third year.

PAPER-III

Calculus 50 Marks
Linear Algebra 50 Marks

PAPER-IV

Numerical Analysis 50 Marks
Algebra 50 Marks
Details of the course

Second year examination

(At the end of second year)

Paper-I

Analysis

Unit-I

Ordered, field of Real numbers, l.u.b. and g.l.b. completeness of R (Not through Dedekind cuts), complex numbers, Inequalities, Metric Properties of R, limit points, closed sets, Open sets, Bolzano-Weirstrass theorem.

Unit-II

Convergence of real sequence and series, monotonic sequences, Cauchy criteria of convergence, limit superior, limit inferior. Tests of convergence of spaces of positive terms, Comparison tests, Ratio test, Root test, Absolute convergence, Alternating series test.

Unit-III

Limit and continuity of functions, properties of continuous functions, discontinuities, uniform continuity, Differentiability of real functions, Higher derivatives, Leibnitz theorem, Mean value theorem, Taylor's theorem with reminder, Taylor's series.
Unit IV

Riemann integration, its properties, Riemann integrability of continuous and monotonic functions, Fundamental theorem of calculus.

Unit-V

Improper Integrals and Fourier Series.

Unit-VI

Functions of several variables, Neighbourhood of points in $\mathbb{R}^2$ and $\mathbb{R}^3$. Limit of a function, repeated limits, continuity, Partial derivatives, differentiability, artial derivative of higher orders, Derivatives of composite functions, change of variables, Taylor's Theorem, Extreme value, Implicit functions (Statement of implicit function theorem only) Jacobians, derivatives of implicit functions, Lagranges method of multipliers (application without proof).

BOOKS PRESCRIBED

S.C. Malik and S. Arora-Mathematical Analysis (New Age International)

Chapters-1 (excluding 4.3 and 4.4), 2, 3, 4 (up to Art. 5 and 10.1, 10.2), 5, 6, 9 (up to Art 9), 11 (excluding Art 5), 14, 15 (up to Art 10) and 16.

BOOKS FOR REFERENCE

1. Fundamentals of Real Analysis-S.L.Gupta and Nisha Rani
2. Mathematical Analysis-II-Sharma and Vasistha.
3. Fundamental of Mathematical Analysis-G.Das & S.Pattanayak.
PAPER-II 100 Marks

(A) DIFFERENTIAL EQUATIONS 50 Marks

Unit-I
Introduction and some basic concept of differential equations. Exact differential equations, first order differential equations but not of first degree. Solution of Higher order Linear differential equations with constant coefficients and equations with variable coefficients.

Unit-II
Power Series solutions about ordinary point, Legendre's Equation and its simple properties.

Unit-III
Power Series solutions about singular points, Bessels Equation and Bessels Function.

BOOKS PRESCRIBED

BOOKS FOR REFERENCE
1. Introductory course in differential equations-D.A. Murray
2. Elements of Ordinary Differential Equations and Special Functions- A. Chakrabarty (New Age International)
(B) DISCRETE MATHEMATICS

Unit IV
Mathematical Logic; Properties and Logical Operators, Construction of Truth tables, Tautologies and contradictions. Equivalence and Implication, NAND and NOR, Functionally Complete sets, Two state Devices and Statement Logic, Normal Forms.

Unit-V
Lattices and Boolean Algebra: Partially order sets, Hasse Diagram of Partially order Sets, Lattices, Boolean Algebra, Karnaugh Map Representation of Logical Functions.

Unit-VI
Graph Theory: Basic Concepts, Operations on Graphs, Isomorphism, Connected Graphs, Distance in a Graph, Cut-vertices and Cut -edges, Connectedness in Directed Graph, Incidence and Adjacency Matrices, Eulerian and Hamiltonian Graphs, Euler Circuits, Eulerian Diagraphs, Trees, Application of Trees, Trees and Sorting, Spanning Trees, Optimal Spanning Graph., Depth-First Search and Breadth-First search
BOOKS PRESCRIBED


BOOKS FOR REFERENCE

Fundamental Approach to Discrete Mathematics- D.P. Acharya and Sreekumar (New Age International)

FINAL YEAR EXAMINATION

(At the end of the 3rd year)

PAPER – III 100 Marks

(A) CALCULUS 50 Marks

Unit-I
Integration of $\mathbb{R}^2$

Unit-II
Integration on $\mathbb{R}^3$

Unit-III
Vector Calculus, Differentiation of Vector functions, Gradient, divergence and curl of a Vector, Green, Gauss and Stokes theorems (Statements without proof) their applications.

BOOKS PRESCRIBED

1. Mathematical Analysis - S.C Mallik, Chapters: 17 and 18 (up to Art 5)

2. Topics of Calculus-Panda and Satapathy, Chapters- 6,7
BOOKS FOR REFERENCE

Vector Analysis with Applications — Ali and Hazra (New Age International )

(B) LINEAR ALGEBRA 50 Marks

Unit-I

Vector space, definition and examples: Subspaces, span of a set, linear dependence and independence, dimension and basis.

Unit-II

Linear transformation, definition and examples, range and vernal, rank and utility, the space L (U, V), composition of Linear Maps, matrix and linear map, linear operations, matrix multiplication, rank and nullity of matrix, transpose of a matrix.

Unit-III

Elementary row-operations, systems of Linear equations, matrix inversion, determinants, minors and rank of a matrix, product of determinants, application to linear equations, eigen values and eigen vector.

BOOKS RECOMMENDED

1. An Introduction to Linear Algebra: V.Krishnamurty et al. (affiliated East-West Press) Chapters: 3, 4 (4.1 to 4.7), 5, 6 (6.5 to 6.8)

BOOKS FOR REFERENCE

1. Basic Structures in Algebra, Part-I, J.N.Patnaik

3. First course in Linear algebra - Bhattacharya Jain and Nagpaul (New Age International)

**PAPER-IV**

100 Marks

**(A) NUMERICAL ANALYSIS**

50 Marks

**Unit-I**

Numerical Analysis and errors, Interpolation.

**Unit-II**

Numerical Integration, solution of Algebraic and transcendental equations.

**Unit-III**

Solution of system of linear equations, Numerical solution of ordinary differential equations.

(Examinees are allowed to use pocket calculators)

**BOOKS PRESCRIBED**


Chapters: I, II (2.1 to 2.9 and 2.13 to 2.16), III (3.7 to 3.14), IV (4.1 to 4.7), V (5.1 to 5.3) VI (6.1 to 6.3).

**BOOKS FOR REFERENCE**

Numerical Methods for Scientific and Engineering Computation - Jain and Iyengar (New Age International)
(B) ALGEBRA 50 Marks

Group Theory-Definitions and Examples, Sub-groups.

Unit-V

Counting, Principles, Normal subgroups, Quotient groups, Homomorphism.

Unit-VI

Ring theory-definitions and examples, some special class rings, Homomorphism.

Unit-VII

Theory of equations: Roots of an equation, relations between roots and coefficients, sum of powers of roots, symmetric functions, transformation of equations, repeated roots, common roots, some standard reduction of cubic, and biquadratic, Cardan's solution of a cubic, Descartes solution of biquadratic.

BOOKS PRESCRIBED

   Chapters: I, II (Art 2.1 to 2.7), III (Art 3.1 to 3.4)

2. Text Books of Algebra: Ravindra Kumar and Srikrishna Wassn (Pitambar Publication) Chapter-III (3.1 to 3.9)

BOOKS FOR REFERENCE


2. Modern Algebra - Vatsa and Vatsa (New Age International)
B.A./B.Sc. (HONOURS)

MATHEMATICS

There shall be in all seven theoretical papers and one practical paper or eight theoretical papers. The duration of each theoretical papers is three hours and practical paper is of six hours. Paper I and II Papers in 1st year, Paper III, Paper IV and Paper V in, Second year and, Papers VI, VII & VIII will be taught in Final year.

PAPER-I 100 Marks

a. Analysis 100 Marks

PAPER-II 100 Marks

a. Differential Equation 50 Marks
b. Discrete Mathematics 50 Marks

PAPER-III 100 Marks

a. Linear Programming 50 Marks
b. Abstract Analysis 50 Marks

PAPER-IV 100 Marks

a. Mathematical Modeling 50 Marks
b. Probability 50 Marks

PAPER-V 100 Marks
a. Partial Differential Equations  50 Marks

b. Computer Programming C   50 Marks

**PAPER-VI**  
100 Marks

a. Calculus  50 Marks

b. Linear Algebra  50 Marks

**PAPER-VH**  
100 Marks

a. Numerical Analysis  50 Marks

b. Algebra  50 Marks

**PAPER-VIII**  
100 Marks

Practical  100 Marks

Or

Operations Research  100 Marks

**FIRST YEAR EXAMINATION**

(At the end of first year)

**PAPER-I**

**ANALYSIS**

100 Marks
Unit-I
Ordered, field of Real numbers, l.u.b. and g.l.b. completeness of R(Not through Dedkind cuts), complex numbers, Inequalities, Metric Properties of R, limit points, closed sets. Open sets, Bolzano-Weirstrass theorem.

Unit-II
Convergence of real sequence and series, monotonic sequences, Cauchy Criteria of convergence, limit superior, limit inferior, Tests of convergence of spaces of positive terms, comparision tests, Ratio test, Root test, Absolute convergence, Alternating series test.

Unit-III
Limit and continuity of functions, properties of continuous functions, discontinuities, uniform continuity, Differentiability of real functions, Higher derivatives, Leibnitz, theorem, Mean value theorem, Taylor's theorem with reminder, Taylor's series.

Unit-IV
Riemann integration, its properties, Riemann integrability of continuous and monotonic functions, Fundamental theorem of calculus.

Unit-V
Improper Integrals and Fourier Series

Unit-VI
Functions of several variables, Neighbourhood of points in $\mathbb{R}^2$ and $\mathbb{R}^3$. Limit of a function, repeated limits, continuity, Partial derivatives, differentiability, artial
derivative of higher orders, Derivatives of composite functions, change of variables, Taylor's Theorem, Extreme value, Implicit functions (Statement of implicit function theorem only) jacobians, derivatives of implicit functions, Lagranges method of multipliers (application without proof).

**BOOKS PRESCRIBED**

S.C. Malik and S. Arora-Mathematical Analysis (Wiley Eastern) Chapters-1 (excluding 4.3 and 4.4), 2, 3, 4 (up to Art. 5 and 10.1,10.2), 5, 6, 9(up to Art 9), 11 (excluding Art 5), 14, 15 (up to Art 10) and 16.

**BOOKS FOR REFERENCE**

1. Fundamentals of Real Analysis-S.L. Gupta and Nisha Rani
2. Mathematical Analysis-II-Sharma and Vasistha.
3. Fundamental of Mathematical Analysis-G.Das & S.Pattanayak.

**PAPER-II**

100 Marks

(A) **DIFFERENTIAL EQUATIONS** 50 Marks **Unit-I**

Introduction and some basic concept of differential equations. Exact differential equation, first order differential equation but not of first degree. Solution of Higher order Linear differential equations with constant co-efficients and equations with variable co-efficients
Unit-II

Power Series solutions about ordinary point, Legendre's Equation and its simple properties.

Unit-III

Power Series solutions about singular points, Bessels Equation and Bessels Function.

BOOKS PRESCRIBED


BOOKS FOR REFERENCE

1. Introductory course in differential equations-D.A. Murray
2. Elements of Ordinary Differential Equations and Special Functions- A. Chakrabarty (New Age International)

(B) DISCRETE MATHEMATICS 50 Marks

Unit-IV

Mathematical Logic: Properties and Logical Operators, Construction of Truth tables, Tautologies and contradictions, Equivalence and Implication, NAND and NOR, Functionally Complete sets, Two state Devices and Statement Logic, Normal Forms.
Unit-V

Lattices and Boolean Algebra: Partially order sets, Hasse Diagram of Partially order Sets, Lattices, Boolean Algebra, Karnaugh Map Representation of Logical Functions.

Unit-VI

Graph Theory: Basic Concepts, Operations on Graphs, Isomorphism, Connected Graphs, Distance in a Graph. Cut-vertices and Cut-edges, Connectedness in Directed Graph, Incidence and Adjacency Matrices, Eulerian and Hamiltonian Graphs, Euler Circuits, Eulerian Dragraphs, Trees, Application of Trees, Trees and Sorting, Spanning Trees, Optimal Spanning Graph., Depth-First Search and Breadth-First search

BOOKS PRESCRIBED


Chapters: 3, 6, 7

BOOKS FOR REFERENCE

Fundamental Approach to Discrete Mathematics- D.P.Acharya and Sreekumar (New Age International)
SECOND YEAR EXAMINATION
(At the end of second year)

PAPER-III

100 Marks
50 Marks

(A) LINEAR PROGRAMMING

Unit-I
Mathematical formulation, Grphical solution, Simplex method.

Unit-II
Duality in linear Programming, Post-Optimal Analysis.

Unit-III
Transportation Problem and Assignment Problem.

BOOKS PRESCRIBED
Operations Research : Kantiswarup , P.K.Gupta and Manmohan
Sultan Chand & Sons.

Chapters : 2,3,4,5 (except 5.8 ), 6,10,11 ( 11.1 to 11.4 )

BOOKS FOR REFERENCE
1 .Linear Programming Methods and Application: By S.I. Gass; McGraw Hill-
International Book Company.

2. Linear Programming: Methods and Applications- G.V. Shenoy (New Age)
(B) ABSTRACT ANALYSIS 50 Marks

Unit-IV
Metric space, with examples, \( R, R^2, R^J \) and \( C(a,b) \) as metric spaces, limit in metric spaces, continuous function on a metric space, open sets, closed sets, Discontinuous function on \( R \).

Unit-V
Connected sets, Bounded sets, Totally bounded sets, complete metric spaces.

Unit-VI
Compact metric spaces, uniform continuity

BOOKS PRESCRIBED
Methods of Real analysis-R.G.Goldberg Chapters: 4, 5, 6 (up to 6.8) and 10(10.1 to 10.2).

BOOKS FOR REFERENCE
S.C. Malik and S.Arora -Mathematical Analysis (New Age International)

PAPER-IV

(A) PROBABILITY

50 Marks

Unit-I
Aximoatic approach of probability theory, finite sample spaces, conditional probability, Independent events.
Unit-II

Concept of random variable, Distribution functions moments of the random variable, Biuomial, passion, uniform and normal distribution.

Unit-III

Joint distribution functions and density functions conditional densities of continuous random variables, conditional expectation and variance.

PAPER-V

100 Marks

(B) MATHEMATICAL MODELLING

50 Marks

Unit-IV

Mathematical modeling through ordinary differential equations of first order.

Unit-V

Mathematical modelling through the systems of ordinary differential equations of the first order.

Unit-VI

Mathematical Modelling through ordinary differential equations of second order.

BOOKS PRESCRIBED

1. Probability of Random Processes-Srinivasan and K.M. Mehta (II edition)

Chapter: 3, 4 (excluding absolute moments), 5(excluding 5.4).
2. Mathematical Modelling - J.N. Kapoor (New Age International)

Chapters: 2, 3 (except 3.13 and 3.14) and 4. BOOKS FOR REFERENCE

1. Kai Lai Chung


PAPER – V

(100 marks)

(A) PARTIAL DIFFERENTIAL EQUATIONS 50 Marks

Unit-I


Unit-II

Linear partial differential equations with constant coefficients Homogeneous linear equations, Reducible non-homogeneous linear equations.

Unit-III

Partial Differential Equations of Order two with variable coefficients Particular forms. Transformation of the independent variable, Manges, methods of integrating $Rr - Ss - Tt = V$
BOOKS PRESCRIBED

A Text book of Differential Equations - N.M.Kapoor (Pitambar Publication)
Chapters: 9(9.1 to 9.7), 10,11(11.1 to 11.11), 12(12.1 to 12.9)

BOOKS FOR REFERENCE


(B) COMPUTER PROGRAMMING - C

50 Marks

Unit-I

Getting started: What is C, Getting started with C, C \instructions, The First C Programme, control instruction in C.

Decision control Structure: Decisions! Decisions! The if statement. The if-else statement, use of Logical operators, A word of caution. The conditional operations

Unit-II

The Loop Control statement: Loop. The break statement, The continue statement, The do while Loop. The case controle structure: Decision using suitch, the go to statement. Functions: What is function, passing value between functions, Scope Rule of functions, Advanced features of Functions.
Unit-III

Data Types Revised: Integers, long and short, integers-signed and unsigned, chars-signed and unsigned, Floats and Doubles, Storage class in C,C preprocessor: Features of C preprocessor, Macro Expansion. File Inclusion, Conditional Compilation, Arrays: What are arrays, more on arrays, pointers and Arrays, More than and Dimension, Array of Pointers..

BOOKS RECOMMENDED

Let us C (third Editions): by Yashvant Kanetkar, BPB Publication., Chapter: 1,2,3,4,5,6,7,8.

FINAL YEAR EXAMINATION

(at the end of third year)

PAPER-VI (A) CALCULUS

Unit-I

Integration on $\mathbb{R}^2$

Unit-II

Integration on $\mathbb{R}^2$

Unit-III

Vector Calculus, Differentiation of Vector function. Gradient, divergence and curl of a Vector function. Green, Gauss and Stokes theorems (Statements without proof).
BOOKS PRESCRIBED

1. Mathematical Analysis-S.C. Mallik, Chapters: 17 and 18 (up to Art 5)

2. Topics of Calculus-Panda and Satapathy, Chapters 6, 7

BOOKS FOR REFERENCE

Vector Analysis with Applications — Ali and Hazra (New Age International)

(B) LINEAR ALGEBRA

50 Marks

Unit-I

Vector spaces, definition and examples, subspaces, span of a set linear dependence and independence, dimension and basis.

Unit-II

Linear transformation, definition and examples, range and kernel, rank and nullity, the space L(U,V), composition of Linear maps, matrix and linear map, linear operations, matrix multiplication, rank and nullity of matrix, transpose of a matrix.

Unit-III

Elementary row operations, systems of linear equations, matrix inversion, determinants minors and rank of a matrix, product of determination, application to linear equations, eigen values and eigen vector.

BOOKS RECOMMENDED

1. An Introduction to Linear Algebra-V.Krishnamurty and others (affiliated East-West Press). Chapters: 3,4(4.1 to 4.7), 5,6(6.5 to 6.8)
BOOKS FOR REFERENCE

1. Basic Structures in Algebra, Part-I, J.N. Patnaik
3. First course in Linear algebra - Bhattacharya Jain and Nagpaul (New Age International)

PAPER-VII  100 Marks

(A) NUMERICAL ANALYSIS

(50 Marks)

Unit-I
Numerical Analysis and errors, Interpolation

Unit-II
Numerical Integration, solution of Algebraic and transcendental equations.

Unit-III
Solutions of system of linear equations, Numerical solution of ordinary differential equations. (Examinees are allowed to use pocket calculator)

BOOKS PRESCRIBED

Introductory Numerical Analysis-R.N.Jena and N.Dutta (Sridhar Prakashini)

Chapters: 1, 11 (2.1 to 2.9 and 2.13 to 2.16), 111(3.7 to 3.14), IV (4.1 to 4.7) V(5.1 to 5.3),VI (6.1 to 6.3)
BOOKS FOR REFERENCE


2. Fundamentals of Numerical Analysis-Akshay Kumar Ojha (Multisoft Publication)

(B) ABSTRACT ALGEBRA

(50 marks)

Unit-IV

Group Theory-Definition and Examples, Sub-groups.

Unit-V

Counting Principles, Normal Subgroups, Quotient Groups, Homomorphism.

Unit-VI

Ring theory-definitions and examples, some special class rings, Homomorphism, Ideals, quotient ring.

Unit-VII

Theory of equations: Roots of an equation, relations between roots and coefficients, sum of powers of roots, symmetric functions, transformation of equations, repeated roots, common roots, some standard reduction of cubic and biquadratic, Cardan's solution of a cubic, Descartes solution of biquadratic.

BOOKS PRESCRIBED
Topics in algebra-I.N.Herstein (Vikas Pub. House) Chapters: I, II(Art 2.1 to 2.7), III(Art 3.1 to 3.4) Text Book of Algebra-Ravindra Kumar and Srikrishna Wasan (Pitambar Publication) Chapter-III(3.1 to 3.9)

BOOKS FOR REFERENCE

1. University Algebra-N.S. Gopalkrishna (Wiley Eastern)
2. Modern Algebra - Vatsa and Vatsa (New Age International)

PAPER-VIII (PRACTICAL)

100 Marks

A student is required to perform two experiments, one from each group, each of three hours duration. A student has to perform at least 70% of the number of experiments prescribed for practical.

First Experiment (Gr.A) 30 marks
Second Experiment (Gr.B) 30 marks
Practical Records 10+10 marks
Viva 10+10 marks

A student shall be required to maintain two records one for each group certified by the teacher and produce them at the time of examination.

List of Experiments:

GROUP-A
i. Determination of the value of "e" the use of Maclaurins' series,

ii. Finding primes less than or equal to a prescribed number by the shieve method

iii. Numerical solution of polynomial equations correct to desired decimal by linear iteration,

iv. Problem (iii) Above by bisection method

v. Problem (iii) Above by Newton Raphson method

vi. Numerical solution of transcendental equation by the above methods,

vii. Fitting of curves by Lagrange and Newton interpolation method. (Forward and back ward),

viii. Numerical Integration by Composite trapezoidal rule and composite Simpson's rule.

ix. Tracing of curves: Cartenary, clssoid, astrold, cardiode and folium of Descrates.

x. Graphical solution of Linear Prgramming problems.

GROUP-B

(Programming in C/Fortran/Basic)

xi. Flow chart and Formation of C / Fortan / BASIC program for searching of primes less than or equal to 'A'.

xii. Write a programme for arranging given numbers in a specific order (ascending or desconding).

xiii. Write a programme to evaluate the area under the curve = Y + ax+b and X-axis between the limits X =0 and X = 10 using trapezoidal rules,
xiv. Write a programme to evaluate the integral \[\int f(x) \, dx\] using Simpon's rule.

xv. Write a programme to solve a quadratic equation.

xvi. Write a programme to evaluate the sum \(N(2n+1)(n+1)\).

xvii. Write a programme and draw the flow chart to evaluate the following function for values of \(x = 1\) to \(3\) in increments of \(0.1\) for \(t(x) = 2x^2 + 3x + 4\) for \(v < 2 = 0\) for \(x = 2 = -2x^2 + 3x + 3\) for \(x > 3\).

xviii. Write a programme to find the product of two matrices,

xix. Write a programme and draw the flow chart to find the Armatrong Number between \(1\) to \(100\).

xx. Write a programme and draw the flow chart to find the sum of \(n\) odd / even natural numbers,

xxi. Write a programme to evaluate the series. \(1/I - x = 1 + x + x^2 + x^3 + \ldots\) for \(-1 > x > 1\) to (0.01)% accuracy.

OR

PAPER-VIII (100 Marks)

OPERATION RESEARCH

Unit-I

Introduction definition, modelling characterization methods and scope of OR.

Unit-II

Deterministic Inventory Models: Elementary Inventory Models. Dynamic or Fluctuating Demand Models.
Unit-III

Replacement Types of replacement Problems, replace of items that deteriorate, replacement of items that fail completely.

Unit-IV

Theory of Games

Unit-V

Project Management by PERT-CPM.

Unit-VI

Job sequencing.

BOOKS PRESCRIBED


Chapters: 1, 19,20( 20.1 to 20.17),22 (22.1 to 22.13 ),23 (23.1 to 23.12 ),24,25 (25.1 to 25.13)

BOOKS FOR REFERENCE

Operations Research for Management- Shenoy, Srivastava and Sharma ( New Age International )

BOTANY (GENERAL)

+3 SCIENCE

Paper – I. Theory 2nd year Marks – 75

Unit – I Cell Biology
<table>
<thead>
<tr>
<th>Paper – II</th>
<th>Theory</th>
<th>Marks – 75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-I</td>
<td>Bryophytes</td>
<td></td>
</tr>
<tr>
<td>Unit-II</td>
<td>Pteridophytes</td>
<td></td>
</tr>
<tr>
<td>Unit-III</td>
<td>Gymnosperms</td>
<td></td>
</tr>
<tr>
<td>Unit-IV</td>
<td>Angiosperm Anatomy</td>
<td></td>
</tr>
<tr>
<td>Unit-V</td>
<td>Angiosperm Embryology</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Practical</th>
<th>Marks – 50</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Paper – III</th>
<th>Theory third year</th>
<th>marks – 75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-I</td>
<td>Angiosperm Systematic</td>
<td></td>
</tr>
<tr>
<td>Unit-II</td>
<td>Economic Botany</td>
<td></td>
</tr>
<tr>
<td>Unit-III</td>
<td>Genetics</td>
<td></td>
</tr>
<tr>
<td>Unit-IV</td>
<td>Environmental Biology – I</td>
<td></td>
</tr>
<tr>
<td>Unit – V</td>
<td>Environmental Biology – II</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Paper – IV</th>
<th>Theory</th>
<th>Marks – 75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit – I</td>
<td>Plant Physiology</td>
<td></td>
</tr>
</tbody>
</table>
Unit-II   Plant Metabolism
Unit-III  nitrogen Metabolism, Growth and Flowering
Unit – IV Biotechnology
Unit – V  Biostatistics

PracticalMarks – 50

BOTANY (GENERAL)
SECOND YEAR EXAMINATION
THEORY PAPER – I

Unit- I Cell Biology


Unit-II (Molecular Biology)

Unit-III (Microbiology)

**Viruses:** Occurrence: morphology and structure of typical plant virus (TMV), animal virons (Polio), and Bacteriphage (T4), Lytic and Lysogenic cycles, viroins and viroins.

**Eubacteria:** Structure, reproduction, nutrition recombination (Conjugation, transformation, Transduction). Economic importance.

Cynobacteria, Archeobacteria, Mycoplasma, Actinomycetes, Ricketta, General account and economic importance of microbes.

Unit – IV (Algae)

Thallus organization, reproduction and economic importance of algae, characteristic and life history of Chlamydomonous, Chlorella, Oedogonium Zygema, Chara, Vaucheria, Fucus, Batrachospermum.

Unit-V Fungi and Pathology

General Characteristics of Fungi, Life cycle of Pytopthora, Rhizopus, Saccharomyces, Penicillium, Erysiphe, Puccinia, Agaricus. Symptoms, causative organisms, transmission and control measures of the diseases: Wilt of Potato, Damping Off, Late Blight, White Rust, Powdery Mildew, Rust, Smut.

THEORY: PAPER-11

Unit -1: Bryophytes

Unit – II (Pterophytes)

General feature of pteridophytes, morphology, anatomy, reproduction and life cycle of Psilotum, Lycopodium, Selaginella, Equisetum, Marsellia.

Unit - III: Gymnosperm and Paleobotany

General features of Gymnosperm, Morphology, anatomy, reproduction, and life cycle of Cycas, Pinus, Gnetum,

Process of fossilization of vegetative and reproductive structures of Rhynia, Lepidodendron, Lyginopteris.

Unit - IV: Angiosperm Anatomy

Tissues Meristematic tissues and their organization in the shoot and root apices; Mechanical tissues; types, principles involved in their distribution. Anomalous Secondary growth. Root-stem transition.

