GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: Mathematics

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Signature of the Members

1. Rabindra Kujur
2. Bhaba Sankar Das
3. Ashutosh Nayak
4.

14/09/19

Signature with date

CHAIRMAN
BOARD OF STUDIES

Approval for paper setter in Math.

The following item (given below) has discussed on Board of Studies conducted in the Dept. of Math on 14/09/19 for approval of Academic council meeting which will be held on 16/09/2019.

1. All question in the End Sem - (11) and (12) of SEC-I (12) (Numerical Aptitude and Logical Thinking) which prescribed by Govt. of Odisha must be a multiple choice with 4 set.
2. All the question of 'A' set are same but different order just like as competitive Exam.
3. There are two group (A and B) where Group 'A' has 40 question (40x1) from Numerical ability and Group B has 20 question (20x2 = 40 marks) from Logical Thinking.

1. Dr. M.K. Mudali
2. Sri Rabindra Kumar Sahoo
3. Sri Bhabani Sankar Das

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: Zoology

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Signature of the Members

Birupakshya Mishra
Debasis Prasad Rath
Bishnu Priya Bisoi

Signature with date

CHAIRMAN
BOARD OF STUDIES

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: PHYSICS.

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Signature of the Members

1. Dr. Snigdha Panigrahi, Lect. in Physics, Govt. (A) College, Phulbani
   14.9.19
2. Jyotiranjan Sahoo
   14.9.19

Snigdha Panigrahi
Signature with date 14.9.19

Dr. Snigdha Panigrahi
CHAIRMAN
BOARD OF STUDIES

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: CHEMISTRY

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Signature of the Members

<1> Nilamadhab Pradhan

<2> Ashok Kumar Rout.

<3> Manoranjan Sahoo

Priyabrata Patnaik 14/9/19

Signature with date

CHAIRMAN
BOARD OF STUDIES

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: ODIA

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

We are agree with the question pattern of arts Subjects.

Signature of the Members

1. Sadananda Dutta
2. Manoj Kumare Mallik
3. Manoranjan Kanhar.

Madhusmita Mohapatra.
Signature with date
14.09.19

CHAIRMAN
BOARD OF STUDIES

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: Geography

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Signature of the Members

1. Tanuj Kumar Sahu
2. Aditya Shankar
3. Samyak Bauddh

Signature with date 14/9/19

CHAIRMAN
BOARD OF STUDIES

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: ENGLISH

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme. *

Signature of the Members

1. Khagendra Sethi 14.9.19 Ext. Member
2. Amit Kumar Maharana 14.09.19
3. Ramakanta Sethi 14.9.19

Signature with date

Subhasis Chandra Pradhan 14-9-19

CHAIRMAN
BOARD OF STUDIES

* N.B. The question pattern for English has been approved with minor modifications and has been attached herewith.

Khagendra Sethi
14.9.19

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: ECONOMICS (UG)

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Balaji Charan Behera, External member

Signature of the Members

14.9.19

Vijaya prasad Nayak, Internal member

Signature with date 14-9-2019

CHAIRMAN
BOARD OF STUDIES

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: ANTHROPOLOGY

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Signature of the Members

1. Mrs Pragyan P. Sahoo - P. Sahoo 14.9.19
2. Dr. S. Baliar Singh - Singh 14.9.19
3. Miss. N. Pani — N. Pani 14.9.19
4. Sri S. K. Mahapatra — 14.9.19
5. Sri M. R. Pattnaik — Manesh 14.9.19

Signature with date

CHAIRMAN 14.9.19
BOARD OF STUDIES

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: Pol. Sc.

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Signature of the Members

1. 14/09/19
2. 14/09/19
3. 14/09/19
4. 14/09/19

Signature with date 14/09/19

CHAIRMAN
BOARD OF STUDIES

(b) Maximum 0.5 (point five percent) grace mark (2 marks)can be given for award of 'B' Grade in 6th semester in aggregate.This is applicable provided the candidate has not availed grace mark underClause-11.1.

(c) Maximum 0.5 (point five percent) grace mark (2 marks) can be given for award of 'B+' Grade in 6th semester in aggregate. This is applicable provided the candidate has not availed grace mark underClause-11.1.

12. EXAMINATION QUESTION PATTERN

12.1 The duration of end semester examination is as reflected in Clause No.5 above.

12.2 For subjectsother than language subjects and without having practical, full marks are 100 per paper out of which 20 marks are allotted for Mid-Semester Examination (Internal) and 80 marks are for end semester examination.

a. The question papers shall be divided into four parts
b. Part I will carry 12 one mark questions in the form of fill in the blanks and one word answer. (12 marks)
F. Part II will carry 10 two mark questions of which 8 have to be answered. The answer should be within two to three sentences maximum. (16 marks (8X2))
G. Part III will carry 10 three mark questions of which 8 have to be answered. The answer should be within 75 words maximum. (24 marks (8X3))
H. Part IV will carry 4 seven mark questions of EITHER OR format. The EITHER OR in question can be from same or different units of the paper. The answer should be within 500 words maximum. (28marks (7X4))

12.3 For subjects other than language subjects and with practical, full marks are 100 per paper out of which 15 marks is allotted for Mid- Semester Examination, 60 marks is for End Semester Examination and 25 marks is for practical.

a. The question papers shall be divided into four parts
b. Part I will carry 8 one mark questions in the form of fill in the blanks and one word answer. (08 marks(8X1)
c. Part II will carry 10 one point five mark questions of which 8 have to be answered. The answer should be within two to three sentences maximum. (12 marks (8X1.5))
d Part III will carry 10 two mark questions of which 8 have to be answered. The answer should be within 75 words maximum. (16 marks (8X2))
e Part IV will 4 numbers of six mark questions of EITHER OR format. The EITHER OR in question can be from same or different units of the paper. The answer should be within 500 words maximum. (24 marks (6X4))
f Practical will carry 25 marks out of which 05 will be for records ,05 for viva voce and 15 for the core experiment .

12.4 For Language courses like Odia, Hindi, Sanskrit, English, the question pattern and marking scheme will be as given in the respective curriculum. For

12.5 For Autonomous Colleges, each department shall have a designated Teacher in-charge of Examination to be decided by the Principal in addition to the Controller of Examinations of the College.For non autonomous college, the principal or the teacher nominated by the principal will be responsible for conducting examinations.

12.6 Suitable modifications may be made by the Autonomous Colleges keeping in view the UGC Guideline for Autonomous Colleges, University as well as state government's Guidelines from time to time. .

12.7 The board of studies in each subject are required to prepare Question Banks in each paper and submit it to the controller of Examination.

13. MINIMUMPERCENTAGE AND MARKS TO BE SECURED FOR PASSING:

13.1 Paper without Practical :

Mid Semester	End Semester	Pass Mark – End Semester	Total	Paper Pass Mark
20	80	30% out of 80 (i.e. 24 marks)	100	40 out of 100 By taking both components (i.e. Mid-Sem + End Sem Exam.)

a. End Semester(University Examinations) Total Mark: 80, 30% out of 80 (i.e. 24 mark)
b. Total Mark: 100 (40% out of 100)
c. No Pass mark for Mid Semester Exam. A student has to appear the Mid Semester Exam. Securing 'ABS' in both the chances in Mid Semester examinations, the student will be declared fail in that paper, though he/she secures pass mark in theory papers.

13.2 Paper with Practical :

Mid Sem	End Semester				Total	Paper Pass Mark
	A-Theory	Pass Mark A-Theory	B-Practical	Pass Mark B-Practical		
15	60	30% out of 60 (i.e. 18 mark)	25	40% out of 25 (i.e. 10 mark)	100	40 out of 100 By taking (i.e. Mid-Sem + End Sem Exam + Practical)

a. End Semester(University Examinations) : Total Mark: 60, 30% out of Total Mark(i.e. 18 mark)
b. Minimum pass mark for practical paper is 40%.
c. Total Mark: 100 (40% out of 100)
d. No Pass mark for Mid Semester Exam. A student has to appear the Mid Semester Exam. Securing 'ABS' in both the chances in Mid Semester examination, student will be declared fail in that paper, though he/she secures pass mark in theory and practical paper.

NB: In order to clear a Semester examination a candidate is required to pass in all theory & practical papers/project component of the said semester.

14. EVALUATION RESPONSIBILITY

14.1 SCHEME OF VALUATION

Scheme of valuation has to be prepared by subject experts, preferably members of Board of Conducting Examiner for every paper and has to be supplied to the valuation zones by the Controller of Examination before evaluation.

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: History

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Signature of the Members

1. Dillara Kumar Sa 14.9.19
2. Tanja Singh 14.9.2019
3. R. K. Mahalik 14.9.19
4. [illegible]
5. [illegible] 14.9.19

Signature with date

[illegible] 14.9.19
CHAIRMAN
BOARD OF STUDIES

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: COMMERCE

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Signature of the Members

1. Dr. Laxman Sahu 14.9.19.
2. Dr. Girija Prasad Dash 14.9.19
3. Dr. Profulla Ku. Parida 14.09.2019.

Signature with date

CHAIRMAN
BOARD OF STUDIES

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: BBA

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Signature of the Members

1) Jyoti Prakash Padhi
14/9/19

14/9/19
Signature with date

CHAIRMAN
BOARD OF STUDIES

GOVT AUTO COLLEGE, PHULBANI-762001

BOARD OF STUDIES: 2019-20

DEPARTMENT: BCA

RESOLUTION FOR QUESTION PATTERN

The members of Board of Studies approve the question pattern suggested in the REGULATION FOR MODEL SYLLABUS to be adopted from 2019-20. In our view the question pattern is appropriate for objective assessment of the students under UG programme.