Unit - V: Angiosperm Embryology

Structural development of Microsporangium; Microsporogenesis; Structure and development of Male gametophyte. Structure and development of mega sporangium; Structure and development of female gametophyte (Embryo Sac). Process of double fertilization.
3rd Year Examination

THEORY: PAPER – III

Unit - I: Angiosperm Systematics

**Taxonomic hierarchy:** ICBN- Principles and rules, Outlines of classification Bentham and Hookers’s, Classification, Merits and Demerits study of following families: Malvaceal, Solanaceal, Ekpteorriaceae, Asclepeabaceae, Apooyanacae, Lamiaceae, Compofitae (Asteraceae), Poace, commerceinacae, Liliaceae.

Unit - II: Economic Botany

Economic uses of flowering plants in relation to human welfare (in form of short notes: should cover botanical name, family and brief description): **Cereals:** rice, wheat and maize, **pulses:** Bengal gram, green gram, black gram, **Oil seeds:** mustard, groundnut, sunflower, **Fibre:** cotton, jute. **Beverages:** coffee, tea. **Phytochemcials:** alkaloids, Yielding medicinal plants, their role in curing disease. **Medicinal plants:** *Rauvolfia, Cinchona, Ocimum, Mentha, Catharanthus, Aegle.*

Unit - III: Genetics

**Principles of inheritance:** Mendelism, laws of Mendelian inheritance, Gene interactions, Structural chromosome aberrations, types and effects of deletion, duplication, inversion and translocations.

**Numerical chromosome aberrations:** aneuploidy: nullisomic, trisomic and monosomic: Cytoplasmic Inheritance: Plashil inheritance in microbial, inheritance in corn and Yast euploidy: autopolypoloidy and allopoly pemoidy.

**Gene Mutation:** Spontaneous and induced mutation, its Molecular mechanism,
Physical and chemical mutagens and action

**Unit - IV: Ecology**

**The Environment:** Soil: general account and adaptations. Water: general account and adaptations. The biotic components and types of biotic interactions.

**Organizational components:** Individuals, species, populations, communities and their characteristics.

**Ecosystem:** Concept of ecosystem, structure and function of ecosystem. Energy flow (primary production) and dynamics in ecosystems, biogeochemical cycles.

**Unit - V: Environmental Biology**


**THEOR: PAPER-IV**

**Unit -1: Plant Physiology**

Water potential, diffusion, osmosis and imbibitions, Absorption of water, ascent of sap, transpirations, absorption of minerals, plant nutrients: macro and micronutrients.
Unit-II: Plant Metabolism

**Photosynthesis:** Historical background of Photosynthetic pigments. Mechanism of light reaction; PS-I and PS-II systems. Cyclic and non-cyclic photophosphorytation, Mechanism of dark reaction, path of Carbon, C3 and C4 Cycle and CAM Cycle.

**Respiration:** Glycolysis, fermentation, Kreb's cycle and oxidative phosphorylation.

Unit - III: Nitrogen

Metabolism, **Growth and Flowering**

**Nitrogen fixation:** symbiotic and non-symbiotic mechanisms, amino acid synthesis, reductive animation and transamination.

**Growth:** Phases of growth, Phytohormones, Physiological role and mechanism of action of Auxins, Gibberellins and Cytokinin.

**Flowering:** Photoperiodism and Vernalisation.

Unit - IV: Biotechnology

Plasmids and episomes as vectors, restriction endonucleases, gel electrophoresis, blotting techniques, (Southern) Concept and application of DNA finger printing techniques. (RFLP)

**Plant tissue culture:** Totipotency, asceptic culture, culture media, protoplast isolation and culture, somatic hybridization, plant tissue and cell culture and its applications.

Unit - V: Biostatistics

Need of statistics in Biology, collection of biological data, arrangement of data. Frequency distribution, relative frequency and cumulative frequency. Central tendency:
mean, mode, median and their biological significance. Dispersion: Range, Mean deviation, Variance, Standard deviation, SEM and their biological significance.

BOTANY (GENERAL)
SECOND YEAR EXAMINATION
PAPER -1 (PRACTICAL)

Full Marks - 50

1) Study of life cycle of algae and fungi included in the syllabus.


3) Study of anomalous secondary growth in dicot and monocot stem. Prepare permanent slides.

4) Study of permanent slides of fossils and embryological preparation.

BOTANY (GENERAL) THIRD YEAR EXAMINATION
PAPER - II (PRACTICAL)

Full Marks – 50


Physiology :

a) Measurement of rate of transpiration

b) Rate of photosynthesis under different wavelength of light, carbon dioxide concentration.
c) Measurement of osmotic pressure by plasmolysis.

3. Biostatistics:

Problems related to mean, medium, mode, standard deviation, standard error of mean, Coefficient of variation.

4. Economic Botany:

a) Identification of 10 locally available economically important plants and their products included in the syllabus.

BOTANY (HONOURS)

FIRST YEAR EXAMINATION

Full Marks - 100

PAPER - I

Cell Biology, Genetic and Evolution

Unit-I - Cell Biology
Unit - II - Molecular Biology
Unit-III - Genetics-I
Unit - IV - Genetics - II
Unit - V - Plant Breeding and Evolution

PAPER-II

Full Marks - 100

Environmental Biology, Microbiology and Biotechnology

Unit - I - Environmental Biology - I
Unit II - Environmental Biology - II
Unit III - Microbiology
Unit IV - Biotechnology - I
Unit V - Biotechnology - II

SECOND YEAR EXAMINATION PAPER - III

Full Marks - 100

Algae, Fungi, Bryophyta, Pteridophyta

Unit I - Algae
Unit II - Fungi and Plant pathology
Unit III - Bryophyta
Unit IV - Pteridophyta - I
Unit V - Pteridophyta - II

PAPER-IV

Biochemistry, Biotechniques and Biostatistics,

Full Marks - 100

Unit I - Basic Chemistry and Enzymes
Unit II - Biochemistry - I
Unit III - Biochemistry - II
Unit IV - Biotechniques
Unit V - Biostatistics
PAPER-V (Practical)

Full Marks-100

FINAL YEAR EXAMINATION

Full Marks -100

PAPER-VI

Gymnosperm, Paleobotany Developmental Biology, Anatomy and Systematics.

Unit -I - Gymnosperms and Paleobotany

Unit - II - Economic Botany

Unit - III - Developmental Biology and Anatomy

Unit - IV - Systematics -1

Unit - V - Systematics - II

PAPER-VII

PLANT PHYSIOLOGY

Full Marks - 100

Unit-I - Water relations

Unit - II - Mineral nutrition, transportation of organic solutes.

Unit - III - Photosynthesis and respiration.

Unit - IV - Nitrogen and lipid Metabolism

Unit - V - Growth and Development.
Unit-I: Cell Biology

Prokaryotic and enkaryotic cell size and structure. Utrastructure of a typical plant cell with cell organelles.

Structure and function of cell wall, plasma membrane, mitochondria, chloroplast, endoplasmic reticulum, golgibodies, lysosomes and microbodies (Peroxisomes Glyoxysomes), ribosomes: prokaryotic and eukaryotic ribosomes

Structure and function of nucleus, heterochromatin and euchromatin, nuclear pore complex, nucleolus,

Cytoskeleton: Microtubules, microfilament, Intermediary filaments, cilia, flagella, spindle apparatus.

Giant chromosomes: Lamp brush and polytene chromosomes

Chromosome: morphology, karyotype, chemistry, nucleosome, Genome concept.

Cell Division: Cell cycle, mitosis and meiosis, apoptosis
Unit - II: Molecular Biology – I


**Gene expression and regulation**: Gene concept, Operon concept, Inducible and repressible regulations (Lac and Tryptophan Operons).

Unit-III: Genetics - I

**Principles of Inheritance**: Mendelian ratios, deviation from Mendelian ratios, Epistasis.

**Linkage and crossing over**: cytological basis of crossing over Three point test cross and gene mapping.

Unit - IV: Genetics - II

**Sex Determination**: sex determination in plants, Cytoplasmic inheritance with suitable plant examples.

**Gene Mutation**: Spontaneous, and induced mutations, (physical and chemical mutagens in plants) Molecular mechanism of gene mutation, detection of mutation.

**Structural chromosome aberrations**: Deletion, Duplication, Inversion and Translocation, Meiosis in structural heterozygotes.

**Numerical chromosome number**: Aneuploidy (monosomic, trisomic and nullisomic), euploidy, autopolyploid and allopolyploid. Role of polyploidy in speciation and evolution of crops.
Unit - V Plant Breeding and Evolution

**Principles of plant breeding:** Introduction, acclimatization, selection hybridization, hybrid vigour, Role of polyploidy and mutation in plant breeding,

**Concept and theories of evolution:** Lamarckism, Darwinism, Mutation Theory, Modern synthetic theory. Evidence of evolution.

PAPER - II

**Environmental Biology, Microbiology and Biotechnology**

Unit -1: Environmental Biology -1

Inter-relationship between living world and the environment, Earth as a system, biosphere, hydrosphere, atmosphere and lithosphere,

**Adaptation:** hydrophytic adaptation, abiotic and biotic interactions. Organizational components: individuals, species, populations, habitat and niche, communities and their characteristics, succession.

Ecosystem: Concepts of Ecosystem; structure and functions of ecosystem, Energy flow, Biogeochemical cycles in ecosystem, Types of ecosystems, food chain, food web, ecological pyramids.

**Phytogeography:** A short account of vegetation of India.

Unit - II: Environmental Biology - II

**Human Ecology and Ecological management:** Population ecology, Renewable and non-renewable natural resources and their management.

Sustainable development.

Unit - III: Microbiology

Concept of microbiology: Systematic Position of Micro-organisms.

Viruses: Historical account. Occurrence, Morphology, architecture, nomenclature classification and symmetry, The envelope and core structure of a Typical plants virus (TMV). Animal virus (Polio) and acterial virus (T4), Replication of Bacteriophage, virodides and prions.

Eubacteria: Structure, Endospore formation, nutrition and recombination.


Archebacteria: Mycoplasma, Actinomycetes, Ricketteis, General Account.

Application of Microbes Role of Microbes in Nitrogen cycling, carbon cycling, biological Nitrogen fixation, industrial application of Micro-organisms-Organic acids, alcohol, food processing, Milk products antibiotics & Biopesticides.

Unit - IV: Biotechnology - I

1 Recombinant DNA Technology: restriction endonuclease, Prokaryotic closing. vectors, T-plasmid, Recombinant DNA technology, r-DNA, selection of recombinant clones, horizontal gene transfer, transgenic plants and crop improvement.

Unit - V: Biotechnology- II
(Southern and Northern)

**Gel** electrophoresis, blotting technique, PCR, genome library and cDNA libraries, DNA finger printing (RFLP, RAPD, AFLP), Basic PCR, DNA sequencing (Maxcun Gilbert method)

**Plant tissueculture**: totipotency, culture condition, protoplast isolation and culture, somatic hybridization plant tissue and cell culture and its application.

**SECOND YEAR EXAMINATIONS**

**PAPER-III**

**Algae, Fungi, Bryophyta and Pteidophyta**

**Unit-I Algae**


**Unit - II: Fungi and Plant pathology**

**General**: Structure and composition of cell wall, nutrition, reproduction, classification, role of fungi in human welfare.

**Type Study**: Life cycle of the following genera: Mastigomycotina *Phytopthora; Zygomycsrtnina Rhizopus; Ascomycotina: Penicillum, Paccinia, Agéricus*; Basidomycetes: *Alternaria, Collecotrichu*, General account of Lichen and Mycorrhiza.
General account of disease caused by plant pathogens: host-pathogens interactions

Plant diseases: Symptoms, Causative organisms, Transmission,

Control of viral, bacterial and Fungal diseases

**Viral Diseases**: Tobaccomoasic, Potato leaf rolls;

**Bacterial**: Wilt of potato, canker of citrus, Red-rot of Sugarcane;

**Fungal**: Late blight of Potato, While rust, powdery mildew, i hp R; I, Smut.

**Unit - III: Bryophyta**

General features of Bryophytes, Comparative thallus structure and reproduction of *Riccia, Marchantia, Porella, Anthoceros, Sphagrum*, Affinities of *Anthoceros and Sphagnum*.

**Unit - IV: Pteridophytes - I**

General features of pteridophytes, Stele structure and wvolnk-r of stele. Telome theory. Heteospory and seed habit. Comparative account of structure, anatomy and reproduction of *Psilelum, Lycopodium, Selaginella, Isoetea*.

**Unit - V: Pteridophytes - II**

Comparative account of structure, anatomy and reproduction of *Cquisetum, Ophioglossum, Manilea, Azolla*.

**PAPER-IV**

Biochemistry, Biotechniques and Biostatics

**Unit -1:**
Basic Chemistry and Enzymes Covalent and non-covalent interaction, Hydrogen bond, electrostatic interactions, structure and properties of water and its biological significance, pH, Buffer, Henderson-Haselbalch’s equation, Laws of thermodynamics enthalpy and entropy.

**Enzyme:** Structure, classification, properties, mechanism of action, activation energy, effect of substrate concentration, Memichallis – menten equation, importance of Km, effect of enzyme concentration, pH and temperature on enzyme activity; Isoenzymes, Allosteric enzymes, structure and mechanism of action.

**Unit - II: Biochemistry -1**

**Amino acids:** Types, structure, characteristics.


**Unit - III: Biochemistry - II**

**Carbohydrates:** structure, classification and properties of monosaccharides, isomarizm, mutarotation.

**Disaccharides:** Structure and function of Lactose, Maltose, Sucrose.

**Polysaccharides:** Structure, and function of starch, cellulose, biosynthesis and degradation of sucrose and starch.

**Lipids:** Fatty acids, (saturated and unsaturated) glycerol, Classification and biological importance of lipids. **Co-enzymes:** structure, classification and function of different co-enzymes, cofactors. **Vitamins:** Plant source of vitamins, structure and function of different vitamins.
Unit - IV: Techniques in Biology Microscopy

Principles of light, and electron microscopy, Principles of centrifugation and its application,

Spectrophotometry (Berlanibrellt's law)

**Chromatography:** Principles and methods, paper chromatography, TLC, column chromatography.

**Electrophoresis:** Principles and methods of gel electrophoresis (Algarox)

Unit - V: Biostatistics

Need of statistics in Biology, collection of data, Frequency distribution, Relative cumulative frequency, Central Tendency - mean, Mode, Median, Dispersion range, Mean Deviation, Varience, Standard Deviation, Standard Error of Mean, their biological significance, Student't' Test and Chi-square ($X^2$) their applications.

**PAPER-V (PRACTICAL)**

100 marks

1. Comparative study of cell structure in Onion cells. Hydrills, Spirogyra.

2. Study of various stages of mitosis and meiosis using appropriate plant materials (*Aloe vera*, *Allium*)

3. Micrometric technique to measure the size of a root cell, pollen, stomata.

4. Counting of phytoplanktons by using haemocytometer.
5. Gram staining of bacteria.

6. Study of genera included under algae, fungi, bryophyta and pteridophyta.

7. Observation of disease symptoms in hosts infected by various causative organisms

8. Statistical problems relating to Mean, Median, Mode standard deviation, coefficient of variation, Problems and exercises applying t-test and, $X^2$ - test.

9. Qualitative tests of protein, carbohydrate, quantitative test and standard course of protein by Byorete test.

10. Preparation of molar soultions and buffers.

11. Study of soil texture and measurement of soil pH

12. To study anatomy of ecological adaptations.

13. Community study by quadrat analysis.

**FINAL YEAR EXAMINATION**

**PAPER-VI**

**100marks**

**Gymnosperm, Paleobotany, Developmental Biology, Anatomy and Systematics**

**Unit -1:**

**Gymnosperms and Paleobotany**

General features, comparative account of structure, anatomy and reproduction of Cycas, Pinus, Ginkgo, Gnetum, Process of Fossilization Types of fossils. Vegetative and
reproduction structure of *Rhynia, Lepidodendron, Catamites, Lyginopteris, Cycadeoides* and their affinities.

**Unit - II: Economic Botany**

Economic importance of various plants: Food grain, cereals, pulses and millets; Oil seeds: mustard, ground nut, sun flower; Fibre plant: cotton, jute; Bevergaes: coffee, tea.

Botanical name, family and brief description, and economic importance of following plants: Spices and condiments: ginger, turmeric, cinnamon, cloves, cardamom, black pepper, nutmeg. . .

Medicinal use and active principles of *Atropa, Rauwolfia, Cinchona, Eucalyptus, Ocimum, Mentha, Aegle, Melia, Emblica, Strychnos, Catharanthus*.

**Unit - III: Development Biology and Anatomy**

Microsporo genes is’. Megasporogenesis, Development of male and female gametophytes, Double Fertilization, Apomikis, Structure, development and morphology of endosperm, Development of dicot and monocot embryos, Polyembryony.

**Tissue:** Meristematic tissue, organization of root apices, shoot apices, lateral meristem, simple, complex and secondary tissue, mechanical tissue. Anomalous secondary growth in dicot root, stem adaptive and non-adaptive types, Root-stem transition, Origin of lateral organs.

**Unit - IV: Systematics – I**

Plant collection and preparation of herbarium, Role of botanical gardens, documentation Key for identification of plants.
Taxonomic groups: concept of species, genus and family, Botanical nomenclature
International Code of Botanical Nomenclature (ICBN).

Phylogeny, Origin of angiosperms with special reference to Bennettitalean, Gentalean, Caytonialean and Herbaceous origin theories.

**Unit - V: Systematics - II**

**Systems of Classification:** Bentham and Hooker’s, Engler-Prantl and Takhtajan

**Morden Taxonomy:** Taxonomy in relation to anatomy, embryology, cytology, palynology and ecology. Describe the families: Maskiliaceae, Annonaceae, Brassiaceae, Capparibaceae, Caryophyllaceae, Rutaceae, Tiliaceae, Fabaceae, Rutaceae, Apiaceae, Asilepialaeae, cucurgitaceae, asteraceaee, apeayanaceaee, Solanaceaee, Rhamanaceaee, Chnopodiaceae, Moraceae, Commedinieo, Poaceae.

**PAPER - VII: Plant Physiology**

**Unit - 1: Plant Water Relation Diffusion, osmosis,**

imbibition, chemical potential, water potential and its components (\(\psi P s\), \(\psi p\) and \(\psi F w\)), plasmolysis.

**Water Relations:** Availability of soil water, Absorption of water, Ascent of sap.

**Transpiration:** Mechanism of stomatal movement, significance of transpiration.

**Unit - II:**


Unit - III


Respiration: Glycolysis, anaerobic pathway, TCA cycle, Electron Transport system, Oxidative photophorylation, Hexose monophosphate shunt.

Unit - IV:


Unit - V: Growth and Development

Growth: Definition, phase of growth, Kinetics (RGR) photoperiodism and vernalization. Phyto-hormones: auxins, cytokinins, gibberllins, ethylene and their roles in plant growth and development.


BOTANY (HONOURS) PAPER - VIII (PRACTICAL)
1. Study of Morphology, anatomy and reproductive structures of general included under pteridophyta and gymnosperms.

2. Study of Fossil materials and slides.

3. Study of economically important plant and their products, students are required to submit a field report.

4. Study of Embryological slides.


6. Separation of pigments by chromatography

7. Spectrophotometric determination of chlorophyll content.

8. Determination of osmotic pressure by plasmalytic method.

9. Determination of D.P.Fi. in potato and rhizome tuber.

10. Determination of relation between transpiration and transpiring surface.

CHEMISTRY (GENERAL)

There shall be two theory papers (75 marks each) of three hours duration, at the end of the 2\textsuperscript{nd} and 3\textsuperscript{rd} year. There shall be one practical paper carrying 50 marks at the end of 2\textsuperscript{nd} year & 3\textsuperscript{rd} year and the duration will be 3 hours in each case.

SECOND YEAR EXAMINATION

<table>
<thead>
<tr>
<th>Paper – I (Theory)</th>
<th>Inorganic Chemistry</th>
<th>75 marks (3 hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper – II (Theory)</td>
<td>Organic Chemistry</td>
<td>75 marks (3 hours)</td>
</tr>
<tr>
<td>Paper-III (Practical)</td>
<td></td>
<td>50 marks (3 hours)</td>
</tr>
</tbody>
</table>

FINAL YEAR EXAMINATION

<table>
<thead>
<tr>
<th>Paper – IV (Theory)</th>
<th>Physical Chemistry</th>
<th>75 marks (3 hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper – V(Theory)</td>
<td>Organic Chemistry</td>
<td>75 marks (3 hours)</td>
</tr>
<tr>
<td>Paper – VI(Practical)</td>
<td></td>
<td>50 marks (3 hours)</td>
</tr>
</tbody>
</table>

PAPER – I

INORGANIC CHEMISTRY (Full marks – 75)

Unit-I (A)

Atomic structure – Rutherford’s model and Bohr’s model of Atom, inadequacies of Bohr’s Model. Summerfield’s modification, wave nature. De Broglie’s equation. Heiseberg’s Uncertainty principle, Schrödinger’s wave equation. Physical signification of wave function probability and Orbital shapes, quantum numbers (Mathematical derivation not needed), pail’s exclusion principle, Hound’s rule of maximum multiplicity, aufbau principle, stability of completely filled and partly filled orbital.

Unit-I (B)
Periodic classification – Long form of periodic table, s.p.d.f. blocks atomic
radil, ionic radil, covalent radil, ionisation potential screening effect, electron
affinity and electro negativity.

Unit-II (A)
Chemical bonding- Ionic bond lattic energy. Born-Haber cycle, dipole
moment properties of ionic compounds electronegetivity differences covalent
bond, characteristics of compounds having such bond. Valence bond approach
(Metallic bond) concept of resonance and resonance energy and bonds SP² – SP²
– hybridisation bond length and strength of bonds, VSEPR theory shape of
simple molecules.

Unit-II (B)
Isotopes of hydrogen, Orthy and parahydrogen, study of fhydrides land their
classification.

Unit-III (A)
Metallurgy – occurrence of metals (Special emphasis as mineral resources of Indian
and Orissa), calculation roasting smelting various methods, methods of purification of
metals extraction and properties of Ag. Cr. Mn. Co and ni.

Unit-III (B)
Preparation, properties and structure of boric acid, diborand borazines, silcons,
hydrazine hydroxylamine, hydrazoic acid and exides and oxyacids of Nitrogen and
chlorine, Halides of phosphorous (Inter-halogen compounds).
Unit-IV (A)

Chemistry old-block elements, general trends in group electronic configuration, atomic and co-valent radil electron affinity, electronagativity and ionisation, potential, colour and magnetic properties variable valence and complex formation with particular reference to 3-d block elements.

Unit-IV (B)

Inert gas, preparation and properties of the compounds and uses of the gases and their compounds.

Unit-V(A)

Nuclear Chemistry, binding energy, mass defect alpha, beta and gamma radiation, half life period, radioactive disintegration stores radioactive equilibria group displacements nuclear reaction induced by proton, neutron and alpha particles, nuclear fission, liquid drop model, chain reaction and nuclear reaction.

Unit-V(B)

Redox reactions shown by $K_2$, $Cr_2 O_7$, $K_2 C_1 O_4$, $K_2M_n C_4$ $KM_n C_4$, $Na_2 S_2 O_3$ properties preparation and structures potassium ferrocyanide, Sodium nitroprusside, Sodium combilitinitrite, Hexamine Cobalt (III) Chloride.

PAPER – II (75 Marks)

Organic Chemistry
Unit-I (A)

Introduction Early history, why organic chemistry requires special dealing
Vastness of Organic compounds.

Unit-I (B)

Purification and identification of organic compounds, Distillation fractional
distillation, crystallisation, Fractional Crystallisation sublimation, Solvent extraction,
Chromatography separation, absorption Chromatography (TLC paper).

Unit-I (C)

Classification and nomenclature of organic compounds on the basis of functional
groups.

Unit-II (A)

Bonding and shape of Organic molecules, Co-valent bond molecular orbital
concept and bonds, hybridisation shapes of molecular.

Unit-II (B)

Distribution of electron in Organic Molecules:

a) Inductive effect, resonance, hyper conjugation and stereo effect.
b) Conditions of resonance: Planarity of unchanged atomic skeleton, presence
   of electron withdrawing and donating group
c) Influence of these effect in acidity, basicity and displacement.

Unit-II (C)
Reaction of Organic compounds: Classification of reaction, substitution, addition, elimination and electron transfer, kinetic terms molecularity, Order of reaction, transition state and intermediate, nucleophiles and electrophiles nucleophilic and electrophilic reactions.

Unit-III (A)

Reaction intermediate:

a) Carbonium: Structure and Stability.
b) Carbanion: Structure and Stability.

Unit-III (B)

Reaction mechanism SN^{1}, SN^{2}, Se^{1}, E^{1}, E^{2}, Ad^{1}, AdE

(Full form explanations with examples details not necessary).

Unit-III (C)

Stereo Chemistry

Structural isomerism, stereoisomerism (e) Conformational isomerism, ethane, n-butenane, saw horbe Newman and flasher projection formula of molecules containing C-C bond, conformation of Cyclohexane, axial and equatorial bonds, boat and chair conformation and their energies.

Configurational isomerism:

Optical isomerism: Concept of mirror image with simple model and examples, conditions for optical activity, place polarised light and optical rotation, Specific rotation
optical isomerism of lactic and tartaric acid, enantiomers, diastereoisomers, racemic modification.

**Unit-IV (A)**

a) Alkenes: Preparation, properties nitration halogenations

b) Alkenes and Alkynes: Preparations (E2 of Alkyl halides and alcohols)

Properties: Geometrical isomerism of alkenes hydrogenation electrophilic addition (HX, Br₂, H₂O) displacement reactions of R2C = CH system, acidity of alkynes of the type Rc = CH.

**Unit- IV (B)**

Alkyl halides:

Preparation (form alcohol, properties physical displacement reactions structure) requirements of SN2 and SN₁ reactivity of organic halides.

**Unit-IV (C)**

Organometallic Compound:

Grignard’s reagent: preparation from alkyl bromide (Principle only) Synthetic uses: Carbanion precursors.

**Unit-V (A)**

Alcohols: Classification of Monohydric alcohols (Primary secondary and tertiary) preparation (from halides, Organometallics, aldehydes Ketones and esters (metal, PCl₅) Oxidation, esterification, distinction of primary, secondary and tertiary alcohols, (Oxidation dehydrogenation, Victor Mayer’s methods, rate of esterification.
Aldehydtyes and Ketenes:

Preparation from alcohols (acid halides organometallic and dry distillation) Reactions (Oxidation, Reduction, carbonyl addition with alcohol Replacement reactions with phenyl hydrazine, hydroxyl amine semicarbazid, HON) aldol, cannizzaro, reaction, distinction between aldehydes and ketones.

Unit-V (B)

Carboxylic acid: Preparation (From alcohohyes Ketones nitrites, Easters) properties (Base, PCl5, socl3, esterification) Derivatives of carboxylic acid chlorides, amides, arhydrides, esters.

Esters containing active methylene group.

a) Aceto-acetic ester synthesis (Claisen reaction, synthetic uses (Alkane, Ketron and acid), Structure of aceteacetic ester, Keto-enol tautomerism.

b) Malonic ester: Preparation and synthetic uses (alkane, ketone, acid)

Unit-V (C)

Amines: Classification (primary secondary and tertiary).preparation of primary amins (from nitro compounds, nitriles Isocyanide SN of all holides) properties: HNO2 acylation, separation of mixture of three types of amines (Hinaberg and Ostwald, method, Distinction between three types of amines).

PAPER – III (Practical)

3 hours 50 marks
1. Qualitative analysis of mixture of Inorganic salt – containing not more than 4 radicals except F, Oxalate, Chromate, Dichromate, Permanganate and Arsenate.

   Or

   a) Estimation of Volumetric Banium Analysis by acidimetric (Alkaic metric method)

   Or

   b) Estimation of Ca (indirect method using Kno₄.

   Or

   c) Estimate of Fe⁺² & Fe⁺³ dichromate method.

   Or

   d) Estimate of Cu⁺² by iodometric method.

2. Viva – Voce 10 marks

3. Record 05 marks

Time – 3 hours  
Paper – IV 75 marks

(Physical Chemistry)

Unit-I (A)


Unit-I (B)

Collegative properties: Osmotic pressure, Laws of Osmotic pressure relative. Lowering of vapour pressure of solution, Lowering of freezing point and clavation of B.
P. Solution Determination of weight by these methods, anomolous molecular weight of solution due to dissociation and association.

**Unit-II (A)**

Colloidals State-types of Colloids, their methods of preparation dialysis optical and electrical properties of colloids coagulation, preparation.

**Unit-II (B)**

Phase rule: Water and Sulphur systems:

**Unit-III (A)**

Distribution Laws – Solvent extraction.

**Unit-III (B)**

Thermodynamics extensive and intensive properties, system and its surroundings, State of system work, heat and energy , 1\textsuperscript{st} Law of Thermo-dynamics, enthalpy chemical reactions and the thermal changes accompanying them. Thermo-chemistry its Law and simple calculations based those, spontaneous and non–spontaneous changes, second law and thermodynamic criteria of equilibrium, effect of temperature and pressure on chemical equilibrium relation between equilibrium constant and free energy.

**Unit-IV (A)**

Homogenous Equilibria-Law of mass action and lechatchier’s principle and their applications to the following systems in equalibria.

a) Manufacture of ammonia from nitrogen and hydrogen
b) Dissociation of Phosphorus pentachloride.

c) Disassociation of nitrogen tetroxide and

d) Hydrolysis of ethyl lactate.

Unit-IV (B)

Chemical Kinetics – Order and molecularity of a reaction rate of reaction for zero order, first order and second order reactions, Half life of a reaction, General method for determining the order of a reaction: effect of extraneous conditions on reaction rates, activated complex collision theory of reaction rates of molecular reaction.

Unit-V


Time – 3 hours

PAPER – V

Full Marks – 75

(ORGANIC CHEMISTRY)

Unit- I (A)

Carbohydrate: Classification, configuration of sugars, glucose and fructose (occurrence, reaction, Osszone formation, elucidation of the structure of glucose (open chain and ring structure) inter-conversion of sugar.
Unit-I(B)

Aromatic hydrocarbon: Nomenclature aromativity and Guckle rule, Coaltar as a source of hydrocarbon, electrophilic substitution (Haloenation preparation nitration, craftreaction) Orientation, determination of structure of Bienzene, aromatic substitution, reaction (SAr NIS and Ar N2) and SAr E2.

Unit-II(A)

Aryl halogen compounds: Preparation (Electrophilic substitution and Sandamcyer’s ) In-ertiness of halogen ato0m: Organohalogens as pesticides gammaxene comparison with aliphatic halides.

Unit-II(B)

Nitroydrocarbons : preparation (SAr, E1 and SAr, E2) of hydrocarbons, properties, reduction of nitrobenzene and TNT.

Unit-III (A)

Amines: Preparation (Reduction of nitro compounds) properties, diszo reaction, alkylation of quaternary salts basicity phenyl hydrazones structure and synthetic uses of benzene diszonium salt, comparison of alapatic aminos.

Unit-III(B)

Aryl Oxygen compounds: Phenols, preparation diazo reaction and fasion), properties (acidity reaction with alkyls and aryl halides caterification electrophillic
substitution, Kolbe synthesis Reimer-Tieman reaction: Diszonikr coupling) comparison with alcohols.

Unit- IV (A)

Automatic side chain derivatives:

a) Etard reaction properties Addition reaction with HCN, Phenyl hydrazine, hydroxylamine, Semicarbazine, alcohol, Canizzaros, Benzoin and Perkin reaction.

b) Aryl Ketens: Preparation (Freedel Craft) properties fadedition and iodeform reaction.

Unit- IV (B)

Aryl Carboxylie acids: preparation (oxidations, hydrolysis of nitriles Grignard’s reaction) properties (acideity with \( \text{PCI}_3 \text{ SCCl}_2 \) alcohol, \( \text{NH}_2 \) and Electrophillio substitution).

Unit-V (A)

Heterocyclic compounds: Five membered heterocycles. (Pyrrole, thiophene and furam) their nomenclature, synthesis (form sugar, dicarbonyl) compound properties, (aromaticity, electrophillic substitution).

Unit – V(B)

Amino acids and proteins-Introduction nomenclature and structure of amino acids acid-base properties, Synthesis form alpha halo acid, Streoker method, Gabriel method, Azlactoned method, reaction (esterification, peptide bond, bond formation) geometry of peptide linkage proteins and their function.
Time – 3 hours

PAPER – VI (PRACTICAL) 50 MARKS.


Or

Gravimetric estimation of (a) Ba as \( \text{BaSO}_4 \) (b) Al as \( \text{Al}_2 \text{O}_3 \) (c) Ni as Nikeldimethylglyoxime.

2. Viva – Voce 10 marks

3. Record 05 marks.

CHEMISTRY HONOURS

There shall be two theory papers only (100 marks each) in the 1\(^{\text{st}}\) year and two theory papers only (100 marks each and one practical paper of 6 hours duration carrying 100 marks in the 2\(^{\text{nd}}\) year. In the 3\(^{\text{rd}}\) year there shall 2 (two) theory papers (100 marks each and One Practical paper of 6 hours duration carrying 100 marks.

FIRST YEAR EXAMINATION

Paper – 1 Inorganic Chemistry 100 marks 3 hours

Paper – 2 Organic Chemistry 100 marks 3 hours

SECOND YEAR EXAMINATION

Paper – III Physical Chemistry 100 marks 3 hours

Paper – IV Organic Chemistry 100 marks 3 hours
INORGANIC CHEMISTRY

Unit- I


Schrodering’s wave equation, significance of wave function. Normal and orthogonal wave function, Schorodinger’s equation for the Hydrogen atom (solution of the equation for hydrogen atom is not required) radian and angular wave function probability density pattern for hydrogen atom (qualitative idea) Quantum numbers and their significance shape of s, p, d and Fortbitals. Paul’s Exclusion principle, Hond’s rale Aufbau principle Energy level diagrams, electronic basis of periodic classification of elements.

Unit-II (A)
Classification of elements: Periodicity of elements, s.p.d and black elements, long form of the periodic Discussion of the following as periodic properties.

a) Effective nuclear charge, schelding
b) Atomic radius, ionic radius and covalent radius.
c) Ionization potential
d) Electronegativity
e) Valance states.

Unit-II (B)

Chemical Bonding: Electrovalent bond.

General characteristics, site effects, radius, ratio , packing of ions is crystals, lattice energy and its evolution from Born-Habar cycle, solution energy, covalent character of ionic compounds, polarising power and polarizability (Rajan’s rule) percentage of ionic character from dipole moment and e4lectronegativity difference.

Unit-III(A)

Covalent bond : Valance Bond approach:

Haitler London treatment of the H\textsubscript{2} molecule (Mathematical treatment totally, excluded) Resonance & resonance energy, Directional characteristics of covalent bond hybridisation of sp\textsuperscript{1}, sp\textsuperscript{2},sp\textsuperscript{3}, dap\textsuperscript{3}, d\textsuperscript{2}sp\textsuperscript{3} hybridisation (Mathematical treatment excluded V and A bonds, bond length, formal charges.

Unit-III(B)
VSEPR theory of direct valence, shapes of simple inorganic molecules and ions containing lone pair of electrons of no-transition element, structures of compounds of the type $AB_2$, $AB_3$, $AB_2$, $B$, $AB_4$, $AB_3E$, $AB_2F_2$, $AB_5$, $AB_4E$, $AB_3E_2$, $AB_2E_3$, $AB_6$ and $AB_4E_2$.

**Unit-IV (A)**

Other types of Chemical Bonds:

Vanderwal’s forces, Hydrogen Bond-its occurrence, nature and consequences, idea about metallic bond, conductors and insulators.

**Unit-IV(B)**

Qualitative treatment of molecular orbital theory-Bonding, non-bonding and antibonding molecular orbits MO treatment of configurations of $H_2$, $He_2$, $N_2$, $O_2$, $F_2$ and Co.

**Unit-V (A)**

Nuclear Chemistry- Nature and properties of radioactive radiations, theory of radioactive disintegration, half life period, radioactive series, artificial radioactivity, disintegration of alpha particles and neutron, Fission and Fission reactions (qualitative treatment) Radioactive isotopes, positive ray analysis principles of mass spectrography, application of radioactive isotopes.

**Unit-V(B)**

Chemistry of noble gases and their compounds:

**PAPER –II**

**ORGANIC CHEMISTRY**
Unit-I (A)

Bond Formation in Organic molecules, atomic orbitals Bond formation using atomic orbital’s, tetrahedral nature of carbon hybrid band orbitals, $SP^3$ $SP^2$ and sp hybridization, sigma and pi-bond distance.

Unit- I (B)

Mobility of Electrons:

a) Permanent polarization of simple bond, polarizability of single bond and double bond, inductive effect.

b) Resonance; Concepts of resonance and conditions of resonance, resonance energy application of concept in dipole moment, acidity, basicity and bond distance.

c) Hyper conjugation.

Unit- II (A)

Carbonium-ion, formation of carbonium ions, requirements of carbonium ions, reactions of carbonium ions.

Carbon ion: Formation, stability and structure, reaction of carbon ions.

Unit-II (B)

Reaction mechanism: Elementary knowledge of substitution reaction : $SN^1$, $SN^2$ and $SN^1$ reactions and their stereo chemistry, effect of solvents, structure, entering and leaving groups on reaction rates.
Elimination $E_1$ and $E_2$ with typical examples, addition reaction (definition and few examples.)

**Unit-III (A)**

Stereo Chemistry: Cistrans isomerism, Optical isomerism: Enantrimerphs, diastereoisomers race3meters, resolution of racenic mixture, ill-strations of these with maleic and fumaric acids, lactic and taxtaric acids, Absolute configuration, R. And S system.

**Unit-III (B)**

General methods of preparation of simple alias chic compounds and Bayer’s strain theory, concepts regarding cyclo haxone, bost and chai9r conformation, equational and axial bonds.

**Unit-IV (A)**

Orgenometallic compounds: Grignard reagents: preparation and synthetic uses: carbon ion pressure.

**Unit-IV (B)**

Esters containing active methysene group:

a) Acetocellic ester synthesis (clarisen reaction synthetic uses: formation of alkanes, ketones and acids) structure of acetoacetic ester, Keto-enol tantomerism.
b) Malonic ester: Preparation and synthetic uses (alkanes, Ketone and acids)

**Unit-V (A)**

Sulphur compounds:

Mercaptans (Preparation and properties)

**Unit-V (B)**

Aliphatic organic compounds:

Production and reactions of the following functional groups: alcoholic group, aldehyde group, Keto group, carboxylic acid group, ester group, amino group, amide group.

**SECOND YEAR EXAMINATION**

**PAPER – III**

**PHYSICAL CHEMISTRY**

**UNIT-I**

The Gaseous state:

Kinetic Theory of gases, Derivation the expression for the pressure of gas, Explanation of the gas Laws (Boyle’s Law Charles Law, Dalton’s Law of partial pressure and Avogadro’s law) on the basis of the Kinetic theory.

Maxwell-Boltman distribution of molecular velocities (only qualitative treatment, Mathematical derivation excluded) Nature of the distribution curve and effect of temperature on distribution, calculation of the root mean square and the most probable velocities. Relationship between them.
Derivation of gas laws from ideal behaviour, Vanderwaal’s equation of state, critical phenomena and critical constants, Law of corresponding states Liquification of gases.

**Unit-II**

‘Thermodynamics:

First Law of Thermodynamics: Heat content and capacity isothermal and adiabatic changes, work done in the expansion of an ideal gas, Joule-Thomson effect, Joule Thomson, coefficient for an ideal and vender walls gases.

Thermo chemistry: Heat changes in chemical reactions Hess’s law of constant heat immunation Kiv-choff’s equation.

Second law of Thermodynamics:

Carnot’s theorem and carnole cycle, Efficiency of heat engines enthalpy entropy, changes in reversible and irreversible process. Entropy changes in an ideas gas, variation of entropy with temperature pressure and volume. Free energy and work functions conditions of equilibrium Clasion-clapeyron equation Gibbs-Helmholtz equation, partial molar quantities and their physical significance chemical potential, Gibbs-Duhems equation.

**Unit-III**

Dilute solution:

Lowering of vapour pressure, Roulette’s Law. Thermodynamic derivations of the laws relating to the elevation of boiling points, depression of freezing point and osmotic pressure, ideal and non-ideal solutions, the activity concept.
Homogeneous Gaseous Equilibria:

Law of mass action and the thermodynamic derivation of the expression for the equilibrium constant Different from the equilibrium constants. Le Chatlier's principle illustration with same a simple gaseous reactions, Influence of products and inert gases of dissociation, combination of equilibria, effect of temperature on equilibrium. The Vent's Huffs equation and its integration isotherm.

Unit-IV

The Solid state, The study of crystals space-lattice crystal systems. Lattice planes and dimensions. The structure of solids, ion metallic elements, metallic elements. Qualitative treatment of bond theory of solids, simple inorganic compound and isomorphism, the structure of glasses.

Phase equilibria:

Phase rule: One component system (water and sulphur) completely insoluble binary liquid, systems, completely insoluble solid liquid systems, solid gas systems, CuS₄, SH₂O only.

Unit-V

Order and Molecularity:

Kinetics of first and second order reactions, Determination of the order of a reaction, simple opposing (A→B) and consecutive (A → B → C) Reactions, Effect of temperature on the reaction rate. The collision theory of reaction rates Qualitative treatment of transition state theory.

Photo Chemistry:

PAPER – V

ORGANIC CHEMISTRY

Unit- I (A)

Aromatic hydrocarbons

Nomenclature, aromaticity and Hickel’s rule, Coaltar as a source of aromatic hydrocarbons. Electrophilic substitution (Halogenation, nitration. Friedel-crafts reaction). Orientation determination of structure of benzene, aromatic substitution reaction (SAr E₁ LArE₂).

Unit- I (B)

Aryl halogen compounds:

Preparation (Electrophillic substitution and sound mayor’s) interness of halogenotom, Oregano halogens as pesticides gammexone, comparison with aliphatic halides.
Unit-II (A)

Aryl Nitrogen compounds:

a) Nitro-hydro carbons: preparation (SAr \( E_1 \) and SAr\( E_2 \) ) or hydrocarbons) properties reduction of nitro benzo0ne and TNT.

b) Aromatic amines:

Preparation (Reduction of nitro compounds) properties, diszo reaction, alkylation of quaternary formation of quaternary salts, basicity) phenyl hydrazine, structure and synthetic uses of benzene disxonium salts, comparison with alipathic amines.

Unit-II (B)

Aryl Oxygen compounds:

Phenols, preparation (diazo reaction and fusion), properties (acidity), electrophilic substitution Kolbe synthesis. Reimar Tieman reaction, diazoniu8m coupling, comparison with alcohols.

Unit-III (A)

Atomic side chain derivatives:

a) Aryl aldehydes: Preparation (Etarda reaction) properties (Addition rean with HCN, Phenyl hydrazine, hydroxyl amine, semicarbazide, alcohol) Cannizzaro, Benzoic and Perkin reaction.

b) Aryl Ketones: Preparation (Friedel crafts) properties addition and iodoform reaction.
c) Aryl carboxylic acids: Preparation (Oxidations, hydro cycles of nitrites, Grignard’s reaction) properties (acidity react with $\text{PCl}_3$, $\text{SOCl}_2$ alcohol and $\text{NH}_2$ Electrophilic substitution).

**Unit-III (B)**

Poly nuclear aromatic hydro carbons.

Naphthalene: Structure, properties, mechanism and Orientation of electrophilic substitution in naphthalence, reactions, napthols, naphylamines and naphthoic acids.

Anthracane: Structure, preparation and reaction of anthracene, anthraquinone (synthesis only) alizarin (synthesis only).

**Unit-IV (A)**

Heterocyclic compounds:

a) Five and six membered Heterocycles:

Aromatic characteristics, structure, synthesis and electrophiloic substition in pyrrole, furan and thiophene, chemical reactivity and orientation structure, synthesis and reactions of pyridine and piperidine.

b) Fused hetero cycle: Synthesis and reactions of indole, quinoline and isoquonolire with special reference to Fischor indole synthesis, skrcap quinoline synthesis.

c) Indigo, structure and synthesis.

**Unit-IV (B)**

Amino Acids and proteins:
Introduction, nomenclature and structure of amino acids, acid-base properties, synthesis (from alpha-holo acids, strecker method) Gabriel method, azisctone method), reaction (esterification, peptide bond formation) geometry of peptide linkage, proteins and their functions.

Unit- V (A)

Name reactions and molecular rearrangements:

Diel’s Alder, Fries, Michael, Manrich, Reformatsky, Backmans, Bentclone Khoevenagel, claison Benzil-Benzolic parkin and pinacolons rearrangements (Principles mechanism and applications).

Unit-V (B)

Purines and its derivatives:

Derivatives of Purine (adenine, hypoxanthine, Xthathine, Theo Bromine, Theophylline) structure of Uric acid and caffeine.

Time – 6 hours Paper – V (Practical) Full Marks – 100

INORGANIC QUALITATIVE ANALYSIS

1. Indentification of the basic and acid radicals of a mixture of inorganic substance consisting of not more than 6 radials (Interfering radicals like phosphate, fluoride and borates) mixture of acid radicals carbonate and sulphite, nitrite and nitrate. Chloride bromide and iodide, Phosphate and arsenate, bromide and nitrate and
one insoluble substance such as Barimn sulphate or Aluminium oxide, Tin Oxide and strontium sulphate.

2. Estimation of Calcium by precipitation as Oxalate (direct method and standardisation of KMnO4 using sodium oxalate).


4. Estimation of Fe²⁺ in a mixture of Fe²⁺ and Fe³⁺ using

5. Estimation of Copper iodometrically and a standardisation of Sodium thiosulphate using potassium dichromate solution.


7. Estimation of Chloride ion using volhard’s method (Ferric alum indicator.)

8. Gravimetric estimation of
   a. Barium as BaSO₄
   b. X Nickel as Nickel Dimathoyl glyoxime.
   c. Aluminium as AT₂O₃

FINAL YEAR EXAMINATION

PAPER – VI (100 MARKS)

PHYSICAL CHEMISTRY, INORGANIC CHEMISTRY

Unit-I (A)

Electro Chemistry

Conductivity of Solutions:

   Specific conductance, Equivalent conductance, Derivations of Onsanger’s conductance equation for electrolytes and its validity, Conductance of week electrolytes
theory of electrolytic solutions, Debye Huckel theory (including mathematical derivation) calculation of the radius of ion atmosphere. Activity and activity coefficient, Application of conductance measurements (Conductometri titrations), Transference number and its determination.

(Hittort and moving boundary)

Unit- I (B)

Electromotive:

Foke Galvasic Cell, reactions EMF of reversible cells and expression for single electrode potential, Reference electrodes standard oxidation potential concentration cells with and without transference liquid junction potential, Determination of transport numbers. Heat of reaction and solubility of sparing by soluble salt by EMF method.

Unit-II (A)

Equilibria in Electrolytes:

Acids and bases-proton transfer theory. Determination of the dissociation constant of week mono-basic acid by conductance and e.m.p method, ionic product of water and its determination.

Unit-II (B)

PH Determination of pH by E.M.F method (Hydrogen quinhydrone and glass electrode ). Hydrolysis of salts, Determination of hydrolysis constant and degree of hydrolysis by conductance e.m.f. & distribution methods, Buffer solution. Henderson
equation Acid Base indicators, Neutralisation curves, Elementary knowledge about other
types of indicators.

Unit-III (A)

Coordination compounds: Werner’s theory, Coordination number, isomerism,
nomenclature, Factors influencing the formation as complexes, valence bond
interpretation of common Octahedral, retrehedral and square planer complexes.

Crystal field theory, qualitative idea about de-orbital splitting in octahedral and
tetra-hedral fields, elementary treatment of spectra and paramagentism of transitional
metal complexes.

Unit-III (B)

Chemistry of Vennadium, Chromium manganese, nickel and their compounds.

Unit-IV (A)

Chemistry of Lanthanides:

Electronic structure, oxidation states, lanthanide contraction and its effect,
separation of lanthedies (ion exchange method only).

Unit-V(B)

Preparation and structure of mononuclear carbonyls of chromium iron and nickel:
effective atomic number rule, preparation and structures of binuclear carbonyls Mn₂
(Co)₈, Fe₃ (Co)₁₂.

Unit-V (A)
Comparative study of the elements of

a) Boron family
b) Carbon family.

Hydride: Their classification (ionic, covalent, interstitial) and their general chemistry. Hydrides of boron with special reference to preparation, properties and structure of diborone, hydrides of silicon chemistry of silicon, bacterial nitrogen fixation (Elementary treatment.

Unit-V (B)

Bio-inorganic chemistry:

Oxygen transport by haemoglobin, toxicity of Cd, pb and Hg.

Time – 3 hours       Paper – VII       Full Maris – 100

ORGANIC CHEMISTRY AND ANALYTICAL CHEMISTRY

Unit- I (A)

Carbohydrates:

Classification, constitution of glucose and fructose, reactions of glucose and fructose, Osazone formation, mutarotation, cyclic structure, pyranose and furanose forms, determination of aldoses and Ketoses, chain lengthening and chain shortening in aldoses.

Unit-I (B)

Dyes:
Relation between colour and constitution chromophore and auxochrome, classification of dyes, preparation and uses of azodyes, triphenyl methane dyes, synthesis of Malachite green, crystal violet and congored.

Drugs:

Antibiotics and gesies (Synthesis of one or two well known drugs of each class).

Unit – II (A)

Alkaloids: Introduction, classification, extraction, general characteristics, general methods of determining the structure, constitution and synthesis of papaverine and Nicotine.

Unit-II (B)

Terpenoids:

Introduction, essential oils, classification of terpenes, isoprene rule, elucidation of the structure of citral and geranial.

Unit-III (A)

Electro Magnetic radiation, features of spectrum, Ultraviolet spectrometry: Basic principles, simple idea about instrument, auxochromes and chromophones, simple idea on transition, woodword Eister rule for the prediction of absorption maxima.

Unit-III (B)

Infroned spectro metry.

Introduction Basic principles of I.R, Spectrum simple idea about instruments-characteristics group frequencies of organic molecules only the following type of molecules are included Hydrocarbons, alcohols aldehydes, Ketone, amines, acids aromatic ring.
Unit- IV (A)

Nuclear magnetic resonance spectroscopy:

Introduction basic principles of N. M. R. Chemical shift and simple spin-spin coupling shielding mechanism, study of NMR spectro of ethyl alcohol and 1.3 Dichloropropane.

Unit- IV (B)

Mass spectrometry: Basic principles, Determination of molecular formula, parent and meta stable peaks-mass spectra of some simple organic molecules only hydrocarbons, alcohol and amines are included:

Unit – V (A)

Polarography: Basic principles, polarography, Principles of ion diffusion – Limiting current and diffusion current and half wave potential polarography as an analytical tool

Unit-V (B)

Simple ideas on principles of chromatography: Paper chromatography column chromatography.

Time – 6 hours

Organic Chemistry

1. Purification of liquids by ordinary and vacuum distillation.


3. Detection of elements in organic compounds (N. S. And halogens)

5. Estimation of glucose.
7. Saponification value of esters.
8. Estimation of anilines and phenol.

**PHYSICAL CHEMISTRY (PRACTICAL)**

1. Study of the distribution equilibrium of iodine in water/benzene or water/carbon tetrachloride or water chloroform medium at room temperature.
2. Determination of the pseudo first order hydrolysis rate constant of methyl acetate at room temperature in 0.5 M H₂SO₄ and 0.5 M HCl media.
3. Study of the absorption of acetic acid from aqueous solution by animal charcoal.
4. Study of distribution equilibrium of ammonia in water/cholera form medium at room temperature.

**BOOKS RECOMMENDED FOR GENERAL AND HONOURS IN CHEMISTRY**

1. Modern Inorganic Chemistry: J. Singh
4. Introduction to Physical Chemistry – A. Findray
5. Outline of Physical Chemistry – F. Daniels & Alberty.
6. Qualitative Analysis – Yogel.
7. Quantitative Analysis – Yogel
10. Modern Essays in Organic Chemistry – Karve & Advani
13. Qualitative Analysis – Mellow Parkin.
14. Qualitative Analysis – Geves
15. Qualitative and Quantitative Analysis – G. S. Mewth.
16. General Chemistry – Linus Panting
17. Advanced Organic Chemistry – Nandkerny and Karthar
18. Organic Chemistry : Finar
21. Element of Physical Chemistry – Glasstone
22. A course in Physics, Chemistry – M. J. Arnikar & R L Kul Karol
   Chachad.
26. Advanced Chemistry of Rare Elements Satya Prakash.
27. Physio-Chemical Aspects of High Polymers – Satya Prakash
   Srivastava.
29. Molecular spectroscopy ( Principles and chemical application) R. P. Singh and S. P.
   Dikshit.
30. Selected Copies in Inorganic Chemistry - Malic, Tuli & Madan
33. Physical and Theoretical of Chemistry
35. Selected topic inorganic Chemistry – Bhataue & Nahar.
36. Physical Chemistry – N. Kundu and S. S. K. Jain
39. Elementary Organic Absorption Spectroscopy – Y. R. Sharma,
41. B. Sc. Practical Chemistry Girl Bajpai & Pandey.
42. Advanced inorganic Chemistry – Satyaprakash, Tull Basu & S. Madan.
44. Modern Inorganic Chemistry Part-III Ratolikart, Nimdookar and Joshi
45. Modern Physical Chemistry – Part-I Ratolikar, Ogal and Basu.
46. Modern Physical Chemistry (Part – I & II) Ratolikar Nimadookar and Opal.
47. Advanced Chemistry Calculations – Satyaprakash and Tiwari
48. Physical Chemistry – Rabi & Tull
50. Advanced Inorganic Chemistry – Satyaprakas and Others.
52. Quantitative Chemical Analysis – Sahey.