Signature of the Members

1. 14/9/19
2. 14/09/19
3. 14-9-19
4. 14.9.19
5. 14.09.19
6. 14-09-19
7. 14.9.19

14/9/19
Signature with date

CHAIRMAN
BOARD OF STUDIES

C-1.2 : CARTOGRAPHY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I: Cartography-Nature and scope

i. Needs of map making, characteristics of maps,
ii. Cartography as a science of human communication
iii. Branches of Cartography, Scope of cartography

UNIT - II: Basic Geodesy, Scale – Concept and application

i. Spherical Earth, Ellipsoidal Earth. Geoid Earth
ii. Geographical Coordinates (Latitude and Longitude), Graticules
iii. Scale, Construction of types of Scales (Plain, Comparative and Diagonal Scale)

UNIT - III: Map Projections

i. Meaning and Use, Brief Historical aspect.
ii. Transformation of area, Distance and Direction
iii. Simple Cylindrical Projection, Conical Projection with one standard projection

UNIT - IV: Slope Analysis and Geological Map Gradient and slope

i. Interpretation of Bedding plane, Strike, Dip, structure & stratigraphy of Geological map.
ii. Slope defined and methods of determination of slope (Wentworth's method and Smith)

PRACTICAL

1. Construction and use of Graphical, RF & Statement Scale, Diagonal Scale
2. Grid Reference System, Latitude, Longitude, International Date Line, Date and Time based on GMT & IST)
3. Construction of Map Projections: Simple Cylindrical, Simple conical Projection with one and two standard parallels, Polyconic , Gnomonic and Mercator's
4. Cartograms of one, two and three dimensions–Simple and Complex bars, circle and sphere diagram, block diagrams.
5. Drawing of Choropleth and isopleths maps, relief and slope maps
6. Practical record and viva-voce

Text Books:

1. Singh R. L. and Singh R. P. B., 1999: Elements of Practical Geography, Kalyani Publishers.
2. Mishra R.P. and Ramesh, A., 1989: Fundamentals of Cartography, Concept, New Delhi.

Reference Books:

- Anson R. and Ormelling F. J., 1994: International Cartographic Association: Basic Cartographic Vol. Pregmen Press.
- Monkhouse F. J. and Wilkinson H. R., 1973: Maps and Diagrams, Methuen, London.
- Robinson A. H., 2009: Elements of Cartography, John Wiley and Sons, New York.
- Sarkar, A. (2015) Practical geography: A systematic approach. Orient Black Swan Private Ltd., New Delhi.

C-2.2 : CLIMATOLOGY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I:

Composition and Structure of the atmosphere, Insolation and Heat Budget of the Earth, World distribution of Temperature –Factors of Distribution, Temperature Inversion.

UNIT - II:

Atmospheric Pressure and Winds – Pressure Belts and Planetary Winds, Periodic and local winds, Factors affecting general circulation of wind, corriolis effect, Jet Stream.

UNIT - III:

Humidity: relative and absolute, Forms of Condensation, types of clouds, types of precipitation, classification of climate of Koppen and Thonrthwait.

UNIT - IV:

Concept of air mass, classification, characteristics, distribution and modification, thunderstorms and tornado, Tropical Cyclones, Temperate Cyclones, weather forecasting.

PRACTICAL

1. Introduction to use of simple weather observation instruments: Thermometer, Barometer, hygrometer, anemometer, wind vane, Rain Gauge, Stevenson Screen, Interpretation of weather maps
2. Drawing of Climograph and Hythergraph, Wind rose diagram.
3. Drawing of isopleth maps : isotherms, isobars and isohyets
4. Spatial and temporal distribution of rainfall using choropleth techniques and trend graphs
5. Record & Viva-Voce carries 10 marks

Text Books:

1. Lal, D S (2006): Climatology, Prayagn Pustak Bhavan, Allahabad

Reading List:

- Barry R. G. and Carleton A. M., 2001: *Synoptic and Dynamic Climatology*, Routledge, UK.
- Barry R. G. and Corley R. J., 1998: *Atmosphere, Weather and Climate*, Routledge, New York.
- Critchfield H. J., 1987: *General Climatology*, Prentice-Hall of India, New Delhi
- Lutgens F. K., Tarbuck E. J. and Tasa D., 2009: *The Atmosphere: An Introduction to Meteorology*, Prentice-Hall, Englewood Cliffs, New Jersey.
- Oliver J. E. and Hidore J. J., 2002: *Climatology: An Atmospheric Science*, Pearson Education, New Delhi.
- Trewartha G. T. and Horne L. H., 1980: *An Introduction to Climate*, McGraw-Hill.
- Gupta L S(2000): Jalvayu Vigyan, Hindi Madhyam Karyanvay Nidishalya, Delhi Vishwa Vidhyalaya, Delhi
- Vatal, M (1986): Bhautik Bhugol, Central Book Depot, Allahabad
- Singh, S (2009): Jalvayu Vigyan, Prayag Pustak Bhawan, Allahabad

C-3.2 : STATISTICAL METHODS IN GEOGRAPHY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I:

Use of Data in Geography: Spatial and attribute data, Types and Sources of Data (Discrete and grouped, primary and secondary), Scales of Measurement of data (Nominal, Ordinal, Interval, Ratio). Distribution of Data: Normal and Bi-nomial

UNIT - II:

Descriptive Statistics: Frequency distribution (grouped and ungrouped data), measures of Central Tendency (Mean, Median and Mode), Types of Sampling-Random, stratified, systematic and purposive

UNIT - III:

Measures of Dispersion (Variance, Mean Deviation, Standard Deviation and Coefficient of Variation. Chi-square test

UNIT - IV:

Measures of Association: Product moment correlation, Rank correlation, coefficient of determination and linear regression.

PRACTICAL

1. Drawing of histogram, frequency curve and ogive in grouped and discrete data
2. Calculation & Drawing of graphs showing mean, median, mode in grouped & discrete data
3. Calculation of mean deviation, standard deviation, coefficient of variation,
4. Practical records and viva –voce

Text Books:

1. Mahmood A., 1977: *Statistical Methods in Geographical Studies*, Concept.
2. Sarkar, A. (2013) Quantitative geography: techniques and presentations. Orient Black Swan Private Ltd., New Delhi

Reference Books:

- Hammond P. and McCullagh P. S., 1978: *Quantitative Techniques in Geography: An Introduction*, Oxford University Press.
- Yeates M., 1974: *An Introduction to Quantitative Analysis in Human Geography*, McGraw Hill, NY
- Silk J., 1979: *Statistical Concepts in Geography*, Allen and Unwin, London
- King L. S., 1969: *Statistical Analysis in Geography*, Prentice-Hall
- Pal S. K., 1998: *Statistics for Geoscientists*, Tata McGraw Hill, New Delhi
- Ebdon D., 1977: *Statistics in Geography: A Practical Approach*.

C-4.3 : ENVIRONMENTAL GEOGRAPHY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I:

Environmental Geography – Concept and Scope, Types and Characteristics of environment: Biotic, abiotic and cultural, Environmental contrast (Global, Continental, Local) Environmental control and concept of tolerance (Light, Temperature, Water, Topography and Edaphic factors)

UNIT - II:

Ecosystem – Concept, Structure and Functions, Trophic level, food Chain and food web, Biogeo-chemical Cycle (Nitrogen and Carbon), Energy flow in Ecosystem.

UNIT - III:

Concept of Biome, Major biomes of the world and their characteristics: Equatorial, Subtropical, Temperate and Polar, Nature and characteristics of environmental pollution of water and air

UNIT - IV:

Environmental degradation; causes and consequences, Environmental conservation methods, programmes and policies in India, Role of International agencies (UNEP, IUCN in environmental management, concept and strategies of sustainable development, Green Tribunal and its functions in India.

PRACTICAL

Project Work :

Submission of a Project Report on any environmental problem of global/national/local significance

Text Books:

1. Santra, S.C *Environmental Science*
2. Singh S., 1997: *Environmental Geography*, Prayag Pustak Bhawan. Allahabad.

Reference Books:

- Chandna R. C., 2002: *Environmental Geography*, Kalyani, Ludhiana.
- Cunninghum W. P. and Cunninghum M. A., 2004: *Principals of Environmental Science: Inquiry and*
- *Applications*, Tata Macgraw Hill, New Delhi.
- Goudie A., 2001: *The Nature of the Environment*, Blackwell, Oxford.
- Miller G. T., 2004: *Environmental Science: Working with the Earth*, Thomson Brooks Cole, Singapore.
- Odum, E. P. et al, 2005: *Fundamentals of Ecology*, Ceneage Learning India.

SEMESTER-V

C-5.1 : REGIONAL PLANNING AND DEVELOPMENT

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I:

Concept of a Region, Types of region: Formal, Functional and Planning Region, Need for Regional Planning, Evolution of Regional planning in India during five year plans

UNIT - II:

Delineation of Planning Regions; Approaches and Methods, Regional disparity and imbalances in India, Planning Regions of India

UNIT - III:

Theories and Models for Regional Planning: Growth Pole Model of Perroux, Myrdal, Hirschman, Rostow.

UNIT - IV:

Policies and Programs for Rural and Regional Development Planning in India, Welfare Programs: IRDP, DPAP, Planning for backward regions, TDA and ITDP, Concept and application of Human development Index in planning and development

PRACTICAL

1. Transport network analysis –Alfa, Beta, Gama indices
2. Nearest neighbor analysis
3. Mapping regional Disparity based on socio-economic data
4. Mapping levels of development based on socio-economic data
5. Practical record and viva-voce

Text Books:

1. Chand, Mahesh and V. K. Puri: Regional Planning
2. Mishra R. P : Regional Planning, Concept Publishers, New Delhi

Reference Books:

- Friedmann J. and Alonso W. (1975): *Regional Policy - Readings in Theory and Applications*, MIT Press, Massachusetts.
- Haynes J., 2008: *Development Studies*, Polity Short Introduction Series.
- Peet R., 1999: *Theories of Development*, The Guilford Press, New York.
- UNDP 2001-04: *Human Development Report*, Oxford University Press.
- World Bank 2001-05: *World Development Report*, Oxford University Press, New

C-5.2 : REMOTE SENSING AND GIS

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I:

Remote Sensing: Definition and Components, EMS and EMR, Wave and Particle theory of EMR, Types of platforms and sensors, Advantages and limitation of Remote Sensing, Energy interaction with Atmosphere and Earth Surface features (Water, soil and vegetation)

UNIT - II:

Aerial Photography, Principles of stereo vision, Geometry of Aerial Photographs, Image elements and visual interpretation of satellite images.

UNIT - III:

GIS: definition and components, Types of GIS Data (Spatial and attribute), Raster and Vector Data models, Special functions of GIS, GPS elements and its uses.

UNIT - IV:

Application of RS & GIS in land use and land cover mapping, Application in cartography and map making, Mapping of water resources and Natural Vegetation

PRACTICAL

1. Stereoscopic vision using stereo cards and identification of objects from cards
2. Feature identification from aerial photographs using Pocket stereoscope/Mirror stereoscope
3. Feature identification from satellite imageries using visual interpretation
4. Identification and mapping of water bodies from satellite imageries
5. Digitization of Odisha state/block /district map and drawing of few point, line and polygon features

Text Book

1. Lillesand T. M., Kiefer R. W. and Chipman J. W., 2004: *Remote Sensing and Image Interpretation*, Wiley. (Wiley Student Edition).