54. Refresher Course in P. Sc. Physical Chemistry
   B. Sc. – Inorganic and Analytical Chemistry

55. Physical Chemistry – N. Kundu, S. K. Jain

56. Advanced Inorganic Chemistry – Satyaprakash, Tull, Basu and Madan

57. Modern College: Chemistry Vol-II Gour, Massian Y. R. Sharma and K. D. Sharma.

58. Modern College Chemistry -do-

59. Modern College Chemistry (Physical) -do-

60. Advanced Experimental Chemistry (Organic) I. N. Gentar S. R. Kapoor

61. Modern College Chemistry (Hons. II) Organic – Hasanain Puvlashri and Sharma


63. Quantum Mechanism – A. K. Ghostole, S. Lokanath

64. Elements of Physical Chemistry (Part-II) K. L. Kapoor

65. –do- part-II -do-

66. –do- Part-I -do-


68. Elements of Industrial Chemistry – G. Mahapatro


70. Fundamental of Bio-chemistry – J. N. Jain

71. Essential of Physical Chemistry – Bahl and Tull

72. Fundamentals of Organic Chemistry - Kumar and Mahayer

73. Modern Inorganic Chemistry – G. G. Srivastava

74. Organic Chemistry – Mital and Mahrat
75. Modern Organic Chemistry – Mital and Bhargav
76. Second Year Inorganic Chemistry Srivastav Lavain, Saxena Sharma
77. Second Year Physical Chemistry - - Gupta , Bhava Mishra
78. Third Year Organic Chemistry – Mahrat, Mital
79. Third year Physical Chemistry – Gupta , Bhargava and Mishra
80. Physical Chemistry Vol – I, II by Dr. Sunakar Panda Vrinde Publication Pvt. Ltd.
     New Delhi.

BACHELOR IN COMPUTER SCIENCE (PASS)

COURSE STRUCTURE

SECOND YEAR EXAMINATION.

Paper – I  Fundamentals of Information Technology and
            Computer Organisation,  
            75 marks

Paper – II  C-Programming
            75 marks

PRACTICAL

A . Operating System and PC Software
    50 marks.

FINAL YEAR EXAMINATION
Paper – III  Data Structure  75 marks
Paper – IV  Logical Organisation of Computer Systems  75 marks

PRACTICAL


SECOND YEAR EXAMINATION

PAPER – I

FUNDAMENTALS OF INFORMATION TECHNOLOGY AND COMPUTER ORGANISATION

UNIT-I

What is a computer and introduction, uses of computer in modern society, example, scientific and business application, Banking, Accounting Desk Top publishing, weather forecasting, speech recognition etc.

Unit-II

Functional block diagram of digital computer, Functions of Central Unit and ALU in CPU, Concept of primary memory (RAM & ROM) and secondary memory-Magnetic Hard Disks Magnetic Tapes, Floppy disk, CD – ROM etc., Functions of I/O devices-Display unit, Keyboard, dot matrix printer, line printer, Laser printer, Ink-jet Printer.


Unit-III

Binary numbers, octal numbers, Hexadecimal numbers, Radix decimal, octal, hexadecimal-conversion from one to another, Representation of decimal, octal
hexadecimal numbers, fractional numbers and signed numbers l’s compliment, 2’s compliment forms, Binary arithmetic-Addition, Subtraction, Multiplication, division.

Codes, Weighted and Non-weighted binary codes-errors detecting codes, error correcting codes, alphanumeric codes-ASCII, 8-bit EBCDIC.

**Unit-IV**

Boolean Algebra: Representation of values and complements, AND, OR, NOT operators, KARNOUGH MPA, De-Morgan’s theorem, combinational logic circuits for expression using NAND and NOR gates, Half Address, Full Add Half Substract, Full Substract.

**Unit-V**


**BOOKS:**

1. Fundamentals of Computer by V Rajarmman
3. Computers To-day by D. S. Sanders.

**PAPER – II**

**C-PROGRAMMING**

**Unit-I**
Steps in program development, problem identification, Task analysis, GIGO, Outputs and inputs. Algorithm as an imitation of programming analysis. Flowcharting as a road map of the algorithm program coding. Testing and Debugging etc.

**Unit-II**

Programming language classification, machine language, Assembly language, third generation language, fourth generation languages, Assemblers concepts, printers, characteristics of 3 GLS and 4 GLS.

Programming techniques, Top-down design, Bottom-up design, Modular design and structure programming.

**Unit-III**

**C Language Programming:**

An overview of C Language, History of C. Language, the structure of a C program, data types, variables and constants, Integer constants, character constants, Floating Constants, Logical constants, string constants, variables, integer variables, real variables, character variable. Floating variable, logical variable, string variables, declaration, Scope of variables, Local variables and Global variables.

**Type of modification:**

**Unit-IV**

Control statement If General forms, Nested ifs. The if-else-if ladder. The ? as an alternative to if, switch general form. Type conversion in assignments, variable initialisations, nested switch statement for while, do-while, break, continue, it ( ) function, go to and legal declarations, console I/O , unformatted console I/O , Print f ( ), Sprint f ( ), scan f ( ) Arrays, declaration, single dimensional arrays, Two dimensional arrays and Multi dimensional array.

**Unit-V**

**Function:**

General form, declaration and prototypes, Function arguments. The return statement, Returning values from a function, function call, call by reference, scope rules of functions, calling functions with array and Recursion.

Pointers the & and * Operators, pointer expressions, pointer assignments, pointer arithmetic, pointer comparison, The dynamic allocation functions malloc and alloc. Structure and Unions and User defined variable, Structures, Basic structures, Declaring a structure, Referencing structure elements Array of structures, passing structures to functions.

Unions : Declaration, Uses, Enumerated data types and typed of the C. Processor.

The C processor # define, # include and C Standard Library and Header files.

1. Balguruswamy E: C. Programming Ch. 1,2,3,4,5,6,7,8,9,10,11.

**REFERENCE BOOKS.**
1. A. M. Tannenbaum and others: Data Structure using C-PHI, 1992

Practical

a) Operation System and P. C. Software (DOS, UNIX, MS, WINDOWS)

THIRD YEAR EXAMINATION

PAPER – III

DATA STRUCTURE

UNIT-I

Data type Data object-Abstract Data Type Data structure, Nation of an algorithm-Complexity measures: Rate of growth, Basic time analysis of an algorithm. Order nation-detailed; timing analysis space complexity.

Unit-II

Arrays, arrays and their representation-single and multidimensional arrays. Row major and ordering-Address calculation.

Unit-III

Linked Lists

Singly and Double linked lists-Insertion and Deletion Operation on lists-representation of sparse matrices and polynomials using lists, circular lists.

Unit-IV

Stacks and Queues:
Stacks and Queues - Representation and manipulation – Uses of stacks and Queues - Recursion Polish expression.

Unit-V

Tress-Binary - Representation of Tress-tree braversal algorithms (Inorder, pre-order, and Post order)

BOOKS

1. S. Lipschutz : Introduction to Data Structures, MC, Graw Hill, Chapter-1,2,3,4,5,6,7

REFERENCE BOOKS.

2. Robert L, Kruse: Data Structure and programme Design pertince Hall of India. 1987

PAPER – IV

LOGICAL ORGANIZATION OF COMPUTER SYSTEM

UNIT-I

Basic Computer Organisation:

Fetching a word from memory, storing a word in memory, Register transfers, performing arithmetic & Logic operations, Execution of a complete instruction, Hardwired control, CPU-Memory interaction Multiple-bus organisation.

Unit-II

Asthamatic logic Organisation.
Addition and substraction in I’s complement and 2’s complement form, Binary adder, Parallel adder, carry look ahead adder, Multiplication, Booth’s algorithm, Division, Floating point operations (Addition and subtraction).

Unit-III

CPU Organisation:

Instructions and Instruction sequencing, Instruction formats (zero, one and two address Instructions) Addressing modes (Register, Absolute, Immediate, Indirect, Indexed, Autoincrement and Auto decrement). Basic input-output operations, stack and queues, subroutines.

Unit-IV

Input-Output Organisation:


BOOKS:

1) Hamacher: Computer Organisation (McGraw Hill Int.)

PRACTICAL

B) Programming in C & all Units of Paper-3.

COMPUTER SCIENCE HONOURS

COURSE STRUCTURE

FIRST YEAR EXAMINATION

PAPER -I Fundamentals of Information Technology and
Computer organisation 100 marks.

Paper-II C- Programming 100 marks

SECOND YEAR EXAMINATION

Paper – III Data Structure 100 marks

Paper – IV Logical Organisation of Computer Systems 100 marks

PRACTICAL

Paper –V PC Software Programming in C. & Problems 100 marks

Implementation of Paper-3

FINAL YEAR EXAMINATION

Paper – VI Operating System Concepts 100 marks

Paper – VII File Organisation and Database Management Systems. 100 marks

PRACTICAL

Paper- VIII Practical C++ 50 marks

(A Project Report on Database Management System has to be submitted. 50 marks.

FIRST YEAR EXAMINATION

PAPER – I

FUNDAMENTALS OF INFORMATION TECHNOLOGY AND COMPUTER ORGANISATION.

UNIT-I
What is a computer and introduction, uses of computer in modern society, example, scientific and business application, Banking, Accounting Desk Top publishing, weather forecasting, speech recognition etc.

**Unit-II**

Functional block diagram of digital computer, Functions of Central Unit and ALU in CPU, Concept of primary memory (RAM & ROM) and secondary memory-Magnetic Hard Disks Magnetic Tapes, Floppy disk, CD – ROM etc., Functions of I/O devices-Display unit, Keyboard, dot matrix printer, line printer, Laser printer, Ink-jet Printer.


**Unit-III**

Binary numbers, octal numbers, Hexadecimal numbers, Radix decimal, octal, hexadecimal-conversion from one to another, Representation of decimal, octal hexadecimal numbers, fractional numbers and signed numbers I’s compliment, 2’s compliment forms, Binary arithmetic-Addition, Subtraction, Multiplication, division.

Codes, Weighted and Non-weighted binary codes-errors detecting codes, error correcting codes, alphanumeric codes-ASCII, 8-bit EBCDIC.

**Unit-IV**

Boolean Algebra: Representation of values and complements, AND, OR, NOT operators, KARNOUGH MPA, De-Morgan’s theorem, combinational logic circuits for
expression using NAND and NOR gates, Half Address, Full Add Half Subtract, Full Subtract.

**Unit-V**


**BOOKS:**

1. Fundamentals of Computer by V Rajarmman
3. Computers To-day by D. S. Sanders.

**PAPER – II**

**C-PROGRAMMING**

**Unit-I**

Steps in program development, problem identification, Task analysis, GIGO, Outputs and inputs. Algorithm as an imitation of programming analysis. Flowcharting as a road map of the algorithm program coding. Testing and Debugging etc.

**Unit-II**
Programming language classification, machine language, Assembly language, third generation language, fourth generation languages, Assemblers concepts, printers, characteristics of 3 GLS and 4 GLS.

Programming techniques, Top-down design, Bottom-up design, Modular design and structure programming.

Unit-III

C Language Programming:

An overview of C Language, History of C. Language, the structure of a C program, data types, variables and constants, Integer constants, character constants, Floating Constants, Logical constants, string constants, variables, integer variables, real variables, character variable. Floating variable, logical variable, string variables, declaration, Scope of variables, Local variables and Global variables.

Type of modification:

Unit-IV

Control statement If General forms, Nested ifs. The if-else-if ladder. The ? as an alternative to if, switch general form. Type conversion in assignments, variable initialisations, nested switch statement for while, do-while, break, continue, it ( ) function, go to and legal declarations, console I/O , unformatted console I/O , Print f ( ), Sprint f ( ), scan f ( ) Arrays, declaration, single dimensional arrays, Two dimensional arrays and Multi dimensional array.

Unit-V

Function:

General form, declaration and prototypes, Function arguments. The return statement, Returning values from a function, function call, call by reference, scope rules of functions, calling functions with array and Recursion.

Pointers the & and * Operators, pointer expressions, pointer assignments, pointer arithmetic, pointer comparison, The dynamic allocation functions malloc and alloc. Structure and Unions and User defined variable, Structures, Basic structures, Declaring a structure, Referencing structure elements Array of structures, passing structures to functions.

Unions : Declaration, Uses, Enumerated data types and typed of the C. Processor.

The C processor # define, # include and C Standard Library and Header files.

1. Balguruswamy E: C. Programming Ch. 1,2,3,4,5,6,7,8,9,10,11.

REFERENCE BOOKS.

2. A. M. Tannenbaum and others: Data Structure using C-PHI, 1992
FINAL YEAR EXAMINATION

PAPER – III

DATA STRUCTURE

UNIT-I

Data type Data object-Abstract Data Type Data structure, Nation of an algorithm-
Complexity measures: Rate of growth, Basic time analysis of an algorithm. Order nation-
detailed; timing analysis space complexity.

Unit-II

Arrays, arrays and their representation-single and multidimensional arrays. Row major and ordering-Address calculation.

Unit-III

Linked Lists

Singly and Double linked lists-Insertion and Deletion Operation on lists-
representation of sparse matrices and polynomials using lists, circular lists.

Unit-IV

Stacks and Queues:

Stacks and Queues-Representation and manipulation – Uses of stacks and Queues- Recursion Polish expression.

Unit-V

Trees-Binary-Representation of Trees-tree braaversal algorithms (Inorder, pre-
order, and Post order)

BOOKS
1. S. Lipschutz: Introduction to Data Structures, MC, Graw Hill, Chapter-1,2,3,4,5,6,7

REFERENCE BOOKS.


4. Robert L, Kruse: Data Structure and programme Design pertinent Hall of India. 1987

PAPER – IV

LOGICAL ORGANIZATION OF COMPUTER SYSTEM

UNIT-I

Basic Computer Organisation:

Fetching a word from memory, storing a word in memory, Register transfers, performing arithmetic & Logic operations, Execution of a complete instruction, Hardwired control, CPU-Memory interaction Multiple-bus organisation.

Unit-II

Arithmetic logic Organisation.

Addition and substraction in l’s complement and 2’s complement form, Binary adder, Parallel adder, carry look ahead adder, Multiplication, Booth’s algorithm, Division, Floating point operations (Addition and subtraction).

Unit-III

CPU Organisation:
Instructions and Instruction sequencing, Instruction formats (zero, one and two address Instructions) Addressing modes (Register, Absolute, Immediate, Indirect, Indexed, Autoincrement and Auto decrement). Basic input-output operations, stack and queues, subroutines.

Unit-IV

Input-Output Organisation:


BOOKS:

1) Hamacher: Computer Organisation (McGraw Hill Int.)

PAPER – V (PRACTICAL)

P. C Software Programming in C & on all Units of Paper -3 (100)

FINAL YEAR EXAMINATION

PAPER - VI

OPERATING SYSTEM CONCEPTS

Unit-I

Review of operating system concepts, batch processing, simple monitor, and multiprogramming. Multiprocessing, time sharing, real-time system.
Operating System Services: The user View, the operating system, File Systems: Access methods, view allocation methods, directory systems, file protection.

Unit-II

CPU Scheduling, scheduling concepts, scheduling algorithms and their evaluation, memory management concepts, swapping, paging and segmentation.

Unit-III

Concept of Virtual memory, Overlay’s demand paging, page replacement techniques, page replacement and allocation algorithms.

Disk and drum scheduling: First come first service scheduling shortest seek-time first scheduling sector.

Unit-IV

Concept of deadlock, deadlock problems, deadlock characterization, deadlock prevention, deadlock avoidance, deal-lock detection, recovery from deadlock, concurrency.

Unit-V


BOOKS RECOMMENDED
THIRD YEAR EXAMINATION

PAPER- VII

FILE ORGANISATION AND DATA BASE MANAGEMENT

Unit-I

Introduction to Database system, Characteristic of database. Database Administrators, Database designers, End-users, Uses of DBMS, Implications of database approach, Data Models, Schemes and Instances DBMS Architecture and Data Independence. Database Languages and interfaces. Classification of DBMS.

Unit-II

Introduction to E-R model, Conceptual data models for database design, E-R model concepts, E-R diagrams.

Unit-III


Unit-IV
Relational model concepts. Relational Model constraints, Operations on relations Defining relations, Relational algebra, Relational Operations, Queries in the relational algebra.

**Unit-V**

RDBMS Packages (ORALE/FOXBASE/d BASE/SYBASE). Data organization files and fields, data access, indexing, sorting program development, modularity, use of procedures and passing parameters, to procedure, user friendliness and menu-driven program development; providing for error conditions, Data input; Custom build screens, data validation templates and functions of data input screen format files, Data Out-put: formatted output on screen and Printer, advantages of custom designed output, use of multiple files, simultaneously report generation using multiple files.

**BOOKS**

1) F. J. Masri & Navathe: Fundamentals of Database system (2/e) (Benjamin/Cummines Pub. Comp. Ins.)

**PAPER – VIII (Practical)**

Practical ((++. A project report on DBMS has to be submitted) (50 + 50 marks)

**VOCATIONAL SUBJECT IN COMPUTER SCIENCE**

**SECOND YEAR EXAMINATION**

Paper – I Fundamentals Information technology  75 marks

Paper – II Computerized Accounting and Database Management  75 marks

Paper -III Practicalm (PC software and operating system)  50 marks
FINAL YEAR EXAMINATION

Paper – IV  Computer Organisation and C-programming  75 marks
Paper – V  Business Computing  75 marks
Paper – VI Practical (C Programming Lab. Programs based on Paper –IV)  50 marks

SECOND YEAR EXAMINATION

PAPER – I

(FUNDAMENTALS OF INFORMATION TECHNOLOGY)

Unit- I

What is Computer – An introduction, uses of computer system in modern society, scientific and business application. Banking, Accounting. Desktop publishing, Internet, e-mail, multimedia weather forecasting.

Unit-II

Block diagram of digital computer, Function of control Unit, AL U in CPU, Concepts of primary Memory (RAM, ROM) and secondary memory, magnetic Hard Disk, Magnetic Tapes, Floppy disk, CR – ROM, Functions of I-O devices, Display unit, keyboard, printer (Dot Matrix), line printer, Laser Printer, Inkjet Printer.

Unit-III


Unit-IV
What is software? Operating system and its functions concepts of Batch processing, operation system. Time shared operating system and real time application. Difference between Business Application Software and operating system. Introduction to Dos, File structure in Dos, some sample Dos commands: create directory, change Directory, delete files, remove directory, copy files format commands etc, various types of operating system.

Unit-V

Analysis of Business systems using spread sheet, preparing pay bill balance sheet and other applications.

BOOKS

1. Fundamentals of Computers by V. Rajaraman
2. Computer Studies – A first course by John Shelly & Hunts
3. Computer for Beginners by Jaggi and Jain

PAPER – II

(Computer Accounting and Database Management System.)

Unit-I

Unit-II

Trading, profit and loss account, Balance Sheet, Ratio analysis meaning, advantage, limitations, types of ratios and their Usage.

Unit-III

Introduction to Database Management system, advantages of DBMS, Data independence, Database administrator, Relational model: Structure of relational database, Query language, selection, projection, Join Operations, 1st, 2nd and 3rd normal form.

Unit-IV

Introduction Database management system software, creating a database modifying querying a database, Generating reports from a database, Database application in Accounting.

Unit-V

Master file, Transaction file, index file, processing of different files, data collection, input and output form design.

BOOKS

1. Introduction to Database System by A. Majumdar and Bhattacharya.
2. Programming in D base/ fox base by R. K. Taxali

Practical

Paper – III PC software and Operating System

(DOS and MS WINDOW)
THIRD YEAR EXAMINATION

PAPER – IV

(COMPUTER ORGANIZATION AND C-PROGRAMMING)

Unit-I

Data representation: Number System (Binary, Octal Hexadecimal) representation of integers, floating point numbers, ASCIT, DIC)

Unit-II

Digital Logic: Boolean function, Truth table, ANDS, OR, NOT, NOR, NAND, DOR, XNOR, Gate, NAND gater as Universal gate.

Arithmatic circuit: Binary Adder (Half and Full adder) Half SDubtraction, Full subtractor, Subtractor through Adder circuit.

Unit-III

Problem solving steps, Algorithm, Flow chart, Decision table Efficiency of algorithms.

Unit-IV

Basic of C Programming, structure of C-language, constants, variables, expressions, operations, simple, I-O functions, control statements, storage classes, conditional and loop statement.

Unit-V

Concept of function parameter passing, function call by value, function call by reference, recursive functions, scope and extent of variables.
BOOKS

1. Programming with C by E. Balguruswamy
2. Programming with “C” by E. Gottfried.

PAPER – V

BUSINESS COMPUTING

Unit – I

Introduction to Business Computing:
Data Vs Information, systems concept in data processing, Data processing function and activities, collection, conversion, manipulation, storage communication.

Unit-II

Management Information System:
Management information system, characteristics of MIL, function of MIS, Decision support system, Intedgrated information system, Internal Use.
External Information.

Unit-III

System analysis and Design:
Methods and procedure, systematic analysis, system approach, system development life cycle, information systems development, System Survey and selection, Feasibility study, Requirement Analysis, logical system design, Physical system design.

Unit-IV
Control in information system:
Process Control, Input Control, output control

Unit-V

Techniques of system Analysis and Design, System implementation system maintenance, human factor, Models in system analysis and Design, Checklist for system and design.

BOOKS


PRACTICAL PAPER – VI

C Programming Lab 50 marks

Programms based on paper - IV

ELECTRONICS SCIENCE (GENERAL)

There shall be total four theory papers and two practical papers in this subject as mentioned below.

SECOND YEAR EXAMINATION

PAPER – I OF 75 MARKS (THEORY ) DURATION : 3 HOURS

PAPER – II OF 75 MARKS (THEORY) : DURATION 3 HOURS
A student shall be required to perform one experiment in each practical examination. Each Student will maintain one laboratory note book of each practical paper. A student has to perform a minimum 75% of the total number of experiments prescribed in each paper to obtain full credit in the examination. Each experiment must be signed (full signature by the student and the teacher with date who has taken the practical classes.

SECOND YEAR EXAMINATION

PAPER – I (THEORY) (75 MARKS)

Unit-I

Basic of A. C: A. C. Circuits AC in I.C. LR, RC and LCR: Growth and decay of A. C. In these circuits, Series and parallel resonances: O – factor.

Unit-II
Network Theorems: Thevenin’s Norton’s Maximum Power Transmission and Superposition Theorems.

**Unit-III**

**Semiconductor Diode:**

Energy band: effect of temperature on energy bands, classification of solids in terms of energy band, intrinsic and extrinsic semiconductor, N-type and P-type semiconductors, P-N Junction, biasing of P-N junction Operation and characteristics, P-N junction, Zener diode and its characteristics.

**Bipolar Transistor:**

NPN and PNP Transistors and their operation C-B, C-E, C-C Configuration and their characteristics, Current amplification factor and their relations, transistor load line analysis, methods of biasing of transistors, Hybrid parameters and hybrid equivalent circuits.

**Unit-IV**

**Field effect Transistor:**

Basic principle and construction of JFET. Operation and characteristic curves of the JFET. Effect of drain to pinch off region, characteristic parameters of FET. Advantages and disadvantages of FET, MOSFET, Depletion type, Enhancement type, characteristic curve of MOSFET.
Industrial Device:

The silicon controlled rectifiers (S. C. R) Construction, Operation and characteristics, Application of S. C. R. As half wave and full wave rectifier – TRIAC – Construction, Operation and characteristics Application of TRAIC as high power, lamp switch, DIAC – Construction. Operation, characteristics Application of DIAC as lamp dimmer, UJT (Unit Junction Transistor) Construction , operation and characteristics Application of UJT as relaxation oscillators.

PAPER – II (THEORY)

(75 MARKS)

Unit-I

Application of Semiconductor Diode (Rectification):

Principle of rectification – Half wave and full wave rectifiers-bridge rectifier- calculation of efficiency and ripple factor, Filters-shunt capacitor, series indicator, L section and section filters, Clipping and Clamping circuits.

Unit-II

Application of Transistor (Amplification):

General classification of amplifiers in CB and CE mode-RC coupled amplifier- construction , operation and frequency response curves advantages and disadvantages of R-C coupled amplifier. Transformer coupled amplifier- Construction operation and frequency response. Tuned amplifier, single and double tuned amplifier.
Unit-III

Power amplifier:

Class A, Class B, Class AB and Class C transistor Amplifier-Class B pushes Pull amplifier. Construction, operation-efficiency-distortion and power dissipation capability of power amplifier.

Unit-IV

Oscillator:


Unit-V

Electromagnetic Wave Theory Maxwell’s equation (No derivation) and their interpretations: Wave equation in dielectric and conducting media: properties of E. M. Waves: nature speed, reflection, refraction-Snell’s Law.

Transmission line theory: Parallel transmission line, transmission line equation, transmission line parameters. Coaxial and two wire transmission lines.

PAPER – III (PRACTICAL)

1. Circuit symbols, colour code Identification of Resistors.

2. Use of Multimeter and VTVM, Testing Resistors and voltages, Continuity Test, Testing Diodes, Transistors etc.
3. Use of CRO for measuring of voltages and frequency.

4. Crystal diode characteristics and calculation of input and output resistances.

5. Zener diode characteristics and calculation of zener impedance.


7. Full wave rectifier: Determination of efficiency and ripple factor with and without filter.

8. Transistor characteristics in common base mode and calculation of current amplification factors.

9. Transistor characteristics in common emitter mode and calculation of current amplification factors.

10. Study of characteristics of JFET and determination of constants.

**Unit-II**

Communication principle – II

Types of wave propagation in space (ground wave, surface wave, sky wave) Demodulation and its essentials, AM diode detector AM radio receiver-type principle of heterodyning, Block diagram and description of SHR, Advantages of super heterodyning.

**Unit-III**

Switching Circuits and Radar multi-vibrator. Basic idea and operation principles of Monostable, blastable and free running multi vibrator.

RADAR: Block diagram, descriptions of each block, terms associated with RADAR, Uses.

**Unit-IV**

Introduction to Internet:

Fundamentals of internet, working principle of Internet. Distinguishing between internet and Web. Resources required to connect the word through internet. Brief idea of electronic mail (e-mail). Advantage of e-mail over other conventional methods.
Unit-V

Satellite Communication:

Introduction. The satellite orbit. The satellite position, Linkages-Tie up-Link. The Down Link, the Cross-Link, Assignable Satellite frequencies. Inside the Satellite. The antenna system, the power package Station keeping.

PAPER – V (THEORY)

(75 MARKS)

Unit-I

Number system and logic gates:

A)  I) Decimal, binary, octal and hexadecimal number, II) bits and bytes,
    III) Number conversions – Decimal to binary, binary to decimal-binary to hexadecimal, hexadecimal to binary, decimal to hexadecimal, hexadecimal to decimal, IV) Addition, subtraction by two’s compliment methods and multiplication of binary numbers.

B) Simple digital circuits, logic gates – AND, OR, NOT, NAND & NOR, exclusive OR gates- Demorgan’s Law.

Unit-II

Fibre optics: Structure of optical fibres, classification of optical fibres, Classification of optical fibres, plastic fibres – propagation of light- Refraction and Snell’s Law, Total internal reflection – Acceptance angle and Numerical Aperture. Fibre
characteristic and losses. Advantages and disadvantages of optical fibres, Application of fibre optic communication.

**Unit-III**

**Electronic instruments:**

Electronic instruments, Multimeter, application of Multimeter, Sensitive of Multimeter, Merits and demerits – VTVM, Application merit and demerit, CRO – CRT, Deflection sensitivity of CRT, various controls of CRO, Application of CRO.

**Unit-IV**

**Integrated circuits:**

Definition, Advantages and Disadvantages, classification, fabrications of components of monolithic IC, IC packaging, IC symbols, Scale in integration.

**Unit-V**

Operational Amplifier:


**PAPER – VI (PRACTICAL)**

**(50 MARKS)**

1. Two stage RC coupled Amplifier and study its frequency response curve band width.
2. Assembling of two stage audio amplifier using transistor.
3. Assembling of audio amplifier using 810-IC and testing its output.
4. Study of Truth table of AND OR, NOT Gate.
6. Assembling of multi-vibrator using IC-553.
7. Assembling and testing of three range battery eliminator.
8. Regulated power supply using IC-7812 or 7912.
9. Study of the characteristics of PHOTO Diode.
10. Study of characteristics of OP-AMP using IC-741

**BOOKS RECOMMENDED**

2. Hand Book of Electronics – By Gupta Kumar.
5. Principles of Electronics – By V. K. Mehta
8. Integrated Electronics – Millman & Halkies
9. Modern Digital electronics – By R. P. Jain
10. Introduction to Microprocessor – By B. Ram
11. Electronic instrument and Measurement Technique- By. W. D. Cooper
14. ABC of INTERNET (BPB Publication)
16. Electromagnetic wave and Radiation systems Jordan

**ELECTROICS (HONOURS)**

There will be total of six theory and two practical papers in this subject as mentioned below:

**First year Examination:**
- Paper – I of 100 marks theory 3 hours
- Paper – II of 100 marks theory 3 hours

**Second year Examination**
- Paper – III of 100 marks theory 3 hours
- Paper – IV of 100 marks theory 3 hours
- Paper – V of 100 marks Practical 6 hours

**Third year Examination**
- Paper – VI of 100 marks Theory 3 hours
- Paper – VII of 100 marks Theory 3 hours
- **Paper – VIII of 100 marks Practical 6 hours**

A student shall be required to perform 2 experiments in Paper – V and One Experiment & Project work in paper – VIII practical examination. Each student will maintain one laboratory note book for each practical paper. A student has to perform a minimum 75% of the total No. of experiments prescribed in each paper to obtain full
credit in the examination. Each Experiment must be signed by the student and the teacher with date, who has taken the practical classes.

FIRST YEAR EXAMINATION

PAPER – I (100 MARKS)

(Elementary ideas on the following topics)

Unit- I

1. **AC Fundamentals:**


   **Unit-II**

2. **Electromagnetic Wave theory:**


   **Unit-III**

3. **Network Analysis:**


   **Unit-IV**
4. **Filters Attenuators:**

Basic filters characteristics Low Pass-High pass-Band, Pass-Band Stop Filters, Design of filter – Attenuators.

**Unit-V**

5. **Transport Phenomenon in semiconductors:**


**Paper – II (100 marks)**

*(Elementary ideas on the following topics)*

**Unit-I**

1. **Semiconductor Diode and Application.**


**Unit-II**

2. **Bipolar Transistors:**

NPN and PNP transistors and their operation, CE, CB and CC configuration and their characteristics, current amplification factors and their relations. Transistor
load line, operating point, biasing and thermal stabilization. Hybrid parameters and hybrid equivalent circuits for transistors.

Unit-III

3. **Amplifiers:**
Principles of amplification – classification of amplifiers, Efficiency, frequency response, gain ; band width, gain-bandwidth product of an amplifier, faithful amplification , RC coupled amplifier-construction, operation and frequency response, advantage and disadvantages, Transformer Coupled amplifiers, direct coupled amplifier, Tuned Amplifier-single and double tuned amplifier.

Unit-IV

4. **Feedback and Power amplifiers:**
Class A, Class – B, Class- AB and Class C transistor amplifier, Class B push and Pull amplifier-construction, operation-efficiency.
Feed back principle-positive and negative feed-back, feed-back amplifiers, transistor gain with feedback, characteristics of negative feedback amplifiers.

Unit-V

5. **Oscillators:**
Effect of positive feedback condition for sustained oscillation Barkhausen criterion-RC phase shift oscillators, colipitt’s Hartley and crystal oscillators and their stability.
SECOND YEAR EXAMINATION

(Elementary ideas on the following topics)

PAPER-III (100 MARKS)

Unit-I

1. Radio Communication:

Types of radio wave propagation-ground wave, sky wave and space wave propagation, attenuation of ground waves, ionosphere, critical frequency of layer, propagation of radio wave through ionosphere, Skip Distance and Maximum Usable frequency, Abnormal behaviour of ionosphere, space wave-propagation range of space wave propagation, Fading.

Unit-II

2. Modulation and Detection:


Unit-III

3. Antenna Theory:

Radiation from a doublet Antenna, radiation field of a dipole (Vertical wire and loop) Image antenna, grounded Antenna : directive gain of antennas Radiation
resistance, Impedance and mutual impedance of antennas, Impedance matching
Antenna Array, Yaggi, Rhombic and loop antenna.

Unit-IV

4. **Radio transmitters and receiver:**
   Principle of radio transmission-principles of radio transmission Block diagram AM
   Radio transmitter: Classification of radio receivers, types of AM receivers-tuned
   radio frequency and Super Heterodyne receivers (Block diagrams) Principle of
   super heterodyne receivers: Function of different sections of Super Heterodyne
   receivers FM.

Unit-V

5. Television-basic principle, TV Cameras-camera tube characteristics, image
   orthicon and Vidicon Scanning-vertical and horizontal resolutions Interlaced
   scanning-Signal, blanking and synchronization pulses (vertical & Horizontal). TV
   channel for broadcasting, Block Diagram and function of television transmitter
   and receivers Basic principle of colour TV.
   Basic communication satellites-classification of satellites. Satellite orbits, satellite
   position, components satellite.

**PAPER – IV (100 MARKS)**

*(Elementary ideas on the following topics)*

1. **Field Effect Transistors: (FET):**
Construction characteristics & operation of JFET – Pinch-off voltage, characteristics, parameters of JFET – effect of temperature of FET parameters, biasing of FET, FET as Amplifiers, FET as voltage resistors (VVR) Merits and demerits of FET.

**Unit – II**

2. Mosfet:

Metal oxide semiconductor FET (MOSFET) depletion and enhancement MOSFETs- n channel & P-Channel, characteristics and applications, threshold voltage biasing and comparison of MOSFET and JFET Dual Gate MOSFET, equivalent circuit and frequency limitation of MOSFET.

**Unit-III**

3. Electronic instruments and ICs.

Detailed study of CRO, Multimeter and VTVM wave meters and their uses, transducers.

Formation and classification of Is -Formation of circuit elements and transistors – IC components, steps of monolithic IC fabrication.

**Unit-IV**

4. Switching circuits.

Multivibrators-astable, monostable, blastable, clipping and clamping circuits, voltage ramp, smith trigger circuits.

**Unit-V**

5. Microwave sources:

Microwave tubes-reflex Klystron, Magnetron (Split Anode) Gunn Diode, IMPATT diode, Tunnel diodes (Qualitative idea).
RADAR Block diagram and description of each block, important terms associated with RADAR, Radar Ranging.

**PAPER – V (PRACTICAL)**

**(Full Marks – 100)**

1. Circuits symbols and color code identification of resistors.
2. Use of multimeter and VTVM, testing resistors and voltage, continuity fest, using diode and transistor.
3. Study and use of CRO.
4. Hall wave rectifier with zener diode and variation of output voltage and output current with and without zener diode.
5. Full wave rectifier-determination of ripple factor and efficiency with and without filters.
6. Crystal diodes characteristics – find the resistances(for Si and Ge diodes).
7. Zener diode characteristics: find zener impedance.
8. Study of transistor characteristics in CB mode and find the simplification factor.
9. Study of Transistor characteristics in CB mode and find the simplification factor.
11. Design of a stable multi-vibrator using transistors and plot the output Waveform.
12. Study the characteristics of FET and find the parameters.
13. Design of a stable multi-vibrator using IC 555 plot the output wave from using CRO.
14. Study of RC coupled amplifier with negative voltage feedback and frequency response.
FINAL YEAR EXAMINATION

PAPER – VI (FULL Marks – 100)

Unit-I

1. Power electronics and Photo electronics devices.

Construction, operation and characteristics of silicon controlled rectifier. unijunction transistor. Diec. Triac.

Photoelectron emission, photodiodes, phototransistor, solar cells, photomultiplier tube.

(Elementary ideas on the topics in following Units)

Unit-II

Operational amplifiers:


Unit – III

Number system and digital electronics:

Number system Decimal, binary, octal, hexadecimal and their inter-conversion binary arithmetic, 1’s and 2’s complement method of subtraction.
Logic gates AND, OR, NOT, NAND, NOR, EX-OR elementary idea of Boolean algebra, Domorgan’s theorem, flip flop circuits – RS, JK, D & T types.

Unit-IV

Fourier and Laplace Transforms:
Transformation of time into frequency using Fourier & Laplace transforms Properties of Fourier and Laplace transform, Physical significance of the above transforms, application of Fourier and Laplace transforms in electronics (Qualitative idea only).

Unit-V

Microprocessor:
Evolution of microprocessors, Introduction to microprocessor, Intel 8085, ALU timing and control unit, registers, data address and control buses, Intel 8085 instruction timing diagrams of Opcode Fetch cycle., memory read memory write, I/O read, I/O write, Addressing modes: direct, indirect, immediate, implicit and register addressing.

PAPER – VII (100 MARKS)
(Elementary ideas on the following)

Unit-I
Digital Computer, Types of Computers, micro, mini, main-frame and super computers, anatomy of Computers – INPUT, OUTPUT, CPU, ALU, CU with block diagram, keyboard, monitors secondary, storage devices: magnetic discs magnetic drum, magnetic taps floppy disc. Compact disc, Random Access Memory and Read only memory.

Basic of internet, the www concept, e-mail, net browsing.

Unit-II

Basics of algorithm, flow chart, different types of loops, if, in-else, neated if, for next do-while, while-do, small algorithms to be dealt using the above basic loops.

Computer languages; high level Intermediate level, low level language, merits and demerits of different language, preliminary ideas about operating system.

Unit-III

Basic elements of communication system, data transmission modes, simplex, half duplex and full duplex, data transmission speed: narrow band, voice band and broadband.

Transmission media: Coaxial able, microwave, optical fibbers, Network topologies star, ring, hybrid, multipoint, LAN, WAN.

Unit-IV

Programming with C:
Programming with C, variables, constants, data, types, arithmetic statements, operators, and expressions, input and output statements, branching statements.

Unit-V

Looping statement working with arrays and pointers, staring operators, gets, puts, getenar, putchar, getch, strlen, strcpy, strcat functions, C-programs using above statement.

PAPER – VIII (PRACTICAL)

GROUP – A (75 MARKS)

1. Study the performance of diode clipping circuits under various operation.
2. Assemble basic logic gates (AND, OR & NOT) and verify the truth tables.
3. Study the characteristics of Photo Diode
4. Study the characteristics of SCR
5. Study the characteristics of UJT & UJT as relaxation Oscillator.
6. Measure the effect voltage and bias current of an OP-Amp. Using IC – 741
7. Determine the CMRR of a given OP-AMP
8. Design a DTL NAND gate and verify its truth Table.
9. Design of two stage audio amplifier and testing
10. Design of Audio amplifier using 810—IC and testing its output.

GROUP- B (Project)

(25 marks)
Any one from the following group.

1. Design of Digital Clock using IC-555
2. Design of regulated power supply using IC 7812 and 7912
3. Assembling of multi-range battery eliminator.
4. Design of an emergency light.
5. Design of low range AM Transmitter.
6. Design of low range FM transmitter.
7. Design of light activated ON/OFF switch

LIST OF BOOKS RECOMMENDED:

1. Electronic and radio Engineering: By G. K. Mittal Khanna Publisher
2. Electronic fundamentals and application: by J. D. Ryder, PHI
7. Solid state Electronic Devices : by B. G. Streetman
9. Microprocessor architecture, programming & Application – by R. S. Gankar, Ponram international
12. Fundamentals of Microprocessor & micr computers – B y B. Ram
13. A course on Electrical and Electronics instruments – by A. K. Sawhney,
16. Communication Engg.: by Everitt & Anner

GEOLOGY (GENERAL)

SECOND YEAR EXAMINATION

PAPER – I

At the end of first year, there shall be two theory paper each carrying 75 marks and are practical paper carrying 50 marks. The duration of the theory and practical examination will be 3 hours. The practical paper includes a field training programme of one week to be conducted under the supervision of the departmental teachers. The students have to bear their all field expenses.

FINAL YEAR EXAMINATION

At the end of second year, there shall be two theory paper each carrying 75 marks and one practical paper carrying 50 marks. The duration of the theory and practical examination will be 3 hours. The practical paper includes a field training of one week to conducted under the supervision of the teacher concerned. The students have to bear their all field work expenses.

SECOND YEAR EXAMINATION

PAPER – I (THEORY)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Subject</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-I</td>
<td>General Geology</td>
<td>15 marks</td>
</tr>
<tr>
<td>Unit-II</td>
<td>Geomorphology</td>
<td>15 marks</td>
</tr>
<tr>
<td>Unit-III</td>
<td>Mineralogy</td>
<td>15 marks</td>
</tr>
</tbody>
</table>
Unit-IV Crystallography 15 marks
Unit-V Optical Mineralogy 15 marks

Paper – II (Theory) 75 marks

Unit-I Igneans Petrology 15 marks
Unit-II Sedimentary Petrology 15 marks
Unit-III Metamorphic Petrology 15 marks
Unit-IV Petrography of rocks 15 marks
Unit-V Stractiocal Geology 15 marks.

Paper – III (Practical) (50 marks)

1. Crystallography 08 marks
2. Identification of Minerals 10 marks
3. Identification of rocks 12 marks
4. Optical study of minus and rocks 08 marks

FINAL YEAR EXAMINATION

PAPER – IV (THEORY) (75 MARKS)

Unit-I Stratigraphy 15 Marks
Unit-II Pre & Post ambrian Stratigraphy 15 marks
Unit-III Structural Geology 15 marks
Unit-IV Palaeontology 15 marks
Unit-V Engineering Geology 15 marks

PAPER-V (THEORY)

Unit-I Processes of formation of Mineral deposit 15 marks
Unit-II  Mineral Exploration  15 marks
Unit-III  Mineral Resources (metallic)  15 marks
Unit-IV  Mineral Resources (Non-Metallic)  15 marks
Unit-V  Hydrology  15 marks

PAPER – VI (PRACTICAL)

1. Structural Geology  20 marks
2. Palaeontology  08 marks
3. Identification of Ore and Industrial minerals  08 marks
4. Field Report  08 marks
5. Lab. Record  03 marks
6. Viva  03 marks.

SECOND YEAR EXAMINATION

PAPER – I

UNIT-I General Geology)

Scope and sub-division of Geology, Age and origin of the earth, earth quakes and volcanic.

Unit-II (Geomorphology)

Process of weathering and erosion geomorphic agents, Geological action of rung water, wind and glacier.

Unit-III (Mineralogy)

Unit-IV (Crystallography)
Crystalline and non-crystalline substances, crystallographic axes, symmetry elements, parameters. Indices, symbols. Classification of crystals, Study of normal class of seven systems.

Unit-V (Optical Mineralogy)

Paper – II

Unit-I (Igneous Petrology)
Form, Texture, structure and Classification of Igneous rocks concept of magma.

Unit-II (Sedimentary Petrology)
Sediments and sedimentary rocks, Texture, structure and classification of sedimentary rocks.

Unit-III (Metamorphic rocks)
Metamorphism, Agents and types of metamorphism. Texture and structure of metamorphic rocks.
Unit-IV (Petrography of rocks)
Igneous, sedimentary and metamorphic rocks of the following: Gram log, Pegmatite, syenite, Basalt, Dolerite, Gaboro, Conglomerate, C. Brenan, Sand Stone, Lime stone, Gneiss, Slate, Marbles, Quartzite., Schist.

Unit-V (Structural Geology)
Attitude of beds – Strike and dip. Concepts of structural Geology, Foliation, its relation with major structure.

PAPER – III (PRACTICAL)
Crystallography – Study and identification of crystal models of normal classes of all the systems.
Mineralogy – Megascopic identification of important rock forming minerals.
Petrology – identification of rock specimens megascopically
Optics – Study of the optical characters of thin sections.
Field – Report
Lab-Record and Viva.

FINAL YEAR EXAMINATION
PAPER – IV
UNIT-I (Stratigraphy)
Principles of stratigraphy, standard stratigraphic time scale and Indian equivalence stratigraphic correlation, Physiographic and tonic divisions of India.

Unit-II (Pre & Post Cambrian Stratigraphy)
Archean formations of India (Karnataka, Rajasthan, Bihar and Orissa) Type area of Cuddapah and Vindhyana, Gondawana formation of India, Mesozoic formation of
India (Triassic of spite classic of Kutch and Cretaceous to Trichnopolly) Geology of Orissa.

**Unit-III (Structural Geology)**

Geometry and classification of folds, faults and joints, Geological significance of unconformities.

**Unit-IV (Palaeontology)**

Definition of fossils, Fossils and Fossilisation, uses of fossils morphologic study of folllering fossils, Murex, Conus Pecten turritela products, Gangamopteris, Terebratula Nautilus Glossopteris, Ptilophyllum.

**Unit-V (Engineering Geology)**

Scope of engineering geology, Geology of reservoir and dams, Building stones and road materials, Soil erosion and conservation.

**Paper – V**

**Unit-I (Processes of formation of Mineral deposits)**

Concepts of ore, Tenor, Grade, Gangue, processes of formation of mineral deposits, Magmatic concentration, hydrothermal deposits oxidation and supergene sulphide enrichment.

**Unit-II (Mineral Exploration)**

Principles of mineral exploration, Geological and Geophysical prospecting of minerals deposits, Assaying and concepts of mining.

**Unit-III (Mineral resources (Metallic))**

Mode of occurrence, genesis, uses and Indian distribution of following mineral deposits:

- Iron, Manganese, Chromium, Aluminium, lead and Zinc.

**Unit-IV (Mineral resources (Non-metallic))**
Raw materials for Cement and refractory Industries and their Indian distribution, coal and petroleum.

**Unit-V Hydrology**

Hydrologic cycle, Hydrological properties of rocks such as porosity, Permeability, vertical zonation of ground water, Aquitard Aquiclude and Aquifer, Types of Aquifer, Ground water provinces of India.

**PAPER – VI (PRACTICAL)**

2. Palaeontology : Study , Identification, drawing, labelling of the following fossils as listed in theory.
4. Field Report
5. Lab. Record and Viva.

**BOOKS RECOMMENDED (PASS)**

1. Introduction to Physical Geology – A. K. Dutta
3. Rutley’s Element of Mineralogy – Thomas Murby
4. Microscopic Identification of Minerals – Henrich
6. Principles of Petrology - G. W. Tyrrell
7. Text of Book of Geology :- S. Ray
8. Invertebrate Palaeontology – H. Woods.
9. Geology of India and Burma – M. S. Krishnan
10. Structural Geology – M. P. Billings
13. Introduction to India’s Economic Geology: N. L. Sharma and V. K. S. Ram
16. Structural and field Geology: Grikle (Oliver & Boyd).
17. Geology of India – A. K. dey, NBT, New Delhi
20. A key to common rock forming minerals.
25. Bharataa Stariya Shila – M. D. Sahu
26. Akruti Bhu Bigyana- B. Dash
32. Introduction to Geophysical prospecting – Dobrin.
33. Physical Geology – Burchfiel et al
34. Geology for Engineers – Trefthrn.

GEOLOGY HONOURS

FIRST YEAR EXAMINATIONS

At the end of first year, there shall be two theory papers carrying 100 marks each. The duration of examination of theory is 3 hours.

THEORY PAPER – I (100 MARKS)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Subject</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-I</td>
<td>General Geology</td>
<td>20</td>
</tr>
<tr>
<td>Unit-II</td>
<td>Geomorphology</td>
<td>20</td>
</tr>
<tr>
<td>Unit-III</td>
<td>Marine Geology</td>
<td>20</td>
</tr>
<tr>
<td>Unit-IV</td>
<td>Geotectonic (A)</td>
<td>20</td>
</tr>
<tr>
<td>Unit-V</td>
<td>Geotectonic (B)</td>
<td>20</td>
</tr>
</tbody>
</table>

Paper – II (Theory) 100 marks

| Unit-I | Crystallography              | 20    |
| Unit-II| Mineralogy                   | 20    |
| Unit-III| Optical Mineralogy          | 20    |
| Unit-IV| Structural Geology (A)      | 20    |
| Unit-V | Structural Geology (B)      | 20    |

SECOND YEAR EXAMINATION
At the end of 2\textsuperscript{nd} year, there will be two theory papers carrying 100 marks each and one practical paper carrying 100 marks. The duration of the theory examination is 3 hours and the practical is 6 hours.

The Practical paper includes a field Training programme of one week to be conducted under the supervision of the teacher. The students have to bear all expenses.

**Paper – III (Theory)**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-I</td>
<td>Igneous Petrology (A)</td>
<td>20</td>
</tr>
<tr>
<td>Unit-II</td>
<td>Igneous Petrology (B)</td>
<td>20</td>
</tr>
<tr>
<td>Unit-III</td>
<td>Sedimentary Petrology</td>
<td>20</td>
</tr>
<tr>
<td>Unit-IV</td>
<td>Metamorphic Petrology</td>
<td>20</td>
</tr>
<tr>
<td>Unit-V</td>
<td>Petrography of Rocks</td>
<td>20</td>
</tr>
</tbody>
</table>

**Paper – IV (Theory) 100 marks**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-I</td>
<td>Stratigraphy (A)</td>
<td>20</td>
</tr>
<tr>
<td>Unit-II</td>
<td>Stratigraphy (B)</td>
<td>20</td>
</tr>
<tr>
<td>Unit-III</td>
<td>Quaternary Geology</td>
<td>20</td>
</tr>
<tr>
<td>Unit-IV</td>
<td>Palaeontology (A)</td>
<td>20</td>
</tr>
<tr>
<td>Unit-V</td>
<td>Palaeontology (B)</td>
<td>20</td>
</tr>
</tbody>
</table>

**PAPER – V (PRACTICAL)**

1. Crystallography 09 marks
2. Megascopich Identification of Minerals 08 marks
3. Megascopich Identification of Rocks 09 marks
4. Microscopich Identification of Minerals 08 marks
5. Microscopich Identification of Rocks 12 marks
6. Topographic Maps 04 marks
7. Structural Map Study 20 marks
8. Palaeontology 10 marks
9. Practical Record 04 marks
10. Field Report & Viva-voce 16 marks

**FINAL YEAR EXAMINATION**

At the end of third year, there shall be two theory papers carrying 100 marks and one practical paper carrying 100 marks. The duration of examination of theory and practical papers shall be three and six hours respectively.

There shall be a field tour programme. This includes visit to Miner and mineral based industries, which is compulsory.

**Paper – VI (Theory) 100 marks**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-I</td>
<td>Origin of Ores</td>
<td>20</td>
</tr>
<tr>
<td>Unit-II</td>
<td>Mineral Resources of India (A)</td>
<td>20</td>
</tr>
<tr>
<td>Unit-III</td>
<td>Mineral resources of India (B)</td>
<td>20</td>
</tr>
<tr>
<td>Unit –IV</td>
<td>Geology and Mineral resources of Orissa</td>
<td>20</td>
</tr>
<tr>
<td>Unit-V</td>
<td>Prospecting of Minerals</td>
<td>20</td>
</tr>
</tbody>
</table>

**PAPER – VII (THEORY) 100 MARKS**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit-I</td>
<td>Hydro geology</td>
<td>20</td>
</tr>
<tr>
<td>Unit-II</td>
<td>Engineering Geology</td>
<td>20</td>
</tr>
<tr>
<td>Unit-III</td>
<td>Mining and Surveying</td>
<td>20</td>
</tr>
<tr>
<td>Unit-IV</td>
<td>Environmental Geology</td>
<td>20</td>
</tr>
<tr>
<td>Unit-V</td>
<td>Phyto Geology and Remote Sensing</td>
<td>20</td>
</tr>
</tbody>
</table>
PAPER – VIII (PRACTICAL) 100 marks

1. Identification of industrial one minerals, one Reserve Calculation, 20 marks
2. Engineering Geology Maps 15 marks
3. Ground Water 10 marks
4. Phyto Geology 10 marks
5. Surveying 10 marks
6. Field Report 20 marks
7. Viva and Lab. Records 15 marks

FIRST YEAR EXAMINATION

PAPER – I (100 MARKS)

Unit-I General Geology (20 marks)
Scope and subdivisions of Geology, Earth as a Planet, origin, interior and age of the earth, Earthquake, Volcanoes.

Unit-II (Geomorphology) (20 marks)
Weathering and erosional, Geomorphic cycle, Geological action river, wind, Glacier and ground water.

Unit-III (Marine Geology) (20 marks)
Relief of the Ocean floor, Marine sediments and their classification, Mineral resources of the sea-bed, men and the ocean.

Unit-IV (Geotectionics – A) (20 marks)
Concept of Plate-tectonics, Continental drift sea-floor spreading, mid-Oceanic ridge, Island are Deep-sea trenches.
Unit-V (Geotectonics – B) (20 marks)
Orogeny and epieorgogeny, Isostosy, Geosynclines, Tectonic design and evolution of Himalayas.

PAPER – II (THEORY) (100 MARKS)

UNIT-I (CRYSTALLOGRAPHY)
Introduction, crystalline and non-crystalline substances. Crystallographic axis, symmetry elements, parameter and inclines, crystallographic axes, symmetry elements and forms present in different axis systems. Twinning and stereographic projection.

Unit-II (Mineralogy) (20 marks)
Physical properties of minerals, silicate structure, physical, chemical, optical properties and occurrence silica, feldspar pyroxene, Amphibole, mica, Garnet Olivine and group of minerals, Tale, calcite, gypsum, fluorite, Apatite, Beryl, Kyanite Barite, Topaz, corundum, sillimanite.

Unit-III (Optical Mineralogy) (20 marks)
Nature of light and their propagation, Polarization, Double refraction and Nicol Frisum, Isotropism, Plochoism interference colour, extionction and extinction angle, Behaviour of light in mineral section, Petro logical Miroscople and their function.

Unit-IV (Structural Geology – A) (20 marks)
Dip and strike, concept of stress and strain, primary structures top and bottom criteria, unconformity, types, recognition in the field and signification.
Unit-V (Structural Geology (B) (20 marks)

Geometry and classification of fold, fault and joints and their recognition in the field, Foliation lineation types.

SECOND YEAR EXAMINATION
PAPER –III (THEORY) 100 MARKS

Unit-I (Igneous Petrology (A) (20 marks)

Concept of Magmas, Crystallisation behaviour of Unicomponent and Bio-component Magma (Solid solution Eutectic and incongruent melting Bowen’s reaction principle, Differentiation assimilation.

Unit-II (Igneous Petrology (B) (20 marks)

Forms, texture, structure, classification of igneous rocks.

Unit-III (Sedimentary Rocks) (20 marks)

Texture structure and classification of sedimentary rocks, Heavy minerals analysis and their significance, Concept of sedimentary environment.

Unit-IV (Metamorphic Rocks) (20 marks)

Agents and kinds of metamorphism, Texture and structure of metamorphic rocks. Zone, Grade and facies of Metamorphic Rocks Classification of Metamorphic Rocks metasomatism.