Reference Books:

- Bhatta, B. (2008) Remote Sensing and GIS, Oxford University Press, New Delhi.
- Campbell J. B., 2007: *Introduction to Remote Sensing*, Guildford Press
- Chauniyal, D. (2010) Sudur Samvedana Avam Bhaugolik Suchna Pranali, Sharda Pustak Bhawan, Allahabad.
- Jensen, J. R. (2005) Introductory Digital Image Processing: A Remote Sensing Perspective, Pearson Prentice-Hall.
- Joseph, G. 2005: *Fundamentals of Remote Sensing* United Press India.

DSE-5.3 : POPULATION GEOGRAPHY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I:

Defining the Field, Nature and Scope of population geography; Sources of population data with special reference to India (Census, Vital Statistics and NSS), Population problems and issues.

UNIT - II:

Population Size, Distribution and Growth – Factors and Determinants, Theories of Growth –Malthusian Theory and Demographic Transition Theory.

UNIT - III:

Determinants of Population Growth: Fertility, Mortality and Migration-Measures, determinants and implications of fertility, mortality and migration.

UNIT - IV:

Population Composition and Characteristics – Age-Sex, Rural-Urban, Literacy, Occupational structure, Contemporary population issues–Ageing of Population; Declining Sex Ratio; HIV/AIDS, Trend of urbanization and related Problems.

PRACTICAL

1. Population projection: AP, GP and R.G India method, calculation and graphical display
2. Drawing of triangular diagram and Lorenz curve
3. Construction of compound and superimposed pyramids
4. Calculation and presentation of population growth Rate, infant and neonatal mortality rate, maternal mortality ratio based on supplied data
5. Practical record and Viva-Voce

Text book:

1. Chandna R. C. and Sidhu M. S., 1980: *An Introduction to Population Geography*, Kalyani Publishers.

Reading List:

❖ Barrett H. R., 1995: *Population Geography*, Oliver and Boyd.

C-6.2 : DISASTER MANAGEMENT

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I:

Concept of Hazards and Disasters, Natural and manmade hazards, Types of hazards, Concept of Vulnerability and risk, prevention, mitigation and management.

UNIT - II:

Disaster management cycle, Pre disaster planning, During disaster management, Post Disaster planning and development, community based disaster preparedness, Role of various stake holders (NGO, GO, NDMA, NIDM, NDRF, ODRAF and OSDMA) in disaster management.

UNIT - III:

Detail study of nature, characteristics and management of natural hazards: Flood, Cyclone, Drought, Earthquake, Tsunami and Land Slide

UNIT - IV:

Man made hazards and disasters, causes and impacts; Fire hazards, industrial hazards and nuclear hazards, Salient features of India's disaster management policy.

PRACTICAL

Project work – Preparation of a case study report on a specific hazard / disaster based on literature review and or field work

Text books:

1. Singh, Savindar (2009): Disaster Management

Reference books:

- Mishra B.J : Natural hazards and disaster management
- Sundar I & Sezuiyan T : Disaster management
- Verma : Encyclopedia of Disaster management
- Eye Publication : Vulnerable India
- Sinha. A. – Disaster management, United Press
- Singh R.B – Risk Assessment and Vulnerability analysis.

DSE-6.3 : URBAN GEOGRAPHY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I:

Urban geography: Introduction, nature and scope; history of urbanization, Trends and Patterns of Urbanization in developed, developing countries, world and India.

UNIT - II:

Functional classification of cities: Quantitative and Qualitative Methods, Christaller Theory, Morphology of Urban Settlements & Urban Sphere of Influence and umland, concept of CBD, rural-urban fringe.

UNIT - III:

Theories of urban growth, Urban Issues: problems of housing, slums, civic amenities (water and transport), Air Pollution and Noise Pollution,

UNIT - IV:

Case studies of Delhi, Mumbai, Kolkata, Bhubaneswar and Chandigarh with reference to city planning and Urban Issues.

PRACTICAL

1. Functional classification of towns
2. Projection of urban population
3. Delimitation of C.B.D and umland
4. Gravity and population potential model.
5. Practical Record and Viva-Voce (10 marks)

C-1.2 : LOGIC AND SCIENTIFIC METHOD

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT – I:

Definition of Logic, Laws of Thought, Deductive and Inductive Arguments, Validity & Soundness of Arguments

UNIT – II:

Classification of Propositions (from stand-point of Quality & Quantity), Distribution of Terms, Square of oppositions, Interpretation of categorical proposition

UNIT – III:

Inference- Immediate Inference (Conversion and Obversion), Mediate Inference (Syllogism): Figure & Moods, Testing of Validity of Arguments by syllogistic Rules

UNIT – IV:

Inductive Reasoning & Scientific Enquiry: Causation & Mills Experimental Methods

Prescribed Book:

1. Cohen & Nagel- Introduction to Logic & Scientific Method.

Books for Reference:

- Copi, Cohen & Mac Mahan- Introduction to Logic (14th Edition)
- Alex Rosenberg- Philosophy of Science: A Contemporary Introduction
- John Hospers: An Introduction to Philosophical Analysis.

C-2.2 : SYMBOLIC LOGIC

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT – I:
Chapter- I Introduction
Chapter- II-The Calculus of Propositions
UNIT – II:
Chapter-III Calculus of Propositions (Sec 1 to 6)
UNIT – III:
Chapter-IV Calculus of Propositions (Sec 7 to 9)
The Elements of Predicate Calculus (Section 1 to 9 of chapter V)
UNIT – IV:
Appendix (Sec-I to Sec-IV)

Prescribed Books:
1. Basson & O' Corner: Introduction to Symbolic Logic

SEMESTER-III

C-3.1 : ETHICS

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT – I:
Definition, Nature & Scope of Ethics, Ethics in relation to Politics, Sociology and Religion

UNIT – II:
Distinction between moral and non-moral action, Moral and factual Judgement. Object of Moral Judgement.

UNIT – III:
Theories of Morality: Hedonism, Utilitarianism, Rigorism

UNIT – IV:
Theories of punishment; Retributive, Reformative and Preventive theory.

Prescribed Book:

1. J. N. Sinha- A Manual of Ethics

Books for Reference:

- W. Frankena– Ethics
- William Lily- An Introduction to Ethics

GE-4.4 : INDIAN ECONOMY - II

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT - I: External Sector in India

Trends, Composition & Direction in exports from and imports of India; Problems of Balance of Payment: Causes of deficit in BOP & measures to correct it; Trade Policy- Export Promotion Vs Import Substitution; Foreign Trade Policy of India; WTO and India.

UNIT - II: Financial Markets in India

Commercial Banking in India- Nationalization of Banks; Lead bank scheme and branch expansion; RBI - Functions, Monetary Policy; Development Banking- IFCI,IDBI, SIDBI and NABARD

UNIT - III: Indian Public Finance

Public Expenditure-Growth and Composition, Causes of Growth of Public Expenditure in India: Tax Revenue of Central and State Governments; Concept of VAT; Deficit Financing in India-Revenue, Budget, Fiscal and Primary Deficits; Purpose and Effects of Deficit Financing; India's Fiscal Policy-Objectives.

UNIT - IV: Current Challenges Facing Indian Economy

Inflation – Causes, Consequences and Anti-inflationary Policy; Poverty – Poverty line and Estimates, Major Poverty Alleviation Programmes; Environmental Degradation – Growth and Environment; Population Growth and Environment; Environment Policy; Economic Reforms- Globalization, Macroeconomic Stabilization, Structural Reforms, and their impact on the Indian Economy; Foreign capital and MNCs-Role and consequences.

Text Book:

1. Misra, S. K. and Puri V. K. Indian Economy — Its Development Experience. Himalaya Publishing House, Mumbai.

Reference Book:

❖ Dutt R. and Sundharam K. P. M. *Indian Economy*. S. Chand & Company Ltd., New Delhi.
❖ Basu, Kaushik (2016): An Economist in the Real World: The Art of Policy Making in India, Penguin.

DSE-5.3 : PHILOSOPHY OF BHAGAVAD GITA

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT – I:

Dharma:-Varnadharma, Swabhava, Swadharma- Paradharma

UNIT – II:

Karma:-Classification of Karma; Niskama Karma, Lokasamgraha

UNIT – III:

Jnana:- Distinction between Jnana and Vijnana. Criteria of True Knowledge (Buddhi Yoga & Jnana Yoga), Kshetra, Kshetrajna, Purusottama. Sattvika, Rajasika and Tamasika Jnana

UNIT – IV:

Bhakti Yoga:- Four kinds of devotee, Characteristics of Ideal Bhakti- Saranagati & Prapattikrupa (grace); Relation between Bhakti Yoga & Jnana Yoga

Prescribed Books:

1. The Bhagavad Gita- S. Radhakrishnan (Trs & Ed)

Books for Reference:

- Concept of Yoga in the Gita- S. C. Panigrahi
- Bhagavad Gita & Modern Life- K. M. Munshi & R. R. Diwakar
- The Lord Speaks (2016)- B. K. Tripathy
- Srimad Bhagavad Gita Bhasya of Sri Sankaracharya- A. G. K. Warrier (Trs)
- The Ethical Philosophy of Gita- P. N. Srinivasachari

C-6.2 : APPLIED ETHICS

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT – I:

What is Applied Ethics: Nature & Scope of Applied Ethics- Ethical Theories- Deontology, Relativism & Subjectivism

UNIT – II:

Taking Life: Animals- Animals rights, Reverence for life
Taking Life: Humans- Types of Euthanasia, Abortion

UNIT – III:

Environmental Ethics: Anthropocentricism, Non-anthropocentricism, Deep Ecology

UNIT – IV:

Professional Ethics: (a) Business Ethics- Rights and Obligations (b) Bio-medical Ethics- Hippocratic Oath, Rights and Obligations of Health- Care Professionals, Doctor- Patient-Relationship

Prescribed Book:

1. Peter Singer- Practical Ethics

Books for Reference:

- J. Jagadeb- Bio-medical Ethics
- Tom Regan - Animal Rights
- J. P. Theroux- Ethics: Theory & Practice
- P.K Mohapatra : Ethics and Society