Unit-V (Petrography) 20 marks
Granite. Pegmatite, Syentie, Basalt, Dolerite, Gabbros Dunite, Periodtite, Anorthosite conglomerate Breccias, Sandstone, Limestone, Slate, schist, gneiss, Marble, Quartzite, Charnolite, khondulite.

**Paper – IV (Theory) 100 marks**

**Unit – I Stratigraphy (A) (20 marks)**

Principles of stratigraphy, standard stratigraphic time-scale, code of stratigraphy classification and nomenclature, stratigraphic correlation, physiographic and tectonic divisions of India.

**Unit- II (Stratigraphy (B) 20 marks)**

Dharwar super-group, Eastenghat Super Group, iron-ore group. Gangapur, Cuddapah, Vindhyan super Group, Gordwana Super group, Decal traps, Triassic of spiti, Jurassic of Kutch, Cretaceous of Trichinopoly.

**Unit-III (Quaternary Geology) 20 marks**

Sea level and climatic changes during quaternary period. Quaternary deposits and sea level changes.

**Unit-IV ( Palaeontology (A))**

Fossils and their mode of preservation, Geological significance of fossils, Introduction to Palaeobotany and study of fossils, Gondwana flora and their characteristics, Foraminifera and their importance.

**Unit-V ( Palaeontology (B) 20 marks)**

Morphology and Geological history of Brachiopoda Pelecypoda Cephalopoda, Gastopoda, Trilobites, Corals.

**PAPER – V (PRACTICAL ) 100 MARKS**

1) Crystallography 09 marks
(Models and projection as in the Theory)

II) Megascopic Identification of Minerals 08 marks

III) Megascopic Identification of Rocks 09 marks

IV) Microscopic identification of minerals 08 marks

V) Microscopic identification of rocks 12 marks

VI) Topographic Maps 04 marks

VII) Structural Maps and problems 20 marks

VIII) Palaeontology 10 marks

IX) Practical Records 04 marks

X) Field Report and Viva 16 marks.

FINAL YEAR EXAMINATION

PAPER – VI (THEOYR) 100 MARKS

Unit – I Origin of Ores (20 marks)

Ore, tenor and gangue, Process of formation of mineral deposits, Magnetic, Hydro-thermal, sedimentary, Residual and Mechanical concentration, Oxidation and supergene enrichment, Controls of Ore localisation and metalogenic epochs and provinces.

Unit-II ( mineral Resources of India (A) 20 marks

Mode of Occurrence, Mineralogy, Genesis, Uses and Indian distribution of Iron. Manganese, Chromium, aluminium, copper, lead and Zinc.

Unit-III ( Mineral resources of India (B) ) 20 marks
Mode of Occurrence Origin, uses and distribution of coal and petroleum, radioactive minerals, graphite and Kyanite.

**Unit-IV (Geology and Mineral Resources of Orissa) 20 marks**

Geomorphology, stratigraphy, structure and economic mineral resources of Orissa.

**Unit-V (Prospecting of Minerals) 20 marks**

Geological, Geophysical and Geochemical Prospecting.

**PAPER – VII (100 MARKS)**

**Unit – I (Hydrogeology) 20 marks**

Hydrological cycle, Porosity, permeability, Darcy’s Law Vertical Zonation of ground water, Aquifer, aquifer, aquitard, Aquifuse, Aquiclude. Types of Aquifer of ground water, Ground water provinces of India with particular reference to Orissa.

**Unit-II (Engineering Geology) 20 marks**

Scope of Engineering Geology, Engineering properties of rocks and soil, Building stones and Road materials, Geology of dam, reservoir Bridge. Tunnels Land slides and their causes of prevention.

**Unit-III (Mining and Surveying) 20 marks**

Introduction, elementary idea about Mining Chain and compass and plain table surveying.

**Unit-IV**

Environmental Geology
Waste disposal impact of Mining activities on environment, Natural Hazards (earthquake and Volcanoes) Soil erosion and conservation, Water pollution, Role of Geologists in Environmental planning and management.

Unit-V

Photo Geology and Remote Sensing:
Basic of aerial photography and remote sensing, application of remote sensing in Geo-Science. Elementary idea about Geographic information system and Global positioning system.

PRACTICAL PAPER – VIII (Full Marks – 100)

1. Identification of Industrial and ore Mineral, Ore Reserve Calculation 20 marks
2. Engineering Geology Maps 15 marks
3. Ground Water Problems 10 marks
4. Photogeology 10 marks
5. Surveying 10 marks
6. Field Training 20 marks
7. Via and Lab. Record 15 marks

BOOKS RECOMMENDED (HONOURS)

1. Principles of Physical Geology – A. Holmes
2. Introduction to Physical Geology – A. K. Dutta
4. Text Book of Geology – P. K. Mukherjee
5. Rut Iye’s Element of Mineralogy –
6. Dana’s Text Book of Geology – Ford
7. Mineralogy – Berry and Mason
8. Optical Mineralogy- P. F. Kerr


10. An introduction of Crystallography – F C Phillips

11. Microscopic Identification of Minerals – Henrich


14. Text Book of Geology – S. Ray,

15. Igneous and Metamorphic Petrology – Turner and Verhoogen.


17. Metamorphism – Harker.

18. Metamorphism Petrology – B. Bhaskar Rao


23. Introduction to Geology of India & Burma – M. S. Krishnan.

24. Geology of India – D. N. Wadia

25. Structural Geology – M. P. Billings

26. Elements of Structural Geology – E. S. Hills

27. Photogeology – Miller & Miller

28. Structural and Field Geology – Gickle (Oliver and Boyd)

29. Field Geology – Lahee (McGraw Hill)


32. Introduction to India’s Economic Minerals – N. L. Sharma and VKS. Ram.
33. Economic Mineral Deposits – A. M. Bateman
35. Petroleum Geology – Levorsen
37. Course in Mining Geology – R. N. P. Arogyaswamy,
38. Mineral Economics – Sinha and Sharma
44. Remote Sensing – Sabins
45. Introduction to Microfossils – D. J. Jones.
47. Principles of Geochemistry – Masson and Moore.
48. Introduction to Geochemistry – K. B. Kruskopt
49. Introduction to Geophysics – Hawel
50. Ground Water – H. M. Raghunath
51. Geotechnology – Roberts.
52. Khanija Bigyan – M. N. Satapathy
53. Soils – An Introduction to Soils and Plant Growth – Donshue Miller and Shickluna (Prentice Hall)
54. Basic problems in Geotechnics – V. V. Beloussov.
57. Fundamental of Soil Science – Miller and Turk
59. Essentials of Crystallography – Flint
60. A Course of Mineralogy – Betcktin.
61. Economic Mineral Deposits – Jensen and Bateman
62. Morphological and Optical Crystallography – S. Ray,
64. Minerals of India – Meher Wadia.
65. Coal and Cola Field of India – N. L. Sharma
66. Historical Geology – Dunbar
67. Study of rocks in their sections – Moorhouse.
68. Interpretation of Topographic and Geology maps – Dake and Brown.
69. Sequence in layered rocks – Shrock
70. Mining and mineral deposits – Shevyakor
71. Geology and Engineering – Lagget
73. Examination and valuation of Mineral property – parks
74. The blue Planet – a introduction to Earth System Science S. Kinner, Porter ane Botkin.
75. Environmental Geology – K. S. Valdiya
76. Ore Deposits – Park (Jr.) and Mc. Diarmid.
77. Elements of Geological Map Reading and interpretation with exercise – Bhattacharya and Begchi.
79. Optical Mineralogy – A. N. Winchell
80. Procedures in sedimentary Petrology – R. E Carver
81. Ore Deposits – Smirnov.
82. Treatise on Indian Minerals – R. K. Sinta
83. Geochemistry in Mineral Exploration – Hawakes and Webb.
84. Statigraphy and sedimentation – Krumberin and Sloss.
85. Submarine Geology – She phased.
87. Akruti Bhu- Bigyana – B. Dash
88. Pakruti Bhu Tatya – R. P. Mohanty
89. Bharators Stariya Shila – M. D. Sahu
90. Pratnajiba Bigyan – B. P. Patro
91. Bharatara Park Kembriya Shila – B. Dash
92. Khanija Sampada – J. K. Das

PHYSICS (GENERAL)
SECOND YEAR EXAMINATION
(At the end of second year)
There shall be two theory papers each carrying 75 marks. The duration of each paper is 3 hours. There shall be a practical paper (Paper – III) of 50 marks and 3 hours duration. An examinee shall have perform one experiment during 3 hours in the second examination.

FINAL YEAR EXAMINATION

(At the end of Third year)

There shall be two theory papers each carrying 75 marks. The duration of each paper is 3 hours. There shall be a practical paper (Paper – VI) of 50 marks and 3 hours duration. An examinee shall have perform one experiment during 3 hours in the Third Year examination.

PHYSICS (GENERAL)

SECOND YEAR EXAMINATION

Paper – 1

Unit-I Vector Algebra

Vector triple product, differentiation of vectors, gradient, divergence and curl operators, application of del operator, Gauss divergence theorem and stoke’s theorem.

Unit-II (Classical Mechanics)

Inverse square law of gravitation, Kepler’s Laws, Gravitational potential due to a spherical shell and solid sphere, Gauss and Poisson’s equations for gravitational self energy.

Moment of inertia of solid sphere, cylinder and cone, theorem of parallel and perpendicular axis in two dimensions, compound and kater’s pendulum.

Unit-III (Properties matter)
Elastic constants and their relations, torsion of a right circular cylinder, bending moment and single cantilever, viscous motion and poiseulle’s equation, surface tension, pressure difference across a curved surface, Quinck’s method of determination of surface tension.

**Unit-IV (Wave and oscillations)**

Composition of shm, Lissajous figures, Free, damped and forced vibration, resonance, torsional pendulum.

Equation of waves and its solution velocity of elastic and transverse waves stationary waves, ripples and gravity waves.

**Unit-V (Relativity)**

Michelson – Morley experiment, Postulates of special theory of relativity. Lorentz transformation, length contraction and time dilation, relativistic addition of velocities, velocity dependence of mass and mass energy relation.

**PAPER – II**

**Unit-I (Kinetic Theory of matter)**

Law of equipartition of energy, Specific heat of mono, di and poly atomic gasses mean free path Clausius’s derivation for mean free path, transport phenomenon (Conduction, viscosity and diffusion), Brownian motion (Einstein’s method) Real Gas, Vander Waal’s equation of state, critical constants, reduced equation of state.

**Unit-II (Thermodynamics)**

Zeroth law, first law and internal energy, Isothermal, adiabatic, isobaric, isochoric processes, second law of thermodynamics, reversible and irreversible processes,
absolute scale of temperature, Carnot’s cycle, Carnot’s theorem, Entropy, characteristics of entropy (T-S diagram), change of entropy for reversible & irreversible process, Nernst theorem, third law of thermodynamics.

**Unit-III (Thermodynamics)**

Enthalpy, Helmholtz’s and Gibb’s function, Maxwell’s relation and application, Causley’s Clapoyron equation and its application, Joule – Thomson effect.

**Unit-IV (Thermal conductivity and radiation)**


Thermal radiation, Kirchhoff’s law of radiation, pressure of radiation & pressure of diffused radiation, Stefan’s law & Wien’s – displacement law, Rayleigh-Jean’s & Planck’s law of radiation.

**Unit-V (Statistical mechanics)**

Phase space, ensemble (micro canonical and grand canonical ensemble), use of ensemble, postulate of equal a prior probability, most probable distribution, relation between thermo dynamical probability and entropy, Maxwell’s law of distribution $V_{mp}$, $V_{Rms}$, $V_{av}$) equipartition of energy, Relation between partition functions & thermo dynamical probability.

**Paper – III (Practical)**

( 50 marks)

1. Young’s modulus of a wire by Searle’s method.
2. Surface tension of a liquid (by capillary rise method).
3. “g” by bar pendulum with movable knife edge.
4. Rigidity modulus by static method.
5. Specific heat of liquid with radiation correction.
6. Poisson’s ratio of rubber.
7. Specific heat of liquids by the method of cooling.
8. Velocity of sound by resonance tube method (avoiding and correction).
9. Frequency of a tuning fork by sonometer
10. Rigidity modulus of wire by dynamic method.
11. Viscosity by capillary flow method.
12. Determination of ‘J’ by Joule’s Calorimeter applying radiation correction.
13. Weight Thermometer
15. Latent heat of ice/steam applying radiation correction.
16. Meld’s Experiment.
18. Surface tension by Meigh drop method.

FINAL YEAR EXAMINATION
PAPER – IV
**Unit-I (Geometrical optics)**

Fermat’s principle, principle of extreme path, cardinal points of coaxial systems of thick and thin lenses, chromatic and spherical aberration. Ramden’s and Huygens’s eye pieces.

**Unit-III (Physical optics)**

Interference of light, bi-prism, Lloyd’s single mirror, division of wave front and division of amplitude, Newton’s ring, Michelson’s interferometer and its application:

**Unit-III (Diffraction of light)**

Fraunhoffer and Fresnel’s diffraction, zone plate, diffraction by single and double slits. Grating and its dispersive power, resolving power of Telescope & microscope.

**Unit-IV (Polarisation)**

Basic ideas of polarisation, Nicol prism, Brewster’s law, quarter wave plate, half wave plate, production and detection of place, circularly and elliptically polarised light, elementary ideas of laser, population inversion, He, Ne LASER.

**Unit-V (Atomic, Molecules and nuclear Physics)**

Bohr’s model of the atom, stationary states, energy levels, spectra of Hydrogen like atom, Bohr’s correspondence principles, Zeeman effect, Raman effect, Rutherford scattering, General concept of nuclear force, Beta-decay (Qualitative) Alpha-decay (Qualitative) Geiger-Nuttal law.

Diffraction of X-rays by crystal lattice, characteristics, Continuous spectrum and Mosley’s law.

**PAPER – V**

**Unit-I (Electricity and magnetism)**
Electrostatic field and potential, Gauss theorem and its application (spherical) shell, charged sheet charged conductor parallel plate condenser.

Dielectrics, parallel plate capacitor with dielectric, polarization, polarization vector, and displacement vector electric susceptibility, relation between $\chi_e$ and $K$, cylindrical condensers, energy per unit volume.

**Unit-II**

Kirchhoff’s law and Multi loop circuits, growth and decay of current in LR and CR circuit, Amper’s law, Faradays and Lenz’s law, self induction of a single coil, mutual induction of two coils.

**Unit-III**

Ballistic galvanometer, A. C. In LCR circuit using J-operator, impedance, power factor, wattles current, resonance electromagnetic wave and Maxwell’s equations.

**Unit-IV (Electronics)**

P-N junction, characteristics Full wave bridge rectifier, filters (L,π, T, filter)

Transistor characteristics, transistor equivalent circuit, Transistor amplifier (common emitter amplifier, R-C coupled amplifier, f3eed back theory, types of feedback, criterion for sustained oscillation, Hartley – Colpitt oscillator, Modulation (AM & FM) and demodulation.

**Unit- V (Quantum mechanics)**

Inadequacy of classical mechanics, two slits Experiment, gamma ray microscope uncertainty principle, de-Broglie wave for free electron, Davison-Germar experiment
Compton scattering, Schrodinger’s equation, probability interpretation, solution of Schrödinger’s equation for one dimensional barrier problem.

**PAPER – VI (PRACTICAL)**

**( 3 hours ) Full Marks – 50**

1. Angle and minimum deviation of prism by spectrometer
2. I Vs D curve by spectrometer.
3. Newton’s Ring
4. Galvanometer resistance by Kelvin’s method
5. Specific resistance of a conductor by Post Office box using moving coil galvanometer.
7. Absolute determination of M. And H by oscillation magnetometer.
9. Refractive index of a liquid by liquid lens method (plane mirror Convex lens and liquid)
10. Focal length of spherical mirrors by Kohiraushe’s method.
11. Magnifying power of a microscope.
12. Magnifying power of a telescope.
14. Comparison of capacities by Desauty’s method
15. Figure of merit of galvanometer.
17. Measurement of high resistance.
18. Variation of Magnetic field along the axis of curricular coil.
BOOKS RECOMMENDED

2. Properties of Matter – Neumann Searle
3. Heat and Thermodynamics by Zremansky.
6. Optics by Jenkin and white
7. Electronics made simple by Jacobuwitz
8. Introduction to Quantum Mechanics by Strauss.
11. Physics Vol I and II
12. Introduction to Statistical Mechanics (Macmillan) by B. B. Laud.

PHYSICS (HONOURS)

FIRST YEAR EXAMINATION

(at the end of First Year)
There shall be two theory papers each carrying 100 marks and each of 3 hours duration.

SECOND YEAR EXAMINATION
(At the end of second year examination)
There shall be two theory papers each carrying 100 marks and each of 3 hours duration. There shall be a practical paper (Paper – V) of 100 marks and 6 hours duration. An Examinee shall have to perform one experiment during 6 hours duration in the second year examination.

THIRD YEAR EXAMINATION
(At the end of third year examination)
There shall be two theory papers each carrying 100 marks and each of 3 hours duration. There shall be a practical paper (Paper – VIII) of 100 marks and 6 hours duration. An Examinee shall have to perform one experiment during 6 hours duration in the third year examination.

FIRST YEAR EXAMINATION
PAPER – I (100 marks)
Unit – I Mechanics

Mechanics of particle and system of particles using vector methods, D. Alembert’s, principle and Lagrange’s equipment. First Integrals of motions, Conservation theorems and symmetry properties, calculus of variation.

Unit-II
Two body central forms problem, equivalent one body problem, Equivalent one dimensional problems and classification of orbits for integrable power law potentials, Kepler’s Law, scattering in a central forced field, virial theorem.

Rotation of rigid bodies about an axis, equation in Newtonian form only, compound and Katter’s pendulums. Theorem of parallel and perpendicular axes, moment of inertia of cylinder, sphere and cone.

**Unit-III (Properties of Matters)**

Gravitational field and potential due to spherical shell and a solid sphere.

Electricity – Relations among elastic constants bending of beams torsion of right circular cylinder vibrations of a loaded spring and beams.

**Unit-IV**

Surface tension and surface energy effect of temperature, pressure difference across a curve surface, shape of a large drop, quick’s method, Gravity waves, capillary wave and ripples. Fluid motion, Bernoulli’s theorem, critical velocity, venturimeter, viscosity of liquids and gases (Rankin’s method) poiseuilles equation, Stake’s theorem, Searle’s viscometer.

**Unit-V (Sound)**

Free, damped and forced vibration, resonance.

Velocity of longitudinal waves in an elastic medium, super-position of waves, combination notes and beats, stationary waves, vibration of strings, Fourier analysis, theory of struck, plucked and bowed strings.

Ultrasonic production and application.

**PAPER – II (100 MARKS)**
Thermal Physics

Heat and Thermodynamics

Postulates of kinetic theory of gases, calculation of pressure, Vander Waals equations, critical phenomena, triple point, reduced equation of state, mean free path, Brownian motion, calculation of specific heat, thermal conductivity and viscosity of gases, Maxwell law of distribution of velocities.

Unit-II

Thermal conductivity of slides, liquids and gases, differential equation for heat flow.

Kirchhoff’s and Stefan’s law’s radiation – Weins Rayleigh Jean’s and Planck’s laws Planck’s quantum theory, Einstein and Debye’s theories of specific heats of solids and experimental verification.

Unit – III

Laws of thermodynamics, heat engines, Carnot’s cycle absolute scale of temperature, isothermal, adiabatic and isobaric processes, work done, internal energy, enthalpy, entropy Helmholtz and Gibb’s functions, thermo-electricity, thermodynamics of thermocouple.

Unit-IV

Maxwell’s equations and their application, Claudius – Clapeyron’s equations vapour pressure, Joule – Kelvin effect, kiquifaction of gases, low temperature thermometry, adiabatic demagnetization, Nernst’s heat theorem, third law of thermodynamics.

Unit-V (Statistical Physics)
Postulates of classical statistical mechanics, liouville’s theorem, statistical ensembles, micro-economical ensemble, relation between entropy and thermodynamic probability derivation of distribution functions, equipartition theorem, specific heat of hydrogen, ortho-para-hydrogen  (Qualitative ideas only) classical ideas gas, entropy expressions, Gibbs paradox.

SECOND YEAR EXAMINATION ‘

PAPER – III

OPTICS

Unit-I

Fermat’s principle, principle of extremum path, thick lens, cardinal points of a coaxial optical system: thick lens and lens, combination, spherical aberration, chromatic aberration, condition for schromatism. Huygens and Rams den’s eye piece.

Unit-II

Interference of light waves, conditions of interference, intensity distribution for fringe bi-prism, bi-mirror, fringes of equal inclination and equal thickness in thin films, phase changes on reflection, Newton’s ring, intensity and sharpness of fringing by transmitted light, Brewster’s fringe, Michelson’s interferometer Fabry perot interferometer, etalon.

Unit-III

Rectilinear propagation of light, Fresnel and Fraunhoffer diffraction, Half period zones, zone plate, single, slit double slit plane diffraction grating concave grating and its Rowland mounting, resolving power of plane grating, telescope and microscope.

Unit-IV
Polarization of light by reflection and double refraction, Brewster’s law, Nichol’s prism, production of plane polarized light, Huygens’s construction of wave fronts in uniaxial crystal, wave velocity and ray velocity, ordinary and extraordinary rays, circularly and elliptically polarised light, methods of production, detection and analysis of circularly and elliptically polarized light, Babinet’s compensator, principle of sacharimetry, Laser, coherence length and coherence time, spatial coherence of a source, Einstein’s AB coefficient. Ruby laser.

**Unit-V (Special theory of relativity)**

Michelson and Morley experiment, postulates of special theory, Lorentz transformation, Simultaneity and order of vents, Lorentz contraction and time dilation, relativistic addition of velocities, velocity dependence of mass, mass-energy relation, relativistic Doppler effect, transformation of energy and momentum, four vectors and minkowaki space.

**PAPER – IV (100 MARKS)**

**MATHEMATICAL PHYSICS**

**Unit-I**

Vector Algebra, scalar and vector products, polar and axial vectors, differentiation of vectors, gradient, divergence and curl, Gauss. Stake’s and Green’s theorem.

**Unit-II**

Orthogonal co-ordinates, expressions for grad, curl, div and \( V^2 \) is Cartesian, Spherical and cylindrical co-ordinates, matrix, diagonalisation Eigen values and Eigen functions, caleyhamiltoniss theorem.

**Unit-III**
Complex variable: limit, continuity, analytic function and Cauchy-picmann conditions, Cauchy’s theorem, Cauchy integral formula, Taylor and Laurent series, residue theorem and applications for evaluation of contour integrals.

Unit-IV

Series solution of linear second order differential equation for harmonic oscillator, Legendre, Bissell, Hermit and Lagurre polynomials, generating function and orthogonality, recursion relations, Rodrigue’s formula and orthogonality, Associated Legendre and Laguerre polynomials.

Unit-V

Gamma and beta functions, Fourier, series, Fourier and Laplace transforms, properties and applications.

PAPER – V (PRACTICAL)

(100 MARKS)

Experiment relating to:

1. Kater’s Pendulum.
2. ‘y’ by bending of beams.
3. ‘n’ by dynamical method
4. Surface tension of soap solution.
5. Viscosity of Stoke’s method.
6. Determination of frequency of a tuning fork.
7. Calibration of a set of weight.
8. Surface tension by Quincke’s method.
9. Temperature co-efficient of surface tension: Jaeger’s method.
10. Young’s modulus by vibration method.
11. Searle’s viscometer
14. Viscosity of water by poiseuille’s method.
15. Frequency of tuning fork by Meld’s experiment.

FINAL YEAR EXAMINATION
PAPER – VI
ELECTRICITY AND MAGNETISM

UNIT-I

Gauss law, Poisson’s and Laplace’s equations for electric potential, conducting sphere in an electric potential, conducting sphere in an electric field.

Dielectric polarization, dielectric sphere in a uniform field.

Electrostatic energy of a system of charges, uniform sphere ionic crystal nuclei.

Definition and properties of magnetic field, magnetic force between current elements, magnetic induction, vector potential, Ampere’s law, magnetic flux calculation of magnetic induction for circular and solenoidal currents.

UNIT-II

Electromagnetic induction: a conducting rod moving through a uniform magnetic field, a loop moving through a non-uniform magnetic field, a stationary loop with field source moving universal law of induction mutual induction, self-induction energy stored in a magnetic field, transformers: step-up and step-down.

Growth and decay of current in RC and LC circuits alternating currents in RC, LC and RLC circuits reactance, impedance and admittance, wattles current, series and parallel resonant circuits, sharpness of resonance.
Unit-III

Magnetic susceptibility and permeability, elementary theory of dia, para and ferro magnetism hysteresis, permanence magnetic, circuit theory and electric measurement, Kirchhoff’s law and its application to circuit, sensitivity of Whetstone’s bridge, Anderson and Owen’s bridge for self inductance and Maxwell’s bridge for mutual unductance, de sauté’s bridge for capacitance, ballistic galvanometer, search coil.

Unit-IV (Electromagnetic theory)

Maxwell’s equations, displacement current, vector and scalar potentials boundary conditions at interfaces between different media, wave equation, plane wave in dielectric media, Pointing theorem and pointing vector polarization of electromagnetic wave, description of linear, circular and elliptic polarization, reflection and refraction of a plane wave over the boundary of dielectric media.

Unit-V (Electronics)

V-I characteristics of P-N junction, schokley model, application in rectifiers, filters L, π, T, clippers and limiters, Zener diode and its applications.

Transistors characteristics and equivalent circuits, h- parameter.

PAPER – VII (MODERN PHYSICS)

Unit – I

Bohr-Sommer field theory of hydrogen atom, correspondence principle, quantum numbers n, i, m and energy level diagrams, Zeeman effect, Raman effect, Stern Gerlach experiment, Many electron atom, Pauli principle, periodic tabled, Frank-Hertz experiment stark effect.

X-ray spectra: The continuum X-ray spectrum, characteristic X-ray Moseley’s law, doublet fine structure, H-like character of X-ray states, X-ray absorption spectra, absorption edges.

Spectra of diatomic molecules, pure rotation spectra selection rules, vibration rotation spectra selection rules.

QUANTUM MECHANICS

Unit-II

Inadequacy of classical mechanics, Photoelectric effect, Compton scattering, Davisson Germer experiment, matter wave dualism, de broghe wave, wave packets, uncertainty principle.

Postulates of quantum mechanics, operator, expectation values.

Superposition principles, wave (function, Schrodinger’s wave equation and its solution for the one dimensional potential step, rectangular well, harmonic oscillator, infinite potential barrier and rectangular potential barrier.

Unit-III (Solid State Physics)

Elementary ideas of crystal structure, types of lattice, unit cell, reciprocal lattice, crystal diffraction, Bragg’s law and X-ray diffraction,
Unit- IV (Nuclear Physics)

Discovery of nucleus, composition basic properties; charges, mass, size, spin, magnetic moment, electric quadruple moment, binding energy, semi empirical mass formula, liquid drop model, nuclear fission, nuclear fusion, elementary shell model.

Radioactive laws of growth and decay, Gamow’s theory of alpha decay, Fermi’s theory of beta decay (qualitative) nuclear forces, elementary ideas of reaction cross section resonance.

Unit-V

(Cosmic Rays and Elementary Particles Physics)

Discovery of cosmic rays, hard and soft components, discovery of muon, plon, heavy mesons and hyperson.

Working principles of G. M. Counter, could chamber and bubble chamber, principle of linear accelerator, synchrotron,

Classification of elementary particles, fundamental interactions in nature, important quantum numbers symmetry, CPT theorem.

PAPER – VIII (PRACTICAL) FULL MARKS – 100

Experiments Relating to :

1. Setting up of a prism by spectrometer by Schuster’s method and its calibration.
2. Determination of wave length of sodium light by diffraction grating.
3. Bi-prism.
4. Resolving power of telescope
5. Diameter of a narrow wise by optical bench.
7. Resolving power of grating
8. e/m by Braun tube
9. High resistance by leakage.
10. Calibrations of a millimetre
13. Determination of ballistic constant of a galvanometer.
15. Double slit
16. Cauchy’s constants
17. ‘J’ by Joule’s calorimeter with radiation correction.
19. Characteristics of a transistors/triode
20. Study of charging and discharging of a capacitor through resistance.

BOOKS RECOMMENDED;

2. Properties of matter by Newmann and Searle.
3. Acoustics by A. Wood
4. Treatise on Heat, Saba and Srivastava.
5. Heat and Thermodynamics by Zemansky.
9. Geometrical Optics by Drude.
10. Optics by Jenkins and white
11. Foundation of electromagnetic theory by Ritz and Milford.
12. Electricity and Magnetism by Segal, Chopra and Segal.
13. Atomic Physics by J. B. Rajam
14. Quantum Mechanics by Dicke and Wittcke
15. Quantum mechanics by Powel and Craseman.
20. Introduction to solid state physics by C. Kittel.
22. Atomic Physics by Ghosal
23. Modern Physics, Retchneyer, Kennard, Lauritsen, Cooper.
27. W. D. Stanley, Electronic devices, circuits and applications (Prentice Hall)
29. Segre, nucleic and particles.
30. Burcham, Nuclear Physics.
31. Rossi, Cosmic Rays
32. Perkins, High Energy Physics
SECOND YEAR EXAMINATION

PAPER – I (THEORY) FULL MARKS – 75

Unit – I (General Sericulture)

Introduction, scope and History of Sericulture: Silk industry in India: World output of silk: characteristics of sericulture industry its prospects, problems present status and trends of development.

Unit-II (Social Science)

Soil: Types of soil, Physical and chemical properties of soil: Importance of Soil Science in sericulture: Soil for mulberry cultivation, problems of soil and its reclamation:
Soil Pollution Mulberry growth and Nutrition: Nutrients essential for plant (Mulberry) growth.

**Unit-III (Biology of Mulberry)**


**Unit-IV (Biology of silk worm)**

Classification of silk worm on the basis of its origin and moltinism.

Silk worm and its races, distribution, muoltinism and voltinism, life cycle of Bombyx mori.

**Unit-V (Non mulberry silk worms and their host plants)**

Introduction to non-mulberry silk worms and their host plants, life history of non-mulberry silk worms (Tasar, Eri Muga) their habit and habits; Brief account of Tasar (Sp) Eri (Sp) and muga (Sp) food plants, type of cocoon and silk produced by non mulberry silk worms.

**PAPER – II (THEORY) (75 Marks)**

**Unit-I (Mulberry Agronomy and Propagation)**

Agro climate for mulberry, propagation of mulberry, mulberry cultivation practices under irrigated and rainfall conditions, Drainage and its importance, application of Manure Pruning, harvesting of mulberry leaves economics of mulberry cultivation.

**Unit-II (Diseases and Pests of Mulberry)**

Fungal, bacterial, viral, nematodes and deficiency diseases, pests of mulberry, leaf eating insect pests, sap feeder borer pests, pest management and mulberry weeds.
Unit-III (Silk worm rearing technology)

Fearing house, rearing appliance, disinfection, incubation, brushing, chawki rearing, moulting, lateage rearing, different rearing methods, methods of mounting harvesting of Cocoons.

Unit-IV (Diseases and Pests of Silk worm)

Protozoan, bacterial, viral, fungal diseases, posts of silk worms, life cycle of technid fly, dermastid bee ties, ants, prevention and control of predators like lizards, rats, birds.

Unit-V (Non Mulberry silk worms rearing their disease and pests)

Rearing of non mulberry silkworms and their food plants different spoil non mulberry silk worms. Their habit and habitat, type of cocoon and silk produced by them. Protozoan bacterial, viral and fungal diseases, preventive and control; measures, pests and predators of non mulberry silk worms.

PAPER – III (PRACTICAL) FULL MARKS – 50

SECTION – A

Identification – Identification of sericulture products, morphology and anatomy of important mulberry cultivars, identification of common mulberry weeds, morphology of larra, pupa, moth, mouth parts, Cocoon mulberry silkworms, characters of popular uni: bi and multi voltine races, life stages of non mulberry silk worms, their silk and silk products. Identification of diseases by Symptoms, major fungal diseases bacterial and viral diseases of mulberry, mealy bugs, scale insects, thrips, jassids, borers, silkworm embryo identification.
Morphological features of larvae infected by bacterial and virus, microscopic examination of polyhedral inclusion, bodies from the haemolymph, visual examination of larvae pupae and moths infected with fungal diseases. 25 marks.

SECTION – B

Anatomy of important mulberry cultivars: Anatomy of the digestive, reproductive and nervous system of silk worms. Dissection the silk glands, Sex separation of larvae, Pupae and moth.

Soil sampling, Soil analysis for pit. 05 marks

SECTION – C

Microscopic preparation of mouth parts, blood spiracle, staining of per brine spores, staining of bacterial collection and fungal spores. 05 marks

SECTION – D

Field work, field study preparation of nursery beds, estimation of leaf yield and harvesting methods.

Propagation methods, collection of diseased samples of mulberry and their preservation. Type of rearing houses, model rearing house, collection of cocoons.

Students are required to prepare a laboratory note book. 10 marks

SECTION – E

Viva voce on paper I & II 05 marks.

THIRD YEAR EXAMINATION

PAPER – IV (THEORY ) 75 MARKS
Unit-I (Silk Worm Seed Technology)
Silk worm seed, grain age, seed organisation synchronization of emergence, sex separation, pairing, depairing oriposition, mother moth.

Unit-II (Preparation and Processing of Eggs)
Collection of eggs, disinfection of eggs, acid treatment for artificial hatching, cold storage of eggs, preparation of loose eggs and sheet eggs packing of loose eggs.

UNIT-III (Types and processing of Cocoons)
Types of Cocoons and silk produced by non-mulberry and mulberry silk worms; properties of silk (Mulberry and non-mulberry) testing, grading processing of cocoons, stiffing, sorting and preservation.

Unit-IV (Silk Reeling)
Conventional charakha, improved Charakha, Cottage basin, filature basin, multiend silk reeling basin, automatic and semiautomatic reeling machines, qualities of water for silk reeling, vara passage, yarn size (denier). Cocoon feeding, Croisgure, reeling speed to reeling, skein formation, raw silk book making.

Unit – V (Silk Technology)
Raw silk testing and grading, silk throwing and weaving grading of silk fabric, chemical processing of silk fabrics, degumming, bleaching, dyeing and printing of silk, yarns and fabrics.

PAPER – V (THEORY) 75 MARKS
Unit-I (Genetics and breeding of mulberry)
Objectives of mulberry breeding, selection, hybridization, selfing polyploidy breeding, mutation breeding, Genetic variability in mulberry.

**Unit – II Genetics and breeding of silkworms**

Genetics of silk worm, different silkworm races, silkworm, different silkworm, rates, silkworm breeding in India, maintenance of races/strains sex determination.

**Unit-III (Sericulture extension)**

Sericulture extension, organisation at various levels. Cooperative and credit agencies, marketing management for sericulture.

**Unit-IV (Project formulation)**

Project formulation and evaluation, sericulture network, credit technical manpower and management practices, labour management.

**Unit-V (Introduction to Statistics)**

Frequency distribution, graphical representation, Measurement of central tendency. Arithmetic mean, median, mode, measures of dispersion, range, mean deviation, standard deviation with problem.

**PAPER – VI (PRACTICAL) 50 Marks**

**Section – A**

1. Silkworm seed technology and silk technology – Grainage equipment Sex separation by pupal method, mother moth examination, sheet egg and loose egg preparation, acid treatment packing of loose eggs. (10 marks)

2. Types of Textile fibres, single coon reeling, determination of average filament length and denier, reeling machine, Yarn passage, diagram, cooking, reeling and re-reeling silk testing. (10 marks)
SECTION – B

Somatic chromosome preparation from root/shoot/meristem chromosomal preparation of testis for meiosis. (05 marks)

SECTION – C

Analysis of qualitative traito. (Cocoon Weight, shell weight, shell ratio etc) percentage of defective cocoon in a lot. (10 marks)

SECTION – D

One month job training in a sericulture firm. The assessment of field work will be done by the teacher during the two years of study and the students are to prepare a detailed report.

Field Report – Practical record Sessional preparation. (10 marks)

SECTION – E

Viva- Voce 05 marks

ZOOLOGY (GENERAL)

SECOND YEAR EXAMINATION:

There shall be two theory papers (Paper – I & II) carrying 75 marks and one practical paper carrying 50 marks. The duration of examination for each theory paper shall be three hours and for practical examination 3 hours.

<table>
<thead>
<tr>
<th>Paper – I</th>
<th>General Zoology / Animal diversity</th>
<th>75 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper – II</td>
<td>Functional Anatomy of Non-chordate</td>
<td>75 marks</td>
</tr>
<tr>
<td>Paper – III</td>
<td>Practical</td>
<td>50 marks</td>
</tr>
</tbody>
</table>
FINAL YEAR EXAMINATION

There shall be two theory papers (Paper – IV & V) carrying 75 marks and one practical paper carrying 50 marks. The duration of examination for each theory paper shall be three hours and for practical examination 3 hours.

Paper – IV
Functional anatomy of chordate and Human Psychology 75 marks

Paper – V
Cell Biology, Endocrinology, Molecular Biology, Genetic, Evolution and Development Biology 75 marks

Paper – VI
Practical 50 marks

Total 200 marks

PAPER – I

GENERAL ZOOLOGY/ ANIMAL DIVERSITY

Unit-I

Classification of Animal: Non Chordata.

Salient features and classification with examples up to classes of the following phyla.

a) Protozoa
b) Parifera
c) Coeierenterate
d) Platyhelminthes
e) Aschelminthes

Unit-II

Salient features and classification the examples up to class of the following Phyla.

a) Auhelida
b) Arthropod
Unit-III

Classification of animals: Chordata

Salient features, adaptive features and classification with examples up to sub-classes of the following groups.

a) Protochordata
b) Places’
c) Amphibia

d) Echinodermata
PAPER – II

FUNCTIONAL ANATOMY OF NON-CHORDATA

Unit-I
Structure, Locomotion, nutrition and reproduction of the following:

a) Amoeba, Euglena and paramecium.

b) Diagnostic characters, mode of infection and diseases caused by the following parasitic protozoa-Eutamoeba and trypancsoma.

Unit-II

a) Structure, histology, reproduction and development of Sycon.

b) Structure and life cycle of Obelia and Auralia

c) Corals and Coral reef formation.

Unit-III

a) Structural reproduction, life cycle and parasitic adaptation of Fescible, Taenia and Ascaris.

b) Structure, digestive system and reproduction in Nereis.

b) Structure, digestive system Nephridial system and reproductive system in Leech.

Unit-IV

a) Morphology, digestive system V respiration vision and reproduction in Prawn.

b) Life cycle of the following beneficial insects.
   1) Silk moth
   2) Honey bee
   3) Lac Insects

b) Culture of economically important insects.
   1) Silk moth
   2) Honey bee
Unit-V

a) Anatomical features, structures, respiration and reproduction of pila.
b) Anatomical features, Locomotion, mode of feeding reproduction in starfish.
c) Larval forms and their significance of echinodermata.

PAPER –III (PRACTICAL)

A) Dissections.

Dissections importance be given to dissect only preserved animal available in the market for understanding of Anatomu of the animals

Leech : 
   a) Digestive system.
   b) Nephridial system
   c) Reproductive system.

Prawn : 
   a) Digestive system
   b) Nervous system

Pila : 
   a) Digestive system
   b) Nervous system.

B) Mounting

Students shall be required to make permanent microscopic preparation of the following:

Euglena, Paramecium, Spicnle, Hydra, Obelia, parapodium of Neries, Dephnia, Nauplins, Zoca, Megalopa, Appendages and statocyst of prawn, Radula and Osphradium of Pila.

C) Study of the following permanent microscopic slides:

i) T. S. Of Sycon, Hydra, Fasciola, Ascaries, Leech.
ii) Wuchreria Ancylostoma, Enterobius
iii) Histological slides of frogs.

D) Study of museum specimens.

Invertebrate:

  Ophioderma, Ophiothrix, Echinus, Holothuria, Antedon, Cuoumaria

Vertebrate:


Macropus, Manis, Pteropus & Limur.

B) Study of the following Larval forms:

- Miracidium, Sporocyst, Redia, Cercaria, Metacercaria, Hexacanth, Trochophore, Nauplius, cylops, Zoea, Bipinnaria, Auricularia, Ophiopluteus and Echinopluteus.

F) Viva voce

G) Sessional Work and Record.
PAPER – IV

Functional anatomy of chrodata and human Physiology Morphological and anatomical organisation of the types of mentioned.

Unit-I

a) Caphalochrodata -- Amphioxus
b) Urochordata -- Hardmania
c) Hemi chordate -- Balanoglossus
d) Pisces -- Labeo

Unit-II

a) Amphibia -- Rana
b) Reptila -- Calotes/Uromastix
c) Aves -- Columba
d) Mammal -- Rabbit

Unit-III

a) Parental Care-in Amphibia
b) Poisonous and non-poisonous snakes of India
c) Habit, habitat, breeding and distribution of wild animals of Orissa-Crocodile, sea turtle, tiger, Elephant.
d) Wild life conservation.

Unit – IV

Elements of human Physiology with reference to :

a) Digestion and absorption
b) Blood composition and blood coagulation
c) Respiration
d) Mechanism of excretion.
Unit-V
a) General characters of hormones.
b) Structure and function of mammalian endocrine glands.
(Pituitary, Thyroid, gonads)

PAPER – V

Cell biology, Mol, Biology, Genetics, Evolution, Developmental Biology

Unit-I
Cell concept, ultra structure of animal cell, plasma, membrane, mitochondria and Golgi bodies. Frokaniotic and Eukanio tic organisation, cell organelles mitosis and Meiosis.

Unit-II
Molecular structure of DNA and its replication, molecular structure of RNA, Types of RNA and their role in the protein synthesis, Elementary Ideas of Genetic code.

Unit-III
Mendelian sex linked inheritance, linkage, sex determination in drosophila, human genetic disorders (Genetic balance theory klinefetra syndrome).

Unit-IV
Concept and evidence of organic ewvolution, tgheories of organic Evolution Darwinism, Lamarkism and theory (Variation, mutation, recombination, Isolation and natural selection).

Unit-V
Structure of sperm and spermatogenesis, Structure of ovum and Cogenesis. Morphology and biochemistry of fertilization, types and pattern of clearage and gastrulation, outline development of Amphioxus and Frog up to the formation of germinal layers.
PAPER – VI (PRACTICAL)
CHRODATA, CELL BIOLOGY, GENETICS, ENDOCRINOLOGY, DEVELOPMENTAL BIOLOGY AND PHYSIOLOGY

Chordata:

A) Dissection

a) Dissection Importance be given to dissect only preserved animals available in the market for understanding the Anatomy of the animals.

Scolidon, Internal ear, afferent, afferent branchial arteries and Vth, Viith and IXth, Xth cranial nerves.

b) Comparative study of skeletal system of Rana, varanus Columba and rabit.

c) Study of the following permanent slides:

T. S of oral hood, pharyngeal region with gonads, intestine and caudal region of amphioxus

T. S. Of oesophagus, stomach intestine, kidney, thyroid, pancreas, adrenal, testis and ovary of mammal.

d) i) Study of frog development through prepared slide.

ii) Study of whole mount preparation of chick embryo (18, 21, 28, 33, 36, and 42 – 48 hours of development.

e) Chromosome segregation in mitosis and meiosis.

i) Preparation of chromosome squashes from onion root tip of grasshopper testis for the observation of the different stages of mitosis and meiosis.

j) Study of prepared microscopic slides of mitotic and meiotic stages.

f) i) Estimation of Hb concentration in blood of man
ii) Demonstration of activity of salivary amylase on starch.

iii) Capillary circulation in web of frog.

g) Human blood grouping  
h) Viva-voce  
i) Sessional work and record,

**ZOOLOGY (HONOURS)**

**FIRST YEAR EXAMINATION**

There shall be two theory papers (Paper – I & II) carrying 100 marks each. The duration of examinations shall be 3 hours.

- **Paper – I**  
  Principle of Taxinomy and functional Anatomy  
  Of Non-Choradates  
  100 marks

- **Paper – II**  
  Cell Biology and Bio-chemistry  
  100 marks

**SECOND YEAR EXAMINATION**

There shall be two theory papers (Paper – III & IV) and one practical paper (Paper – V) carrying 100 marks each. The duration of examination for each theory papers shall be 3 hours and for practical paper six hours.

- **Paper – III**  
  Classification, Functional anatomy and Comparative study  
  Of Chordates  
  100 marks

- **Paper – IV**  
  Genetics, Evolution and Applied Zoology  
  100 marks

- **Paper – V**  
  Practical, The Examination shall include the courses  
  Of Paper I to IV)  
  100 marks
FINAL YEAR EXAMINATION

There shall be two theory papers (Paper – VI & VII) and one practical paper (Paper-VIII) carrying 100 marks each. The duration of examination for each theory paper shall be 3 hours and for practical paper 6 hours.

Paper – VI  Development Biology and Ethology  100 marks

Paper – VII  Physiology, Endocrinology and Mammalian Reproduction,  100 marks

Paper – VIII  Practical (The Examination shall include practical related with syllabus of Paper – VI and VII)  100 marks

PAPER – I (Honours) (100 marks)

PRINCIPLE OF TAXONOMY AND FUNCTIONAL ANATOMY

OF NON-CHORDATES

Unit-I

1) Importance to taxonomy, kinds of classification, component of classification.
   International code of Zoological nomenclature.

Unit-II

1) Silent features and classification with examples up to classes of the following Phyla:
   Protozoa, Parifera, Coelenterate, Helminthes, Annelids, Arthropoda Mollusca and Echinodermata.

Unit-III

1. Structure, Locomotion, nutrition & reproduction of the following Euglans, Paramacium and Monocysits.

2. Diagnostic characters mode of infection and disease causes by the following Entemoeba, Trypanosoma & Leishmania
3. Origin of Metazoa

4. Structure, histology, canal system, reproduction and development of sycon.


7. Salient features of Ctenophore.

**Unit-IV**

1) Structure, reproduction, life cycle of Fasciola and Taenia, Nemathelmin Ascoris.

2) Structured, reproduction life cycle of Asearlsls.

3) Diagnostic characters, modes of infection & life cycle of Ancylostoma, Enterablius & Wucheria.

4) Structure & reproduction nereis and Leach.

**Unit-V**

1) Structure & reproduction vision of Prawn.

2) Zoological importance of peripatus & Limulus.

3) Structure, respiration & reproduction of pila

4) Torsion in gastropeda.

5) Structure, locomotion, mode of feeding water vascular system and reproduction in starfish

6) Larval forms of echinoderms and their evolutionary significance.
PAPER – II

CELL BIOLOGY AND BIOCHEMISTRY

Unit-I

Cell concept, ultra structure of animal Cell prokaryotic Eukariotic Cell Organisation, cell organelles (Plasma Membrane, Mitochondria, Galgi bodies, Nucleus, Ribosomes and Endoplasmic Reticulum).

Cell cycle, mitosis, meiosis, Ultra structure of chromosomes, Nucleosome concept, Mechanism of DNA.

Unit-II

An elementary idea of Cell transformer characteristics of cancer cell, etiology and its clinical evaluation, elementary idea of humoral and cellular basis of immunity, Role of antigen presenting cell in generation of cellular immune response.

Unit-III

Functional significance and properties of water physical organisation and functional aspects of protoplasm.

Elementary idea of carbohydrate metabolism (glycolysis and Krebs cycle.)

Unit-IV

Structure of protein, amino acids, lipids and carbohydrates.

Classification, action and function affecting enzyme action.

Unit-V

SECOND YEAR EXAMINATION
PAPER – III (100 MARKS)
CLASSIFICATION, FUNCTIONAL ANATOMY AND
COMPARATIVE STUDY OF CHORDATES.

Unit-I

1. Salient features, adaptive features and classification with examples upto sub-classes of the following groups
   a) Protochordata
   b) Agnath
   c) Pisces.

2. Salient features, adaptive features and classification with examples up to orders of the following extent groups.
   a) Amphibia
   b) Septilia
   c) Aves
   d) Mammals

Unit-II

Morphological organisation and anatomical peculiarities of the following:

a) Caphalochordata -- Amphioxus
b) Urochordata -- Herdmania
c) Hemichordata -- Balanoglosus
d) Agnatha -- Petromyzon and Myxine
e) Pisces -- Scolidon & Labeo
f) Amphibia -- Rama
g) Reptilia -- Varanus
h) Aves -- Columba
i) Mammal -- Rabbit

**Unit-III**

a) Physiology and interrelationship of protochordata
b) Affinities of cyclostome
c) Dipnoi, Litimeria and sphenodon as living fossils
d) Biting mechanism of snakes, Plasma Studies of India and extinct reptile (Dinosaurs).

**Unit-IV**

a) Habit, habitat, breeding and distribution of wild animals of Orissa.
   
   Crocodile, sea turtle, elephant.
b) Wild life conservation
c) Flight adaptation of bird.
d) Salient features of prototheria, Matathena and aquatic Mammals.

**Unit-V**

Comparative anatomy of the following vertebrate series:

1) Heart
2) Aortic arches
3) Kidney
4) Brain.
PAPER – IV (100 Marks)

GENETICS, EVOLUTION AND APPLIED ZOOLOGY

Unit – I

a) Mendelian and non-Mendelian inheritance
b) Linkage
c) Sex determination and sex linkage inheritance
d) Multiple alleles and interaction of genes.

Unit-II

a) Chromosomal aberration and types of & Translocation
b) Human Karyotype and nomenclature.
c) Chromosomal disc
d) Applications of Genetic engineering in medicine and agriculture.

Unit-III

a) Theories of organic Evolution (Lamarkism & Darwinism & Synthetic theory).
b) Concept of evidence of organic evaluation.
c) Evolution of man.

Unit-IV

a) Origin of life
b) Evolution of life through different geological era
c) Concept of Species
d) Isolation its role in speciation & in evolution.

Unit-V

a) Silk worms and sericulture
b) Honey bee and apiculture
c) Elementary knowledge of pisciculture
d) Induced breeding.

**PAPER – V (PRACTICAL )**

**(100RKS)**

**A) Dissection.**

Shall be dissection of only preserved specimens available in the market.

- **Leech:**
  - 1) Digestive system
  - 2) Nephridial system
  - 3) Reproductive system

- **Prawn:**
  - 1) Digestive system
  - 2) Nervous system

- **Pila:**
  - 1) Digestive System
  - 2) Nervous system

- **Sepia**
  - 1) Nervous system

**2) Mounting**

**B) Mounting:**

Students shall be required to make permanent microscopic preparation of the following:

- Euglena, Paramecium, Spicules, Hydro, Obella, Parapodium of Neries, Daphnia, Neuplius, Zoea, Megalopa, Appendages and statocyst of prawn. Radhula and Osphradium of Pila.

**C) Study of the following permanent microscopic slides:**

a) T. S. Of Sycon, Hydra, Fasciola, Ascaries, Leech.

b) Wucheria Ancylostoma, Enterobius

c) Histological slides of frog.

**D) Study of museums specimens.**


E) Study of following Larval forms:
Miracidium, Sporecyst, Redia, Cercara, Motacercaria, Hexacanth: Trochophora, Nauplius, Cyclops, Zoa, Glochidum, Bininnaria, Auricularia, Opiopluteus and Echinopluteus and tornaia.

F) Cell Biology biochemistry, genetics, evolution:

a) Use of light microscope

b) Chromosome segregation in mitosis and meiosis.

Preparation of chromosome squashes from onion root tip of grasshopper testis for the observation of the stage of mitosis and meiosis.

G) A) Demonstration for enzyme activity.

B) Qualitative tests for carbohydrates and protein

c) Paper chromatography of amino acids

d) Atomic models of amino acids, fatty acids and nucleotides.
H) Human blood grouping

i) Viva voce

ii) Sessional work and record.

FINAL YEAR EXAMINATION

PAPER – VI (100 MARKS)

DEVELOPMENT BIOLOGY AND ETHOLOGY

Unit-I

a) Aim and scope of developmental biology

b) Ultra structure of sperm and ovum

c) Spermatogenesis and cogogenesis.

d) Fertilization: Morphological and biological events occurring during fertilization

Unit-II

a) Construction of fate maps in amphioxus, frog and chick, types and pattern of cleavage.

b) Balstulation and gastrulation upto formation of three germine layers in amphioxus, frog and chick.

c) Organizer concept induction and nature of inducing substance

d) Mechanisms of differentiation

e) Types placements

f) Regeneration.

Unit-III

a) Concept of animal behaviour and patterns of behaviour

b) Forms of learning, development and mechanism of learning
c) Physiological basis of memory

Unit-IV

a) Parental care in amphibians
b) Migration fishes (Anadromous & catadromous)
c) Migration and navigation in birds.

Unit-V

a) Biological clocks
b) Social organisation in insects (Honeybees and termites)
c) Animal communication

THIRD YEAR EXAMINATION

PAPER – VII (100 MARKS)

Unit-I

ELEMENTS OF MAMMALIAN PHYSIOLOGY WITH REFERENCE TO :

a) Digestion and absorption.
b) Blood composition and mechanism of blood coagulation.
c) Respiration: Types, pigments, transport of respiratory gases by blood and body fluid.
d) Mechanism of Urine formation.

Unit-II

a) Structure of neuron.
b) Mechanism of Nerve conduction and synaptic transmission.
c) Types of muscles and mechanism of muscle contraction.
d) Thermoregulations (Temp. Regulation in poikilotherms) and Homeotherms
   (prototheria and metatheria)
e) Osmoregulation.

Unit-III

a) General characters of hormones.
b) Structure and function of mammalian endocrine glands (Pitutary, thyroid,
   Adrenal, Pancrease and gonads )
c) Insect endocrine glands.

Unit-IV

a) Foctoplacental unit as an endocrine entity.
b) Placental hormones and their regulation.
c) Corpus lutedum and its control
d) Parturition and its regulation.
e) Principles and techniques of fertility regulation in males and females.

Unit-V

a) Principles of bioassay and application: Techniques of RIA ELIS as radio receptor
   assay.
b) Invitrofertilisation , embryo transfer techniques, collection and preservation of
   gametes.
c) Basic principle and applications of light microscope and electron microscope
   (TEM & SEM) Electrophoresis, Chromatography, Colorimeter, PH Meter, Ultracentrifuge.
PAPER – VIII (PRACTICAL)

GROUP ‘A’

COMPARATIVE ANATOMY OF CHORDATA, REPRODUCTION AND DEVELOPMENT.