C-1.2 : CONSTITUTIONAL GOVERNMENT AND DEMOCRACY IN INDIA

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

Introduction: *This course acquaints students with the Constitutional design of state structures and institutions, and their actual working over time. The Indian Constitution accommodates conflicting impulses (of liberty and justice, territorial decentralization and a strong union, for instance) within itself. The course traces the embodiment of some of these conflicts in constitutional provisions, and shows how these have played out in political practice. It further encourages a study of state institutions in their mutual interaction, and in interaction with the larger extra-constitutional environment.*

UNIT-I: The Constituent Assembly and the Constitution

i. Formation and working of the Constituent Assembly
ii. The Philosophy of the constitution: The Preamble and its Features.
iii. Fundamental Rights, Directive Principles of State Policy, Fundamental Duties

UNIT-II: Organs of Government

i. The Legislature and the Executive
ii. The Judiciary: Supreme Court and High Courts

UNIT-III: Federalism

i. Federalism: Centre-State relations
ii. Recent trends in federalism

UNIT-IV: Decentralization

i. Panchayati Raj Institutions: Composition, Powers and functions of Gram Panchayat, Panchayat Samiti and Zilla Parishad, Gram sabha & Palli sabha.
ii. Municipalities: Composition Powers and function of Municipal Corporation, Municipal Council and Notified Area Council

Text Books :

1. G. Austin, (2010) 'The Indian Constitution: Cornerstone of a Nation', New Delhi, Oxford University Press, 15th print.
2. R. Bhargava (ed.) 'Politics and Ethics of the Indian Constitution', New Delhi, Oxford University Press.
3. D. Basu, (2012) 'Introduction to the Constitution of India', New Delhi, Lexis Nexis.
4. S. Chaube, (2009) 'The Making and Working of the Indian Constitution', New Delhi, National Book Trust.
5. G. Austin, (2000) 'Working a Democratic Constitution', New Delhi, Oxford University Press.
6. B. Shankar and V. Rodrigues, (2011), 'The Indian Parliament: A Democracy at Work', New Delhi: Oxford University Press.
7. P. Mehta and N. Jayal (2010) (eds.) 'The Oxford Companion to Politics in India', New Delhi, Oxford University Press.

Reference Books :

- Mehra and G. Kueck (eds.) 'The Indian Parliament: A Comparative Perspective', New Delhi, Konark.
- B. Kirpal et.al (eds.) 'Supreme but not Infallible: Essays in Honour of the Supreme Court of India', New Delhi, Oxford University Press.
- L. Rudolph and S. Rudolph, (2008) 'Explaining Indian Institutions: A Fifty Year Perspective, 1956-2006', Volume 2, New Delhi, Oxford University Press.
- M. Singh, and R. Saxena (2011) (eds.), 'Indian Politics: Constitutional Foundations and Institutional Functioning', Delhi: PHI Learning Private Ltd.
- K. Roy, C. Saunders and J. Kincaid (2006) (eds.) 'A Global Dialogue on Federalism', Volume 3 Montreal, Queen's University Press

C-3.2 : INTRODUCTION TO PUBLIC ADMINISTRATION

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

Introduction: *The course provides an introduction to the discipline of public administration. This paper encompasses public administration in its historical context with an emphasis on the various classical and contemporary administrative theories. The course also explores some of the recent trends, including feminism and ecological conservation and how the call for greater democratization is restructuring public administration. The course will also attempt to provide the students a comprehensive understanding on contemporary administrative developments.*

UNIT-1 : Public Administration as a Discipline

(i) Meaning, Scope and Significance of the Discipline, Public and Private Administration
(ii) Evolution of Public Administration as a discipline

UNIT-II: Theoretical Perspectives

Classical Theories

(i) Scientific management (F. W. Taylor), Ideal-type bureaucracy (Max Weber)
(ii) Administrative Management (Gullick, Urwick and Fayol)

UNIT-III: Neo-Classical and Contemporary Theories

(i) Human Relations theory (Elton Mayo), Rational decision-making (Herbert Simon)
(ii) Ecological approach (Fred Riggs), Innovation and Entrepreneurship (Peter Drucker)

UNIT-IV: Public Policy and Major Approaches in Public Administration

(i) Public Policy-Concept and approaches, Formulation, implementation and evaluation
(ii) New Public Administration, New Public Management, New Public Service Approach
(iii) Good Governance, Feminist Perspectives in Governance

Text Books:

1. B. Chakrabarty and M. Bhattacharya (eds), 'Administrative Change and Innovation: A Reader', New Delhi, Oxford University Press.
2. Basu, Rumki, (2014) 'Public Administration: Concepts and Theories', Sterling Publishers, New Delhi
3. D. Ravindra Prasad, Y. Pardhasaradhi, V. S. Prasad and P. Satyrnarayana, (2010)
4. (eds.) 'Administrative Thinkers', Sterling Publishers.
5. J. Shafritz, and A. Hyde, (2004) (eds.) 'Classics of Public Administration', 5th Edition. Belmont, Wadsworth.
6. M. Bhattacharya, (2008) 'New Horizons of Public Administration', 5th Revised Edition. New Delhi, Jawahar Publishers.
7. M. Bhattacharya, (2011) 'New Horizons of Public Administration', New Delhi: Jawahar Publishers.
8. M. Bhattacharya, (2012) 'Restructuring Public Administration: A New Look', New Delhi, Jawahar Publishers,
9. N. Henry, (2013) 'Public Administration and Public Affairs', 12th edition. New Jersey, Pearson,
10. Shafritz, J. and Hyde, A., (1997) (eds.) 'Classics of Public Administration', 4th Edition. Forth Worth, Hartcourt Brace, TX.

Reference Books:

- B. Chakrabarty and M. Bhattacharya (2003) (eds.), 'Public Administration: A Reader', New Delhi, Oxford University Press.

C-3.3 : PERSPECTIVES ON INTERNATIONAL RELATIONS

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

Introduction: *This paper seeks to equip students with the basic intellectual tools for understanding International Relations. It introduces students to some of the most important theoretical approaches for studying international relations. The course begins by historically contextualizing the evolution of the international state system before discussing the agency-structure problem through the levels-of analysis approach. After having set the parameters of the debate, students are introduced to different theories in International Relations. It provides a fairly comprehensive overview of the major political developments and events starting from the twentieth century. Students are expected to learn about the key milestones in world history and equip them with the tools to understand and analyze the same from different perspectives. A key objective of the course is to make students aware of the implicit Euro-centricism of International Relations by highlighting certain specific perspectives from the Global South.*

UNIT-I: Studying International Relations

(i) International Relations: Meaning, Scope and Evolution, Emergence of International State System
(ii) National Interest-Key Determinants of International Relations
(iii) Power-Cornerstone of International Relations

UNIT-II: Theoretical Perspectives

(i) Classical Realism & Neo-Realism, Liberalism & Neo-liberalism
(ii) Marxist Approaches, Feminist Perspectives, Euro- centricism & Perspective from the Global South

UNIT-III: An Overview of Twentieth Century IR History-I

(i) World War I: Causes & Consequences, significance of Bolshevik Revolution
(ii) Rise of Fascism & Nazism, World war II-Causes &Consequences

UNIT-IV: An Overview of Twentieth Century IR -II

(i) Cold War Evolution& Different Phases (4 Lectures) Disintegration of USSR
(ii) Emergence of the Third World, End of the Cold War

Text Books:

1. Basu, Rumki (2012) (ed.) 'International Politics: Concepts, Theories and Issues', New Delhi.
2. Baylis & S. Smith (2002) (eds.), 'The Globalization of World Politics', Oxford University Press, UK, 4th edition, 2007 W. Bello, Deglobalization, Zed Books, London.
3. M. Nicholson, (2002) 'International Relations: A Concise Introduction', New York, Palgrave.
4. P. Viotti and M. Kauppi, (2007) 'International Relations and World Politics: Security, Economy, Identity', Pearson Education.
5. R. Jackson and G. Sorensen, (2007) 'Introduction to International Relations: Theories and Approaches', 3rd Edition, Oxford, Oxford University Press.
6. S. Joshua. Goldstein and J. Pevehouse, (2007) 'International Relations', New York, Pearson Longman.

Reference Books:

- Calvocoressi, P. (2001) 'World Politics: 1945—2000'. Essex, Pearson.
- Dey, Dipankar (2007) (ed.), 'Sustainable Development: Perspectives and Initiatives', ICFAI University Press, Hyderabad,
- K. Booth and S. Smith, (eds), 'International Relations Theory Today', Pennsylvania, The Pennsylvania State University Press.
- M. Smith and R. Little (2000) (eds.), 'Perspectives on World Politics', New York, Routledge

C-4.2 : PUBLIC POLICY AND ADMINISTRATION IN INDIA

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

Introduction: *The paper seeks to provide an introduction to the interface between public policy and administration in India. The essence of public policy lies in its effectiveness in translating the governing philosophy into programs and policies and making it a part of the community living. It deals with issues of decentralization, financial management, citizens and administration and social welfare from a non-western perspective.*

UNIT-I: Public Policy

(i) Definition, characteristics and models
(ii) Public Policy Process in India

UNIT-II: Decentralization

(i) Meaning, significance, types and approaches to decentralization.
(ii) Local Self Governance: Rural and Urban

UNIT-III: Budget and Social Welfare Administration

(i) Concept and Significance of Budget, Budget cycle in India, Types of Budgeting
(ii) Concept and Approaches of Social Welfare.
(iii) Social Welfare Policies:
  (a) **Education:** Right to Education,
  (b) **Health:** National Health Mission,
  (c) **Food:** Right to Food Security,
  (d) **Employment:** MNREGA

UNIT-I V: Citizen and Administration Interface

(i) Public Service Delivery System;
(ii) Redressal of Public Grievances: RTI, Lokpal, Citizens' Charter and e-Governance

Text Books:

1. Basu Rumki (2015) 'Public Administration in India Mandates, Performance and Future Perspectives', New Delhi, Sterling Publishers
2. Bidyut Chakrabarty, (2007) 'Reinventing Public Administration: The Indian Experience', Orient Longman,
3. Henry, N. (1999) 'Public Administration and Public Affairs', New Jersey, Prentice Hall
4. Jean Dreze and Amartya Sen, (1995) 'India, Economic Development and Social Opportunity', Oxford, Oxford University Press.
5. R.B. Denhardt and J.V. Denhardt, (2009) 'Public Administration', New Delhi, Brooks/Cole
6. Satyajit Singh and Pradeep K. Sharma (2007) (eds.) 'Decentralization: Institutions and Politics in Rural India', Oxford University Press, New Delhi.
7. Singh, S. and Sharma, P. (2007) (eds.) 'Decentralization: Institutions and Politics in Rural India'. New Delhi, Oxford University Press.
8. Vasu Deva, (2005) 'E-Governance In India: A Reality', Commonwealth Publishers.
9. Vijaya Kumar, (2012) 'Right to Education Act 2009: Its Implementation as to Social Development in India', Delhi: Akansha Publishers.

Reference Books:

- 'World Development Report', (1992) World Bank, Oxford University Press.
- Anderson, (1975) 'Public Policy Making', New York, Thomas Nelson and sons Ltd.
- Gabriel Almond and Sidney Verba, (1965) 'The Civic Culture', Boston, Little Brown.
- J.Dreze and Amartya Sen, (1997) 'Indian Development: Selected Regional Perspectives', Oxford, Clareland Press
- Jayal, N.G (1999) 'Democracy and The State: Welfare, Secular and Development in Contemporary India', Oxford, Oxford University Press.
- Jugal Kishore, (2005) National Health Programs of India: National Policies and Legislations, Century Publications.
- Lee and Mills, (1983) 'The Economic of Health In Developing Countries', Oxford, Oxford University Press.
- M. Howlett, M. Ramesh, and A. Perl, (2009), 'Studying Public Policy: Policy Cycles and Policy subsystems', 3rd edition, Oxford University Press, New Delhi
- Marma Mukhopadhyay and Madhu Parhar (2007) (ed.) 'Education in India: Dynamics of Development' New Delhi, Shipra Publications.
- Noorjahan Bava, (2001) 'Development Policies and Administration in India', Delhi, Uppal Publishers.
- R. Putnam, (1993) 'Making Democracy Work', Princeton University Press.
- T. Dye, (2002) 'Understanding Public Policy', New Delhi, Pearson
- United Nation Development Programme, (1997) 'Reconceptualising Governance', New York
- Y. Dror, (1989) 'Public Policy Making Reexamined'. Oxford, Transaction Publication.

C-4.3 : GLOBAL POLITICS

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

***Introduction**: This course introduces students to the key debates on the meaning and nature of globalization by addressing its political, economic, social, cultural and technological dimensions. In keeping with the most important debates within the globalization discourse, it imparts an understanding of the working of the world economy, its anchors and resistances offered by global social movements while analyzing the changing nature of relationship between the state and transnational actors and networks. The course also offers insights into key contemporary global issues such as the proliferation of nuclear weapons, ecological issues, international terrorism, and human security before concluding with a debate on the phenomenon of global governance.*

UNIT-I: Globalization: Conceptions

(i) Understanding Globalization and its Alternative Perspectives, Non-Proliferation Regimes
(ii) Global Economy: Its significance & anchors of Global Political Economy: IMF, World Bank, WTO, TNCs

UNIT-II: Globalization: Perspectives

(i) Political Debates on Sovereignty and Territoriality
(ii) Cultural and Technological Dimensions
(iii) Global Resistances (Global Social Movements and NGOs)
(iv) Ecological Issues: International Environmental Agreements, Climate Change

UNIT-III: Contemporary Global Issues-I

(i) Proliferation of Nuclear Weapons
(ii) International Terrorism: Non-State Actors and State Terrorism; Post 9/11 developments

UNIT-IV: Contemporary Global Issues-II

(i) Migration & Human Security
(ii) Global Shifts: Power and Governance

Text Books:

1. G. Ritzer, (2010) 'Globalization: A Basic Text', Sussex: Wiley-Blackwell.
2. M. Strager, (2009) 'Globalization: A Very Short Introduction', London, Oxford University Press.
3. Heywood, (2011) 'Global Politics', New York, Palgrave-McMillan.
4. J. Baylis, S. Smith and P. Owens (2011) (eds.) 'Globalization of World Politics: An Introduction to International Relations', New York, Oxford University Press.
5. W. Ellwood, (2005) 'The No-nonsense Guide to Globalization', Jaipur, Rawat Publications.
6. D. Held and A. McGrew (2000) (eds.) 'The Global Trans-Formations Reader', Cambridge, Polity Press.

Reference Books:

❖ A. Narlikar, (2005) 'The World Trade Organization: A Very Short Introduction', New York, Oxford University Press.
❖ Goldstein, (2006) 'International Relations', New Delhi, Pearson.
❖ P. Hirst, G. Thompson and S. Bromley, (2009) 'Globalization in Question', Cambridge, Polity Press.
❖ D. Held et al, (1999) 'Global Transformations: Politics, Economics and Culture', California, Stanford University Press.
❖ F. Lechner and J. Boli (ed.), (2004) 'The Globalization Reader', London, Blackwell. (WTO).
❖ G. Ritzer, (2010) 'Globalization: A Basic Text', Sussex, Wiley-Blackwell.
❖ T. Cohn, (2009) 'Global Political Economy', New Delhi, Pearson.
❖ D. Held and A. McGrew (eds.), (2002) 'Global Transformations Reader: Politics, Economics and Culture', Cambridge, Polity Press.
❖ A. Vanaik, (ed.), (2004) 'Globalization and South Asia: Multidimensional Perspectives', New Delhi, Manohar Publications.

DSE-6.3 : INDIA'S FOREIGN POLICY IN A CHANGING WORLD

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

Introduction: *This course's objective is to teach students the domestic sources and the structural constraints on the genesis, evolution and practice of India's foreign policy. The endeavour is to highlight integral linkages between the 'domestic' and the 'international' aspects of India's foreign policy by stressing on the shifts in its domestic identity and*

the corresponding changes at the international level. Students will be instructed on India's shifting identity as a postcolonial state to the contemporary dynamics of India attempting to carve its identity as an 'aspiring power'. India's evolving relations with the superpowers during the Cold War and after, bargaining strategy and positioning in international politics facilitate an understanding of the changing positions and development of India's role as a global player since independence.

UNIT-I : India's Foreign Policy in a changing world
- (i) India's Foreign Policy: Major bases and determinants
- (ii) India's Foreign Policy: Postcolonial Perspective

UNIT-II : India's Relation with USA& Russia
- (i) India's Relations with the USA
- (ii) India's Relation with USSR/Russia,

UNIT-III : India-China Relations, India and South Asia
- (i) India-China Relations
- (ii) India and South Asia: SAARC, Look East Policy, Act East Policy

UNIT-IV : India and Contemporary World
- (i) India as an emerging Global Power, Myth and Reality
- (ii) India in the Contemporary World

Text Books :

1. Appadorai, A. and M.S. Rajan(1988), 'India's Foreign Policy and Relations', New Delhi, South Asian Publishers Pvt. Ltd.
2. Bahadur, Kalim (ed.) (1986), 'South Asia in transition: Conflicts and Tensions', New Delhi, Patriots.
3. Bandyopadhyaya, J. (2006), 'The making of India's Foreign Policy', New Delhi, Allied Publishers Pvt. Ltd.
4. Banerjee, A.K. (ed.) (1998), 'Security issues in South Asia: Domestic and External Sources of Threats to Security', Calcutta, Minerva.
5. Bidwai, Praful and Achin Vanaik (eds.) (1999), 'South Asia on a Short Fuse: Nuclear Politics and the Future of Global Disarmament', New Delhi, Oxford University Press.
6. D. Scott (2011) (ed.), 'Handbook of India's International Relations', London, Routeledge.
7. Dutt, V.P. (2007), 'India's Foreign Policy Since Independence', New Delhi, National Book Trust.
8. Tellis and S. Mirski (2013) (eds.), 'Crux of Asia: China, India, and the Emerging Global Order', Carnegie Endowment for International Peace, Washington.

Reference Books

- A. Ganguly, S. and Rahul Mukherji (2011), India since 1980, New Delhi: Cambridge University Press.
- Ghosh, Partha S. (1989), Cooperation and conflict in South Asia, New Delhi: Manohar.
- Gould, H.A. and Sumit Ganguly (eds.) (1993), The Hope and the Reality: U.S.-Indian Relations from Roosevelt to Reagan, New Delhi: Oxford & IBH.
- Gujral, I.K. (1998), A foreign policy for India, Delhi: External publicity division, MEA, Government of India.
- Mansingh, Surjeet (1984), India's search for power: Indira Gandhi's foreign policy, 1966-1982 New Delhi: Sage.
- Muni, S.D. (2010), India's Foreign Policy the democracy dimension, New Delhi: Foundation Books.
- Nayar, B.R. and T.V. Paul (2004), India in the world order searching for major power status, New Delhi: Cambridge University Press.
- S. Cohen, (2002) *India: Emerging Power*, Brookings Institution Press.
- S. Mehrotra, (1990) 'Indo-Soviet Economic Relations: Geopolitical and Ideological Factors', in *India and the Soviet Union: Trade and Technology Transfer*, Cambridge University Press:
- Cambridge.
- Sengupta, Bhabani (1998), Fulcrum of Asia relations among China, India, Pakistan and the USSR, New Delhi: Konark Publishers.
- W. Anderson, (2011) 'Domestic Roots of Indian Foreign Policy', in W. Anderson, *Trysts with Democracy: Political Practice in South Asia*, Anthem Press: University Publishing Online.

DSE-5.3 : INTRODUCTION TO HUMAN RIGHTS

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

Introduction: This course attempts to build an understanding of human rights among students through a study of specific issues in a comparative perspective. It is important for students to see how debates on human rights have taken distinct forms historically and in the contemporary world. The course seeks to anchor all issues in the Indian context, and pulls out another country to form a broader comparative frame.

UNIT-I: Human Rights: Theory and Institutionalization

(i) Understanding Human Right
(ii) Three Generations of Rights

UNIT-II

(i) Universal Declaration of Human Rights

UNIT-III

(i) Rights in National Constitutions: South Africa and India

UNIT-IV

(i) International Refugee Law, International Humanitarian Law

Text Books:

1. Alston Philip (1995), 'The United Nations and Human Rights-A Critical Appraisal', Oxford, Clarendon.
2. Baxi, Upendra (1995) (ed.), 'The Right to be Human', Delhi, Lancer,
3. Beetham, David (1987) (ed.), 'Politics and Human Rights', Oxford, Blackwell.
4. Desai, A R. (1986) (ed), 'Violations of Democratic Rights in India', Bombay, Popular Prakashan.
5. Evans, Tony (2001), 'The Politics of Human Rights: A Global Perspective', London, Pluto Press.
6. Hargopal. G. (1999) 'Political Economy of Human Rights', Hyderabad, Himalaya.
7. J. Hoffman and P. Graham, (2006) 'Introduction to Political Theory', Delhi, Pearson.