Dissection:

Shall be dissection of only preserved animals available in the market.

1) Scoliodon:
   a) Digestive system
   b) Afferent and efferent bronchial arteries
   c) Internal ear
   d) Brain
   e) Cranial nerves, V, VII and IX, X

2) Clarias or Heteropneutes or Ophicoephalus - accessory respiratory organs.

3) Mystus/Cirthinus - weberial ossicles.

Group ‘B’

Comparative study of skeletal system of Rana, Varanus, Pigeon and Rabbit.

Group ‘C’

Study of the following permanent slides:

j) Amphioxus: T. S. Of oral head, Pharyngial region with gonads, intestine and caudal region.

k) V. S. Of skin of frog, reptile, bird and mammal.


Group ‘D’

Classification and Distinctive Features of the following:
Salpa, Doiolum, Botrylus, Pyrosoma, Petromyzon, Myxine, Sphyrna, Torpedo, Pristis Execoetas, Hippocampus, Syngnathus, Tetradon, Anguilla, Ichthyiophis, Axoltol larva, Alytes, pipa, Rhacophorus, Chamelcon, Draco, Alligator, Crocodyllus, Natrix, Naja, Viper, Corvus, Pavo Endynamys, Passer, Pisttacula.

Ornithorlychus, Tachyglossus, Macropus, Manis, Pteropus, Hystrix and Lomur,

**GROUP ‘B’**

**PHYSIOLOGY; ENDOCRINOLOGY, DEVELOPMENTAL BIOLOGY, ANIMAL BEHAVIOUR AND APPLIED ZOOLOGY**

1. 
A) Determination of Oxygen consumption of cockroach.
B) Capillary circulation in web of frog.
C) Count of R. B. C. And W. B. C. In man
D) Estimation of Hb concentration in blood of man.
E) Estimation of hemin crystals from blood of man
F) Demonstration of activity of salivary amylase of starch.

2. Study of eggs and tadpoles of frog.

3. Life cycle of lac insect and honeybee (Charts/Models)

   Or

   Study of the structural organisation of the beehive.

4. Visit to study the management of the following

   Fish farm, diary farm, poultry farm, sericulture and appiculture, submission of report on any one of the above visti.

5. Study of histological slides of the following endocrine glands in mammals.
Testis, Ovary, Thyroid, Adrenal, pituitary & Islets of Langerhans.

6. (i) Study of frog development through prepared slides.
   (ii) Study of whole mount preparation of chick embryo – 18, 21, 24, 28, 33, 36, and 42 – 48 hours development.

7. Viva-voce.

8. Sessional work and record.

9. Students shall be required to identify and comment on the embryological slides related to theory.

10. Sessional students shall have to submit permanent slides of embryos (chick) and tadpole larva of frog.

GROUP ‘C’

RECORDS

ZOOLOGY (GENERAL AND HONOURS)

BOOKS RECOMMENDED

1. Embryology ; the cell – Swanson, Prentice – Hall Publication

2. Cell Physiology and Bio-chemistry – Mc Elroy, Prentice Hall (Publication)

3. Heredity – Bonner and Mills, prentice Hall Publication


7. Genetics – Levine, Holt and Winston (Pub.)
8. Evolution – Savage, Holt and Watson (Pub.)
11. Elements of Human Physiology – Rogers John Willey and Winston (Pub)
17. Life of Vertebrates – Young , O. U. P
20. Cytology and cytogenetic – Swanson, Prentice Hall (Pub.)
22. Introduction to Evolution – Heody, Harpet Row.
24. The Vertebrate Body – Best and Taylor
26. College Physiology -Rece and MC Cashland, Thomas Vrawell, N. Y
27. Human Physiology, Chatterjee, Books and Allied Pub. Lt.
28. Evolution of Vertebrates – Colbert, John Willey and sons,, N. Y.
29. Protozoology – Kudo
30. sText Books of Zoology Vol – I and II – Parker and Haw well (Mac Millen and company)
31. The invertebrate – Borrdallecal C. U. F.
33. Evolution, Genetics and Eugenics – Mewman, H. H.
34. Principles of Genetics – Sinnot, Dunn Delezansky.
35. Comparative Embryology of Vertebrates - Nelson
37. Animal Evolution – Carter ( O. U. P. )
38. Elementary Biochemistry – Hertz, Vakils & Simson P. Ltd.
40. Biological Chemistry – Mahtar & Cordes, Harper and Row.
42. Biochemistry – Lheninger
43. Principles of Biochemistry – White, Handler and South McGraw Hill
44. Basic Concept of Ecology – Knight
49. Biochemistry Cytology – Brachet, A. C. Press
50. Cell Physiology – Giocse, Saunders
51. The ultra and structure of animal cell – Threedgold Pergamm.
52. Cell and Organolles – Novikoff Harper, Row
53. Genetics – A Itenberg, Ox India
54. The Science of Genetics – Burns O. M. T
55. Heredity – Bonner, P. Hall
56. The Mechanism of Inheritance – Stahi, P. Hall
57. Genetics – Levine, Holt Rein
59. Life of Mammals – Young
60. Modern Embryology – Bodemer, Hall
61. Patterns and problems of Development – Child Chicago University Press.
63. General and Comparative animal Physiology – Hoar
64. Animal Physiology – Scheer, Wiley
65. Text Book of Biochemistry and Human Biology – G. P. Talwar Print ice Hall
66. Comparative Animal Physiology – Prosser and Brown (Sunder)
67. The Living body – Best and Taylar, Mathewn
70. Wildlife conservation principle and practice – 1970 Teague
72. Cell Biology Genetics and Evolution – Kohil, Kaul, Sharma
73. A Text Book of Zoology – Sivapuri K. S. Dillon
74. Invertebrate Zoology – S. C. Saxcena, P. N. Saxcena
75. Laboratory Manual in Chordate and Experimental Zoology – Vyas and Jacob
76. Laboratory Manual in Invertebrate and Experimental Zoology – Vyas and Jacob
77. Manual of Practical Zoology - Vyas and Jacob
78. Cell Biology and animal Physiology – kaul, Kohli
80. An introduction to Parasitology – P. O. Sharma and L. S. Patro
81. Boolotian and Stiles: College Zoology (Macmillan)
82. Campbell : Biology (Benjamin)
83. Wolife: Biology and Foundation (Wadsworth)
84. Prescot – Cell (Jones & Bartiett)
85. Albert et al – Molecular Biology of the Cell (Garland)
86. Lodish et al : Molecular Cell Biology (Freeman)
87. Hoar : General and Comparative Physiology (Prentice Hall)
88. Nielsen: Animal Physiology ( Cambridge)
89. Balinsky : An introduction to Embryology ( CBS College Publishers)
90. Grant : Biology of Developing systems (Hold, Reihart, Winston)
91. Gillbert: Developmental Biology (Sinsuer)
92. Strickberger : Genetics (Macmillan)
93. Farnaworth: Genetics (Harper & Row)
94. Moody: Introduction to Evolution
95. Shukla & Upadhyaya: Economic Zoology
96. Srivastava : Text Book of Applied Entomology ( Kalyani Publisher)
97. Venkitaraman: Economic Zoology
98. Barnest Invertebrate Zoology (Sudarshan Publisher)
100. Boolootn & Stiles: College Zoology (Macmillan)
102. Hickman, Boberts & Hioman: Integrated principles of Zoology (Times-Mirror, Mosby)
103. Kotpal, Agarwal & Khetrapal: Modern Textbook of Zoology
104. Invertebrate (Rastogi Publication)
106. Hildebrand: Analysis of Vertebrate Structure (Wiley)
107. Kingalay: Outline of Comparative anatomy (Central Book Depot)
108. Romer and Persons: The vertebrate baby (Saunders)
109. Walter and Sayles: Biology of the vertebrate (Macmillan)
110. Hadley: Endocrinology (Prentice Hall)
111. Nalbandov: Reproductive Physiology
112. Grier: Biology of Animal Behaviour (Mosby College)
113. Immelmann: Introduction to Ethology (Plenum)
114. Lorednz: The Foundation of Ethology (Springer – Verslag)
115. Manning: An Introduction to Animal Behaviour (Addison – Wesley)
116. Wood – Gush: Elements of ethology (Chapman and Hall)
117. Vander, Sherman and Luciano – Human Physiology (McGraw Hill)
INDUSTRIAL CHEMISTRY (PASS) (VOCATIONAL)

There shall be two theory papers (75 marks) for three hour duration at the end of the Second year and third year. There shall be one practical paper carrying 50 marks at the end of second year and third year and duration of examination will be three hours in each case.

SECOND YEAR T.D.C.

Theory Paper – I  Principle of Industrial Processes  75 marks
Theory Paper – II  Industrial Organic Chemistry  75 marks
Paper -III  Practical  50 marks

FINAL YEAR EXAMINATION

Theory Paper – IV  Chemical Process Industries – I  75 marks
Theory Paper – V  Chemical Process Industries – II
Environmental Pollution  75 marks
Practical paper – VI  Practical  50 marks

SECOND YEAR EXAMINATION

PAPER – I PASS

(PRINCIPLES OF INDUSTRIAL PROCESSES)

Unit-I
Collegative properties- Lawering of vapour pressure and Raoult’s law, Elevation of boiling point, Depression in freezing point and Osmosis and laws of Osmotic Pressure, Methods of determination of molecular mass from above these methods.

Unit-II

a) Law of mass action – statement, application to synthesis of NH₂ Water gas reaction; Lechatelier’s principle.

b) Surface Chemistry and interfacial phenomenon – Adsorption isotherm, sole, gels, emulsions, micelles.

Unit-III

a) Phase Rule-Water system, Two immiscible liquids – solution, solid liquid mixture Pb-Ag system, Iron Carlson system.

b) Distribution law solvent extraction method.

Unit-IV

Catalysis-Introduction, types of catalysis-homogeneous, heterogeneous, basic principles, mechanisms, Factors affecting: Introduction to phase transfer catalysis, Enzyme catalysed reaction.

Unit-V

Energy Balance – Heat capacity of pure gases and gaseous mixture at constant pressure, sensible heat change in liquid. Enthalpy change:

PAPER – II

INDUSTRIAL ORGANIC CHEMISTRY

Unit-I
a) Purification of organic compounds- Distillation, fractional distillation, crystallisation, Fractional crystallisation, sublimation chromatography-column. Thin layer and paper chromatography.

b) Renewable Natural resources- Cellulose starch properties and modification, important industrial chemicals derived from them Alcohol and alcohol bases chemicals.

**Unit-II**

a) Aromatic hydrocarleons and their derivatives- Nomenclature, Hydrocarleons, Phenols Adohydes, Ketenes, Acids, Amines, Amides and nitro compounds.

b) Nitration – Introduction, Nitrating agents, processes of Nitration of – Paraffin hydrocarbons, benzene to Nitrobenzene, m-dinitro-benzeno, chloro-benzene to O - & P-Nitrochlorobenzene , toluene, acetanilide to p-nitroautanilide.

**Unit-III**

a) Halogenations – Introduction, Reagents for halogenations, Halogenations of aromatic side chain and nuclear halogenations, commercial manufactures – chlorobenzenes; chloral, dichlorofluoro methane,

b) Sulphonation – Introduction, sulpho9nating agents commercial sulphonation of benzene, naphthalene alreylbenzene.

**Unit-IV**

Oxidation – Introduction, types oxidation reactions, Oxidising agents, liquid and vapour phase oxidation commercial manufacture of benzoic acid, phthalic acid, arolein, acetic acid.
Hydrogenation – Introduction, catalysis for hydrogenation reactions, hydrogenation of vegetable oil, methanol from CO and H₂, hydrogenation of acids and esters to alcohols.

Unit-V

a) Fermentation – Introduction, conditions favourable for fermentation, characteristics of enzymes, short account of some fermentation processes, Manufacture of beer, wine, spin ts, vinegar, ethylalcohol from molasses, starchy materials, cellulose materials and hydrocarbon gas.


Waxes – classification, qualitative solubility of waxes, analysis of oil, fats and waxes, saponification values, ester value, iodine value, manufacture of candle, hydrogenation of oils, the dry process and wet process, soap and its manufactures, cleaning action of soap, detergent-principal groups, classification of surface active agents, anionic, cationic and non-ionic detergents, manufacture of shampoos.

PAPER – III (Full Marks – 50)

I) Part – A Volumetric estimation: 30 marks

1) Estimation of Ca²⁺ in lime

2) Estimation of NH₄⁺ ions.

3) Estimation of mixture of NaOH & NG₂ CO₃

Or
Part – B Industrial organic experiments:

1) Preparation of aspirin
2) Preparation of Methylsalicylate
3) Extraction of caffeine from tea leaves.
4) Separation of casein from mien.

ii) Viva – Voce 10 marks

iii) Record. 10 marks

THIRD YEAR T.D.C.

PAPER – IV

(CHEMICAL PROCESS INDUSTRIES – I)

Unit-I

a) Physico chemical principles of extraction of metals – 2n, Cr, Ni,
b) Corrosion – Factors promoting corrosion, corrosion of boiler unit, prevention of corrosion.

Unit – II

Inorganic materials of industrial importance-sources, forms, structure and modification of following compounds-glass. Silicates, zeolite, mica and carbon.

Unit-III

Refractories – Introduction. Classification of refractories, properties and manufacture of refractories Fire clay and silica brick-manufacture, properties and uses, lime refractories.

Unit-IV
Portland cement-introduction, types of cement-sulphate resistance, water proof, coloured, acid resistance, types of Portland cement, raw material, manufacture reaction in the kiln, mixing of additives and setting of cement, function and properties of cement.

**Unit-V**

Paints & Pigments – Introduction, characteristics of pigments, uses and manufacture process – white lead, zinc oxide, titanium dioxide, paints, classification, constituents and manufacture of paints, importance of PVC.

**PAPER – VI**

**(CHEMICAL PROCESS INDUSTRIES – II AND ENVIRONMENTAL POLLUTION)**

**Unit-I**

a) Synthetic Fibres and plastics – Introduction important requirements of fibre, difference between natural fibres and artificial fibres, properties, preparation and application of synthetic fibres, rayon, pyroxylin, nylon-66, nylon, Teflon.

Introduction, classification of plastic, difference between thermosetting plastics and thermoplastics, properties and formation of plastics.


**Unit-II**

Insecticides – Introduction, inorganic and organic insecticides, dinitrophenol, DDT, BHC gammexane attractants and repellents, Rodenticide, fungicide, Synthetic insecticides (General) introduction, detail no necessary.

**Unit-III**
Explosives-Introduction, classification, characteristics of explosives, nitrocellulose, DNB, TNB, TNT, nitro-glycerine and dynamite, gun power, RDX.

**Unit-IV**

Drugs and Dyes-introduction, some important drugs like sulpha drug, sulphonamide and antibacterial, antipyretics and analgesics, aspirin. Introduction and classification of dyes, acid dyes, basic dyes, azo dyes, vat dyes.

**Unit – V**

a) Air pollution- Introduction, classification of air pollutants, air pollutants, and their effects, acid rain, photochemical among.

b) Water Pollution-introduction classification of water pollutants inorganic pollutants, suspended solids and sediments, approaches to prevent and control of water Pollution.

c) Sewage and industrial waste-Municipal Waste water, sewage and its composition, bacteriology and sewage and methods of sewage treatment-primary secondary and tertiary treatment, Aerobic oxidation plants, Anaerobic leiological oxidation plants.

**PAPER – VI (PRACTICAL)**

**(50 MARKS) 3 HOURS**

1) Group – A  
1) Chemical oxygen Demand (COD) of sewage sample.

2) Estimation of ct (Gravimetry and Volherds method.

3) Determination of ssaponification value of oil.

4) Estimation of hardness of water.
5) Dissociation constant of week acids (Monobasic) by PH meter. (OR)

Group – B

a) Preparation of Methyl red, Pieric acid.
b) Separation of simple organic mixture by column chromatography.
c) Preparation of soap or cosmetic cream.
d) Determination of indicator constant by spectrometric method.
e) Preparation of Naphthalene Balls.

2) Viva-voce 10 marks

3) Record. 10 marks.

BOOKS FOR REFERENCE

1. Introduction to Industrial Chemistry – B. K. Sharma
3. Industrial Chemistry – B. C. Sharma
4. Catalysis in Micellan and Macromolecular systems – Fendier J. & Fandler E
5. Elements of Industrial Chemistry – Dr. Golilananda Mohapatra,
9. Environmental Pollution – Tgimmy Katyal & Prof. M. Satake (Anmol Pub)
11. Industrial Chemistry – Riegel (Reinhold)


**PRACTICAL**

1. Evaluation Pollution Analysis – S. M. Khopker

2. Laboratory Manual of Organic Chemistry – B. B. Dey & M. V. Sitaraman (Allied Publisher Lt.)


4. Instrumental Methods of Chemical analysis – Willard (Merrit, Dean Settel)

5. Quantitative Inorganic Analysis – A. Vogel (Longman Publication)

6. Quantitative Inorganic Analysis – A. Vogal (Longman Publication)

7. Experiments in Materials Technology, A. Laboratory Text for Engineers Manufacturing Metallurgy and materials Testing (Govt of India East West ) Publication.

**INFORMATION TECHNOLOGY (GENERAL)**

**SECOND YEAR EXAMINATION**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Paper title</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper –I</td>
<td>Fundamentals of Information Technology</td>
<td>75 marks</td>
</tr>
<tr>
<td>Paper –II</td>
<td>P. C. Software &amp; Application</td>
<td>75 marks</td>
</tr>
<tr>
<td>Paper –III</td>
<td>(Practical)</td>
<td>50 marks</td>
</tr>
</tbody>
</table>
(A) Problem solving using C)

THIRD YEAR EXAMINATION

Paper - IV Object oriented Programming 75 marks
Paper – V Business Data Processing 75 marks
Paper – VI Practical (Problem Solving using C++) 50 marks.

PAPER – I

FUNDAMENTALS OF INFORMATION TECHNOLOGY

1. Introduction Computer System
2. Computer Hardware/Software
   (CPU, RAM, EPROM, MOTHERBOARD COMPUTER)
3. A. Number systems
   - KB
   - Monitor
   - Mouse
   - Printers (DMP, LP, IN K-JET etc.)
   - Storage devices
   - Floppy Disk
   - Hard Disk
   - Optical Disk
   - Book up devices
   - MODEM/FAX
5. Computer Operating System
   - DOS
   - WINDOW
   - UNIX

BOOKS

1. Computer Fundamentals by B. Ram
2. Fundamentals of Computer by V. Rajaraman
3. Computer for beginners by Jaggi & Jain
4. Digital Computer Fundamentals by Thomas Bartee

PAPER – II

P.C. SOFTWARE AND APPLICATION

   - Introduction to Personal Computer
   - Overview of Basic Operating System Commands.
   - Introduction office Automation.
   - Introduction to Word Processing
   - Examples of some popular W. P. Packages
   - Uses and applications of word processors
   - Creation, Editing, Formatting of Documents.
   - Global Search and Replacement of Text
   - Spelling checker
   - Creating a presentation
   - Formatting Slides
   - Slide transition, adding special effects in slides
   - Inserting pictures, sound, chart etc. in slides.

2. Spreadsheets
- Introduction to spreadsheets
- Examples of some popular spreadsheet packages
- Uses of spreadsheet packages
- Building spreadsheet using formulas, conditional calculations, built in function.
- Database Utilities: Sorting, filtering, extracting etc.
- Graph – plotting facilities
- Writing macros and spreadsheet menus to build a user interface to the spreadsheet package.

1. Manual of PC Software

**PAPER – IV**

**OBJECT – ORIENTED PROGRAMMING**

Preliminaries: Object oriented development, object modelling techniques object modelling, Objects, classes, links, Associations, Generalization, Inheritance Grouping constructs, Aggregation, Abstract classes, Multiple inheritance, constraints.


Object oriented programming paradigm, basic data types, variables, operators, functions, classes, constructors, destructors operators overloading.

C++ Programming Language.

Programming paradigm, support for data Abstraction, support for Object oriented programming. Declaration and constants. Expression and statement. Function
and files, linkage. How to make a library. Functions, classes and objects, definition of class, class declaration. Data numbers, Member functions, private and public members, Default labels. Data hiding and encapsulation, Arraya within a class. Class Function class declaration scope resolution operator (::) private and public member function, Nesting of member functions.

1. Object oriented Modelling and Design by J. Rumbaugh (PHI)
2. Object Oriented: programming with C++ E Balguruswamy (TMH)
3. Object oriented programming in TURSOC-R. Lafore (Galgotia)
4. OOP using C++ - V Olshevsky & A Ponomarev.

PAPER – V

BUSINESS DATA PROCESSING

1. Introduction
   - File processing systems database systems and the evolution of database technology
   - Aims and importance of database technology: data independence. Data sharing, data integrity, data redundancy control.

2. Business Files and Structured
   - Elements Fields and records
   - Fixed a variable lengths
   - Record layout segmentation/ indexed/ relative fields

3. Working with Database Management System
   - Creation and modification
   - Searching sorting, indexing
- setting system environment.

4. Screens and Reports
   - Designing custom screens
   - Creation and printing of report.
   - Labels

5. Database Programming
   - Managing strings, numbers and dates using built-in function memory variable
   - Designing and developing programme
   - Debugging techniques procedure files

6. Management information system – G. B. Davis & M. H. Oison,

   **PAPER – III & V**

   **The student is required to develop programs using C & C++**

   *(Files handling is excluded)*

   1. Balgurushamy B. C. Programming
   2. A. M. Tannenbaum and others – Data structure using C-PHI, 1992
   3. Practical C Programming – O’ Reilly
   4. C. Problem solving and programming – A Kanneth PHI.

   **NB:** The total course is based on two major stress namely hardware and software which can be treated as two subjects.

**INFORMATION TECHNOLOGY (HONOURS)**

**FIRST YEAR EXAMINATION**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Paper title</th>
<th>marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper – 1</td>
<td>Fundamentals of IT &amp; WINDOW based application &amp; Unix</td>
<td>100 marks</td>
</tr>
<tr>
<td>Paper – 2</td>
<td>C. Programming and Data Structure</td>
<td>100 marks</td>
</tr>
</tbody>
</table>
SECOND YEAR EXAMINATION

Paper – 3  Object oriented programming With C++  100 marks
Paper – 4  Relational Database system and ORACLE  100 marks
Paper – 5  ORACLE Practical & C++ Practical  100 marks

FINAL YEAR EXAMINATION

Paper – 6  Java Programming & E – Commerce  100 marks
Paper – 7  Web Technology and Visual Basic  100 marks
Paper – 8  Java Practical and Project using VB Java  100 marks

FIRST YEAR EXAMINATION

PAPER – I

FUNDAMENTAL OF IT & WONDOW BASED APPLICATION

UNIT-I

Development of Computer technology, Hardware , Software anatomy of Computer and functions of different units, description and working of different input, output and storage devices.

Unit-II

Software concepts, use of machine, assembly and high level programming language , 4GLs. Operating systems interpreter, Complier use of software packages, editors types of software.

Unit-III

Operating system: Dos (Internal and external commands). Windows & Unix.

Unit-IV
M. S. Office, Excel and Power point.

BOOKS

1. Computer for Beginners – V. P. Jaggy & S. Jain (Academic India) Publisher


PAPER – II

(C-PROGRAMMING AND DATA STRUCTURE)

C. Programme structure, Keywords, declaration of variable & Constants, arithmetic operation control structures, if, if else, nested if, CASE structures, loop control structure, for while, do-while, break continue.

Unit-II

Use of arrays, functions, structures, pointers.

Unit-III

Data representation, concepts of data structure, algorithm notation, linear and multi dimensional arrays, stack and queue with operations like insertion and deletion of items.

Unit-IV

Single and double linked lists with operations like creation, counting the number of nodes, insertion and deletion of items, binary tree, some applications of these data structure.

BOOKS

1. Data structure using; C – S, K. Bondhyopadhyay and K. N. Dey (Pearson pub.)
2. Let us C – Y Kanetkar (BPB).

SECOND YEAR EXAMINATION

PAPER – III

OBJECT ORIENTED PROGRAMMING WITH C++

Unit-I
Procedure oriented Vs object oriented programming, encapsulation, data abstraction structure of C++ program, reference variables, classes and objects, data members & member functions.

Unit-II
Operators in C++ scope resolution, manipulators, constructor, destructors, operator overloading, function overloading.

Unit-III
Concept of inheritance, base class, derived class, visibility modes, single level, multi level, multiple inheritance, function overriding.

Unit-IV
Dynamic memory allocation, virtual functions, polymorphism, exception handling.

BOOKS
1. OBJECT ORIENTED PROGRAMMING WITH C++ - S. Sahay (Oxford University press)
2. Object oriented programming in C++ - E. Balaguruswamy (TMH)

PAPER – IV

RELATIONAL DATA BASE SYSTEMS AND ORACLE
Unit-I

File organisation structures, concepts of database, comparison with traditional file system DBMS architecture. Relational data model, base table, view relational operations, DDL, DML, E. R. Modelling.

Unit-II

Integrity rules, the normalization process (1 NF, 2 NF, 3 NF) data base transaction, ACID properties, concurrency control through locking mechanism.

Unit-III

SQL data types of commands, creation of tables, view and index making queries and sub-queries using SELECT clause, insert, update and delete operations, synonymies, sequences. Joins.

Unit-IV

Aggregate functions. Order by clause, group by clause, PL/SQL Programming with SQL using If. For, while structures, cursors, triggers.

BOOKS

1. Introduction to relational database & SQL programming (TMH)
2. Database management system – A. Leon M Leon. (Leon tech world)

PAPER – V (PRACTICAL)

ORACLE & C++ PROGRAMMING

THIRD YEAR EXAMINATION

PAPER – VI

JAVA PROGRAMMING & E – COMMERCE

UNIT-I
Introduction to Java, execution environment of java programs, structure of java programs, data types, variable & literals, operates, conversion of data type, basic input and output.

Unit-II
Objects & classes: Definition a class, constructors, attributes, methods, control structures, IF, nested IF ..., Break, switch structures, looping structures, WHILE, DO-WHILE, FOR, nested loops, continue, method overriding, objects as parameters, recursion.

Unit-III
Arrays, multi dimensional arrays, Inheritance and inter faces, notion of frames, frame class, Applets, Applet tag in HTML.

Unit-IV
Event handling, event classes, event generators, event listeners exception handling, try and patch. Throw, user defined exceptions, concept of multithreading, thread class.

Unit-V

BOOKS
1. Programming with Java – E. Balaguruswamy (TMH)
2. Programming with java – 2-C Xavier (Sci Tech.)

PAPER – VII

WEB TECHNOLOGY ANDVISUAL BASIC

UNIT-I

Concept of web, web development through HTML, DHTML.

Unit-II

Web hosting, Design of static and dynamic web page, web enabled data bases.

Unit-III

Window programming, document interfaces – DLL, software development kit (SDK)
Visual Basic Programming, forms variables decision structures, looping structure,

Unit-IV

Functions & Procedures, exception banding, intrinsic control, Properties events & methods, Database connectivity, ADO, data reports.

Books


PAPER – VIII

PRACTICAL + PROJECT

Laboratory practical: JAVA Programming

Project to be done based on VB/ORACLE/JAVA.

======