Reference Books:

- Kothari, Smitu and Sethi, Harsh (1991) (eds.), 'Rethinking Human Rights', Delhi, Lokayan.
- Saksena, K.P. (1999) (ed.), 'Human Rights: Fifty Years of India's Independence', Delhi, Gyan.
- Subramanian, S. (1997), 'Human Rights: International Challenges', Delhi, Manas Publications.
- Vistaar Iyer, V.R. Krishna (1999), 'The Dialectics and Dynamics of Human Rights in India', Delhi, Eastern Law House.

C-1.2 : MATHEMATICAL METHODS FOR ECONOMICS - I

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT - I: Preliminaries and Functions of one Real Variable

Sets and set operations; Cartesian product; relations; functions and their properties; Number systems
Types of Functions- constant, polynomial, rational, exponential, logarithmic; Graphs and graphs of functions; Limit and Continuity of functions; Limit theorems

UNIT - II: Derivative of a Function

Rate of change and derivative; Derivative and slope of a curve; Continuity and differentiability of a function; Rules of differentiation for a function of one variable; Application- Relationship between total, average and marginal functions

UNIT - III: Functions of two or more Independent Variables

Partial differentiation techniques; Geometric interpretation of partial derivatives; Partial derivatives in Economics; Elasticity of a function – demand and cost elasticity, cross and partial elasticity

UNIT - IV: Matrices and Determinants

Matrices: concept, types, matrix algebra, transpose, inverse, rank; Determinants: concept, properties, solving problems using properties of determinants, solution to a system of equations - Crammer's rule and matrix inversion method

Text Book :

1. A. C. Chiang and K. Wainwright (2005): *Fundamental Methods of Mathematical Economics*, McGraw Hill International Edition.

Reference Book :

❖ K. Sydsaeter and P. J. Hammond (2002): *Mathematics for Economic Analysis*. Pearson Educational Asia

C-2.2 : MATHEMATICAL METHODS FOR ECONOMICS - II

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT - I: Linear models:

Input- Output Model: Basic concepts and structure of Leontief's open and static Input-Output model; Solution for equilibrium output in a three industry model; The closed model.

UNIT - II: Second and Higher Order Derivatives and Integration:

Technique of higher order differentiation; Interpretation of second derivative; Second order derivative and curvature of a function; Concavity and convexity of functions; Points of inflection, Derivative of Implicit Function; Higher Order Partial Derivative.

Indefinite Integrals; Rules of Integration; Techniques of Integration: Substitution Rule, Integration by parts, and Partial Fractions; Definite Integral – Area Interpretation.

UNIT - III: Single and Multivariable Optimization:

Optimum values and extreme values; Relative maximum and minimum; Necessary versus sufficient conditions - First and Second derivative tests (using Hessian Determinants); Economic applications thereof, First and second order condition for extrema of multivariable functions; Convex functions and convex sets.

UNIT - IV: Optimization with Equality Constraints:

Effects of a constraint; Finding stationary value – Lagrange-Multiplier method (Two variable single constraint case only): First and second order condition; The Bordered Hessian determinant.

Text Book:

1. A. C. Chiang and K. Wainwright (2005): *Fundamental Methods of Mathematical Economics*, McGraw Hill International Edition.

Reference Book:

❖ K. Sydsaeter and P. J. Hammond (2002): *Mathematics for Economic Analysis*. Pearson Educational Asia

C-4.3 : RESEARCH METHODOLOGY

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT - I: Basics of Research

Introduction to Research: Meaning, Objectives, Motivation, Types, Approaches, Significance, Research Process, Criteria of Good Research; Qualities of a Good Researcher, Research as a Career

UNIT - II: Research Problem

Defining the Research Problem: What is a Research Problem? Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem; Research Design: Meaning, Need, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs

UNIT - III: Issues in Research

Measurement in Research, Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Techniques of Measurement Tools, Scaling and Important Scaling Technique Research Ethics: codes and ethics, permissions to research, responsibilities, confidentiality, feedback, participatory research; Research Proposal and literature review: research proposal, review of literature, levels of analysis, using the library and internet, abstracting, word processing, plagiarism, Concept of IPR

UNIT - IV: Actions in Research

English in report writing: words, sentences, paragraph, writing style; The Report: improving quality, sections, drawing conclusions, evaluation checklists, persistence; Common Citation Styles

Text Book:

1. Kothari, C. R. (2004): Research Methodology: Methods and Techniques, New Age International Private Limited Publishers, New Delhi.

Reference Book:

❖ Guthrie, G. (2010): Basic Research Methods, Sage Publications India Private Limited, New Delhi.

DSE-5.4 : INTRODUCTORY ECONOMETRICS

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT - I: Introduction

Definition, Nature and scope of econometrics; Theoretical Probability Distributions: Binomial, Poisson and Normal distributions: their properties Theory of Estimation: Estimation of parameters; properties of estimators – small sample and asymptotic properties; point and interval estimation.

UNIT - II: Hypothesis Testing

Testing of hypotheses: defining statistical hypotheses; Simple and composite hypotheses; Null and alternative hypothesis; Type I and Type II errors, Critical region; Neyman-Pearson lemma; Power of a test; Test statistics: z, chi square, t and F.

UNIT - III: Linear Regression Analysis

Two variable linear regression model – Assumptions; Least square estimates, Variance and covariance between Least square estimates; BLUE properties; Standard errors of estimates; Coefficient of determination; Inference in a two variable linear regression model; ANOVA; Forecasting. Introduction to multiple regression models.

UNIT - IV: Violation of Classical Assumptions

Heteroscedasticity, Multicollinearity and Auto-correlation: Meaning, consequences, tests and remedies.

Text Book:

1. Gujarati, D & Sangeetha (2007); "Basic Econometrics", McGraw Hill Book Co.

OR

DSE-5.4 : ODISHA ECONOMY

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT - I: Odisha Economy before 1947

Orissa's Economy in the Nineteenth Century: Benevolence or Exploitation, Forces of Nature, Animal Power, The Company Steps in, Public Works and Public Health, Education, Disintegration of Village Economy, New Social Environment, Changing Position of Social Classes, The Moneylenders, The Borrowers, Money-flows from Village to Metropolis, Pauperization of Peasantry, The Wage Earners, Demographic Changes, Profiting from Rural Adversity; Diarchy in 1919 and Separation of Provincial Finances from Central Government in 1937; Emergence of Federal Finance (Ref.: Das 1976a and 1976b, GoO 2016).

UNIT - II: Macro Economy of Odisha

A macro glance of Odisha economy: aggregate income, broad sectoral decomposition, performance of districts, employment, child labour and bonded labour, employment programmes, consumption expenditure, cost of living; Odisha State public finances (Chapter 14 and 15 of Ref 1; & Chapter 2 and 9 of Ref 2).

UNIT - III: Agriculture, Industry, Infrastructure and Environment in Odisha

Agriculture: land ownership and land tenure, agricultural wages and rural unemployment, production and productivity of major crops, agricultural inputs, agricultural policy; Animal Husbandry; Fisheries (Chapter 1 to 3 of Ref 1; & Chapter 3 of Ref 2)

Industry: Investment, industrial policy, and the growth of large industries, mining and quarrying; Construction; tertiary sector: tourism, transport and power; Water Resources, Forest Resources (Chapter 4 to 8 of Ref 1; & Chapter 4 & 5 of Ref 2).

UNIT - IV: Social Sector in Odisha

Poverty: income poverty and inequality; health sector: outcomes, infrastructure, finance, public health, NRHM; education: Literacy, Primary education, secondary education, higher education, SSA; human development (Chapter 9 to 13 of Ref 1; & Chapter 7 & 8 of Ref 2).

DSE-6.3 : APPLIED ECONOMETRICS

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I :
Stages in Empirical Econometric Research

UNIT-II : Regression Diagnostics and Specification
Misspecification; functional forms; model selection.

UNIT-III : Advanced Topics in Regression Analysis
Selected Topics: Dynamic Econometric Models: distributed lag models; autoregressive models; instrumental variable estimation; simultaneous equation models.

UNIT-IV : Panel Data Models
Methods of estimation; fixed effects model; random effects model.

UNIT-V : Introduction to Econometric Software Package
Use of econometric software, types of software packages. Use and features of GRETL, SHASAM, & SPSS.

Suggested Books:

1. Jeffrey M. Wooldridge, *Econometrics*, CENGAGE learning, India Edition, 2009.
2. Dimitrios Asteriou and Stephen Hall, *Applied Econometrics: A Modern Approach*, Palgrave Macmillan, 2007.
3. Damodar Gujarati, *Econometrics by Example*, Palgrave Macmillan, 201

OR

DSE-6.3 : ENVIRONMENTAL ECONOMICS

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT - I: Economy and Environment
Nature and Scope of Environmental Economics- Environment and Economy interaction; Environment as a public good- Serious environmental problems of Developing Countries – Air pollution, water pollution and deforestation. Global environmental problems, trade and environment, International Cooperation for Environmental Protections, Montreal and other protocols.

UNIT - II: The Economics of Pollution and Climate change
Pollution as externality, The market Approach to optimal pollution, Property rights and market bargain theorems, Coase theorem; Pigouvian Taxation, Subsidies and optimal pollution; Climate change – concept, causes, effects and management.

UNIT - III: Valuation of Environmental Damage
Methods and difficulties of environmental valuation, Economic value, Use value, Option value, Existence value; Direct and Indirect Valuation of Environmental Goods: The hedonic price approach, Contingent valuation, Travel cost approach.

UNIT - IV: Natural Resources and Sustainable Development
Natural resources- Renewable and exhaustible; Tragedy of commons, People's Participation in the management of common property resources; Sustainable Development Concepts, Sustainability rules, Indicators of sustainability, Solow/Hartwick, Natural capital stock, Safe Minimum Standard.

Text Book:

1. Bhattacharya, R. N. (2002): Environmental Economics: An Indian Perspectives, OUP, New Delhi

Reference Book:

❖ Kolstad, C.D (1999); Environmental Economics Oxford University Press, New Delhi

C-1.2 : INTRODUCTION TO SOCIO-CULTURAL ANTHROPOLOGY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I :

Anthropological perspective and orientation; Scope and relevance of Social Anthropology; Relationship of Social Anthropology with other disciplines. Its distinction from sociology

UNIT - II :

Concepts of society and culture; status and role; groups and institution, social stratification, and civil society

UNIT - III :

Social organization; social structure; social function; social system

UNIT - IV :

Theory and practice of ethnographic fieldwork; survey method; comparative and historical methods

PRACTICAL

Methods and Techniques of Social Anthropology: The practical will include the following techniques and methods in collection of data in Social Anthropology.

1. Observation
2. Interview
3. Questionnaire and Schedule
4. Case study
5. Life history

Text book recommended :

1. Ember C. R. et al. (2011). *Anthropology*. New Delhi: Dorling Kindersley.
2. Haviland, Prins, Walrath, McBride (2008). Cultural Anthropology. Cengage Learning India Pvt. Ltd., New Delhi.
3. Kapadia, K.M, 1966, Marriage and Family in India, Oxford University Press, London
4. Murdock, G.P. 1949, Social structure, Macmillan Co. London
5. Tylor, E. B. 1920 (originally in 1871), Primitive Culture, New York: J.

Suggested Readings :

- Beattie J. (1964). Other Cultures. London: Cohen & West Limited.
- Bernard H.R. (1940). Research Methods in Cultural Anthropology. Newbury Park: Sage Publications.
- Davis K. (1981). *Human Society*. New Delhi: Surjeet Publications.
- Delaney C. (2004). *'Orientation and disorientation' In Investigating Culture: An Experiential Introduction to Anthropology*. Wiley-Blackwell.
- Ferraro G. and Andreatta S. (2008). In *Cultural Anthropology: An Applied Perspective*. Belmont: Wadsworth.
- Karen O'reilly. (2012). *'Practical Issues in Interviewing' Ethnographic Methods*. Abingdon: Routledge
- Lang G. (1956). 'Concept of Status and Role in Anthropology: Their Definitions and Use. *The American Catholic Sociological Review*, 17(3): 206-218
- O'reilly K. (2012). *Ethnographic Methods*. Abingdon: Routledge.
- Parsons T. (1968). *The Structure of Social Action*. New York: Free Press
- Rapport N. and Overing J. (2004). *Key Concepts in Social and Cultural Anthropology*. London: Routledge.
- Royal Anthropological Institute of Great Britain and Ireland (1971). *'Methods' In Notes and Queries on Anthropology*. London: Routledge & Kegan Paul Ltd.

SEMESTER-II

C-2.1 : ARCHAEOLOGICAL ANTHROPOLOGY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I :

Introduction, Definition and scope of archaeological anthropology; Relation with other disciplines; Methods of studying archaeological anthropology.

UNIT - II :

Methods of Estimation of Time and Reconstruction of the Past; Absolute dating methods: Radiocarbon14 dating (C14), Potassium-Argon, Dendochronology, Fission Track Dating; Relative dating methods: Stratigraphy, Palaeontology, Palynology.

UNIT - III :

Geochronology of Pleistocene Epoch; Glacial and Interglacial; Pluviation and Inter Pluviation; Different types of geoclimatic events.

UNIT - IV :

Understanding Culture; Technique of tool manufacture and estimation of their relative efficiency; Classification of tools: primary and combination of fabrication techniques; Earliest evidence of culture in the World: Konso, Olorgesaille, Olduvai Gorge, Pirro Nord, Dmanisi, Attirampakkam, Isampur, Kuliana.

PRACTICAL

Typo-technological Analysis of Prehistoric Tools: Identification, Interpretation and Drawings of the tool Types

1. Core Tool Types

2. Flake Tool Types
3. Blade Tool Types
4. Microlithic Tool Type
5. Neolithic Tool Type

Text book recommended :

1. Bhattacharya D.K. (1990). *An introduction to Prehistoric Archaeology, Delhi,* Hindustan Publishing Corporation..
2. Rammi Reddy, V. 1987. Elements of Prehistory, New Delhi: Mittal Publications
3. Sankalia H.D. (1964). *Stone Age Tools.* Poona Deccan College

Suggested Readings :

- Allchin and Allchin (1993). *The Rise of Civilization of India and Pakistan*. Cambridge
- University Press
- Bhattacharya D.K. (1978). *Emergence of Culture in Europe*, Delhi, B.R. Publication.
- Bhattacharya D.K. (1979). *Old Stone Age Tools and Techniques*. Calcutta, K.P. Bagchi Company
- Bhattacharya D.K. (1996). *Palaeolithic Europe*. Netherlands, Humanities Press.
- Champion et al. (1984). *Prehistoric Europe*. New York, Academic Press.
- Fagan B.M. (1983). *People of Earth: An Introduction*. Boston, Little, Brown & Company.
- Phillipson D. W. (2005). *African Archaeology*. Cambridge, Cambridge University Press.
- Renfrew, C. and Paul Bahn 1996, Archaeology: Theory, Method and Practice: Thames & Hudson ... London

SEMESTER-III

C-3.1 : TRIBES AND PEASANTS IN INDIA

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I :

Definition and Concept of Tribe; Problems of nomenclature, distribution and classification; Features of tribes in India.

UNIT - II :

Tribes in India. The history of tribal administration; Constitutional safeguards; Draft of National Tribal Policy, Issues of acculturation assimilation and integration; Impact of development schemes and programme on tribal life.

UNIT - III :

Concept of Indian Village; The concept of peasantry; Approaches to the study of peasants – economic, political and cultural. Characteristics of Indian village: social organization; economy and changes. Caste system and its changes in the Indian society.

UNIT - IV :

Ethnicity Issues: Tribal and peasant, movements; Identity issues.

PRACTICAL

Reading of Ethnography: Students are required to read and analyze any two of the ethnographies (as listed below) and prepare a report based upon it. The report should clearly link up the study with the concept of tribe and peasantry and delineate clearly the concept used in the text.

1. Research questions/objectives of the study and their relevance.
2. Theoretical schema.
3. Methods and techniques used in the study.
4. Key findings and their significance in the context of the objectives of the study.
5. Critical analysis of the finding on the basis of contemporary available resources.

List of Ethnographies :

1. Walker A. (1986). *The Todas.* Delhi : Hindustan Publishing Corporation
2. Verrier Elwin (1992). The *Muria and their Ghotul.* USA: Oxford University Press.
3. Malinowski M. (1922). *Argonauts of the Western Pacific.* London: Routledge and Kegan Paul Ltd.
4. Furer- Haimendorf C.V. (1939). *The Naked Nagas.* London: Methuen and Co.
5. Evans-Pritchard E.E. (1940). *The Nuer: A Description of the Modes of Livelihood and Political Institutions of a Nilotic* People. Oxford : Clarendon Press.
6. Majumdar D. N. (1950). *Affairs of tribes.* Lucknow: Universal Publishers Ltd.
7. Dube S.C. (1955). *Indian Village.* London: Routledge and Kegan Paul Ltd.
8. Berreman G.D. (1963). *Hindus of the Himalayas.* Berkeley: California University Press.

Suggested Readings :

- Gupta D. (1991). Social Stratification. Oxford University Press: Delhi.
- Madan V. (2002). The Village in India. Oxford University Press: Delhi.
- Nathan D. (1998). Tribe-Caste Question. Simla: IIAS.
- National Tribal Policy (draft). (2006). Ministry of Tribal Affairs. Government of India.
- Patnaik S.M. (1996). Displacement, Rehabilitation and Social change. Inter India Publication, Delhi.
- Shah G. (2002). Social Movement and the State. Delhi: Sage.
- Shanin T. (1987). Peasants and Peasantry. New York, Blackwell.
- Vidyarthi L.P. and Rai B.K. (1985) Tribal Culture in India, New Delhi, Concept Publishing Company.
- Wolf E. (1966). Peasants. NJ, Prentice Hall.

C-3.3 : BIOLOGICAL DIVERSITY IN HUMAN POPULATIONS

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I :

Concept of Biological Variability; Sources of Genetic Variation; Structuring Genetic Variation; Interpretation of Human Variation, Genetic Polymorphism (Serological, Biochemical and DNA Markers).

UNIT - II :

Concept of Race and UNESCO Statement on Race, A Comparative account of various races of the world. A critical appraisal of contribution of Risley, Guha, Rickstett and Sarkar towards understanding ethnic elements in the Indian populations.

UNIT - III :

Demographic Anthropology: meaning and scope, Sources of Demographic Data, Demographic Processes, Demographic profile of Indian populations and its growth structure. National population policy.

UNIT - IV :

Role of Bio-cultural Factors: Bio-cultural factors influencing the diseases and nutritional status; Evolution of Human diet, biological perspectives of ageing process among different populations.

PRACTICAL
(ANY TWO)

1. Craniometric Measurements (Skull & Mandible)
2. Determination of A, B, O; and Rh blood groups of ten subjects.

3. Analysis and interpretation of finger ball pattern types, palmar main lines and pattern index; Finger print classification and development of chance prints and statistical treatment of the data collected (Ten Subjects)
4. Collection of demographic data from secondary sources.

Text book recommended :

1. Shukla B.R.K. & Rastogi, S. 1990. *Physical Anthropology & Human Genetics: An Introduction*. Plaka Prakashan. Delhi.
2. Das B.M. 2008. *Outlines of Physical Anthropology*. Kitab Mahal, New Delhi.
3. Sarkar, R. M. 2004. *Fundamentals of Physical Anthropology* (New Edition). Book World. Kolkata.
4. Mukherji, D., D. Mukherjee and P. Bharti and A. Mukhopadhya. 2018. *Laboratory Manual for Biological Anthropology: Revised and Enlarged 2nd Edition*. SCHOLAR Booksellers & Publishers, Kolkata.

Suggested readings :

- Baker P.T. and J.S. Weiner (ed.) (1996) *The Biology of Human Adaptability*. Oxford & New York, Oxford University Press.
- Bhende A. and T. Kantikar (2006) *Principles of Population Studies*. Himalayan Publishing House, Mumbai
- Bogin B. (1999). *Pattern of Human Growth*. 2nd edition CUP.
- Cameron Noel and Barry Bogin (2012) *Human Growth and development*. Second edition, Academic Press Elsevier.
- Eckhardt R.B. (1979) *The Study of Human Evolution*. McGrand Hill Book Company, USA.
- Frisancho R. (1993) *Human Adaptation and Accommodation*. University of Michigan press
- Harrison G.A., Tanner, J.M., Pilbeam, D.R., Baker, P.T. (1988) *Human Biology*. Oxford University Press.
- Jurmain Robert Lynn Kilgore Wenda Trevathan and Ciochon (2010). *Introduction to Physical Anthropology*. Wadsworth Publishing, USA.
- Kapoor A.K. and Satwanti Kapoor (ed) (1995). *Biology of Highlanders*. Jammu, Vinod Publisher & Distributor.
- Kapoor A.K. and Satwanti Kapoor (eds) (2004) *India's Elderly-A Multidisciplinary Dimension*. Mittal Publication, New Delhi.
- Klepinge L.L. (2006). *Fundamentals of Forensic Anthropology*. John Willey & Sons., New Jersey.
- Malhotra K.C. and B. Balakrishnan (1996) *Human Population Genetics in India*.
- Malina Robert M., Claude. Bouchard, Oded. Bar-Or. (2004) Growth, and Physical Activity. *Human Kinetics*.
- Stanford C., Allen, S.J. and Anton, C.S. (2013): *Biological Anthropology*. 3rd edition, Pearson, USA.
- Bhende A. and Kaniikar, T. (2010) *Principles of Population Studies. Himalaya Publishing House*. Mumbai

C-4.2 : HUMAN GROWTH AND DEVELOPMENT

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I :

Concept of human growth, development, differentiation and maturation; Evolutionary perspective on human growth.

UNIT - II :

Prenatal (conception till birth) and postnatal (birth till senescence) period of growth, pattern of normal growth curves, variation from normal growth (canalization, catch-up growth and catch-down growth), ethnic and gender differences in growth curves, secular trend.

UNIT - III :

Bio-cultural factors (genetic, social, and ecological factors) influencing patterns of growth and variation, methods and techniques to study growth, significance/ applicability of growth studies

Nutritional epidemiology-concept of balanced diet, impact of malnutrition (over and under) with special reference to obesity, Kwashiorkor and Marasmus. Assessment of nutritional status.

UNIT - IV :

Human physique and body composition – models and techniques; gender and ethnic differences; Somatotyping and human physique with reference to Sheldon, Parnell, Heath and Carter methods.

PRACTICAL
(ANY TWO)

1. Growth status: Somatometry (stature, body weight, mid upper arm circumference etc), assessment of chronological age, percentile, z-score, height for age, weight for age, BMI for age
2. Obesity assessment: General (BMI, body fat %, Conicity index, body adiposity indices) and regional adiposity indices (WC, WHR, WHtR)
3. Estimation of body composition (fat percentage and muscle mass) with skinfold thickness and bioelectric impedance
4. Nutritional assessment through dietary pattern and anthropometric indices

Text book recommended :

1. Das B.M. 2008. *Outlines of Physical Anthropology*. Kitab Mahal, New Delhi.
2. Mukherji, D., D. Mukherjee and P. Bharti and A. Mukhopadhya. 2018. *Laboratory Manual for Biological Anthropology: Revised and Enlarged 2nd Edition*. SCHOLAR Booksellers & Publishers, Kolkata.

Suggested Readings :

- Bogin B. (1999) Patterns of human growth. Cambridge University Press.

- Frisancho R. (1993) Human Adaptation and Accommodation. University of Michigan Press.
- Cameron N and Bogin B. (2012) Human Growth and Development. Second edition, Academic press Elsevier.
- Harrison GA and Howard M. (1998). Human Adaptation. Oxford University Press.
- Harrison GA, Tanner JM, Pibeam DR, Baker PT. (1988). Human Biology. Oxford University Press.
- Jurmain R, Kilgore L, Trevathan W. Essentials of physical anthropology. Wadsworth publishing.
- Kapoor AK and Kapoor S. (1995) Biology of Highlanders. Vinod Publisher and Distributor.
- Kathleen K. (2008). Encyclopedia of Obesity. Sage.
- Malina RM, Bouchard C, Oded B. (2004) Growth, Maturation, and Physical Activity. Human Kinetics.
- McArdle WD, Katch FI, Katch VL. (2001) Exercise Physiology: Energy, Nutrition, and Human Performance.
- Singh I, Kapoor AK, Kapoor S. (1989). Morpho-Physiological and demographic status of the Western Himalyan population. In Basu and Gupta (eds.). Human Biology of Asian Highland Populations in the global context.
- Sinha R and Kapoor S. (2009). Obesity: A multidimensional approach to contemporary global issue. Dhanraj Publishers. Delhi.

C-4.3 : RESEARCH METHODS

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I :

Field work tradition in Anthropology; Ethnographic approach, contribution of Malinowski, Boas and other pioneers; cultural relativism, ethnocentrism, etic and emic perspectives, comparative and historical methods, techniques of rapport establishment identification of representative categories of informants, maintenance of field diary and logbook.

UNIT - II :

Research Design, Review of literature, conceptual framework, formulation of research problem, formulation of hypothesis, sampling and reference. Genealogy; data analysis and report writing- Chapterization, preparing a text for submission and publication, concepts of preface, notes (end and footnotes), bibliography (annotated) and references cited, review and index.

UNIT - III :

Ethics and Politics of Research, ethical issues in the context of human subject research; privacy and confidentiality in research; Issues of academic fraud and plagiarism, conflicts of interest, authorship and publication.

UNIT - IV :

Basic tenets of qualitative research and its relationship with quantitative research; Types of variables, presentation and summarization of data (tabulation and illustration). Descriptive statistics- Measurers of Central Tendency, standard deviation,

PRACTICAL

1. Construction of Genealogy &Pedigree Analysis.
2. Observation: Direct, Indirect, Participant, Non-participant, Controlled
3. Questionnaire and Schedule, Interview- Unstructured, Structured, Key informant interview, Focussed Group Discussion, and Free listing, pile sorting
4. Case study and life history.

Text book Recommended :

1. Garrard E and Dawson A. What is the role of the research ethics committee? Paternalism

Suggested Readings :

- Bernard H.R. Research Methods in Anthropology, Qualitative and Quantitative Approaches. Jaipur: Rawat Publications. 2006.
- Madrigal L. Statistics for Anthropology. Cambridge: Cambridge University Press. 2012.
- Zar JH. Biostatistical Analysis. Prentice Hall. 2010.
- Michael A. The Professional Stranger. Emerald Publishing. 1996.
- Emerson RM, Fretz RI and Shaw L. Writing Ethnographic Field Notes. Chicago, University of Chicago Press. 1995.
- Lawrence NW. Social Research Methods, Qualitative and Quantitative Approaches. Boston: Allyn and Bacon. 2000.
- O'reilly K. Ethnographic Methods. London and New York: Routledge. 2005.
- Patnaik S.M. Culture, Identity and Development: An Account of Team Ethnography among the Bhil of Jhabua. Jaipur: Rawat Publications. 2011.

C-5.2 : ANTHROPOLOGY IN PRACTICE

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I :

Academic Anthropology; Academics and Practitioners: Differences, Structure, Activities, Controversies and Issues: Applied Anthropology, Action Anthropology and Development Anthropology.

UNIT - II :

Role of Anthropology in Development; Anthropology and Public Policy, Need Assessment and Community Development, Anthropology of NGO's, Business Anthropology, Environment and Community Health, Social and economic sustainability, Cultural resource management.

UNIT - III :

Future Dynamics in Anthropology; Trends in Anthropology: Anthropology of Tourism, Anthropology in Census; Designing And Fashion, Visual Anthropology.

UNIT - IV :

Biosocial anthropology in practice; Bio-social elements of human development at national and international level, application of conceptual framework of Forensic Anthropology in judicial settings both criminal and civil, Population Dynamics and relationship between population growth and various aspects of culture such as means of subsistence, kinship, social complexity, social stratification and political organization, Biosocial counselling of an individual or population.

PRACTICAL

1. The students will visit a NGO or corporate office or census office in Odisha and its adjoining areas and write principal observations on the same.
2. Write a project on constitutional provisions or evaluation of any development project/report.
3. Draw a scene of crime and identify the various evidences in a portrayed crime scene.
4. Write a project on Religious Tourism / Tribal Tourism / Health Tourism / Fashion / Human Rights / Ecotourism.
5. Write a project on the demographic profile from secondary data.
6. Collect data on bio-social problem and design counselling and give the analysis and interpretation.

Text Books Recommended:

1. Vidyarthi V (1981). Tribal Development and its Administration. Concept Publishing Company, New Delhi.
2. Vidyarthi LP. (1990). Applied Anthropology in India – Principles, Problems and Case Studies. Kitab Mahal, U.P.
3. Vidyarthi LP and BN Sahay (2001). Applied Anthropology and Development in India, National Publishing House, New Delhi.

Suggested Readings

- Arya A and Kapoor AK. (2012). Gender and Health Management in Afro-Indians. Global Vision Publishing House, New Delhi.
- Ervic, Alxander M., (2000). Applied Anthropology: Tools and Perspectives for Contemporary Practice, Boston, MA: Allyn and Bacon.
- Erwin A. (2004). Applied Anthropology Tools and Practice, Allyn and Bacon.
- Goodale M. (2009). Human Rights: An Anthropological Reader. Wiley Blackwell.
- Gupta S and Kapoor AK. (2007). Human Rights, Development and Tribe. In : Genes, Environment and Health – Anthropological Perspectives. K. Sharma, R.K. Pathak, S. Mehra and Talwar I (eds.). Serials Publications, New Delhi.
- Margaret AG. (2003). Applied Anthropology: A Career-Oriented Approach, Boston, MA: Allyn and Bacon.
- Kapoor AK and Singh D. (1997). Rural Development through NGO's. Rawat Publications, Jaipur.
- Kumar RK and Kapoor AK. (2009). Management of a Primitive Tribe: Role of Development Dynamics. Academic Excellence, Delhi.

SEMESTER-VI

C-6.1 : FORENSIC ANTHROPOLOGY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I:

Introduction to Forensic Anthropology: Definition, Brief History, Scope, Applications and Integration of Forensic Anthropology. Crime……

UNIT - II:

Basic Human Skeletal Biology, Identification of Human and Non-Human Skeletal Remains,
Ancestry, age, sex and stature estimation from bones. Discovery and Techniques for recovering skeletal Human Remains.

UNIT - III:

Personal Identification, Complete and Partial Identification, Methods of Identification in
Living Persons: Somatometry, Somatoscopy, Occupational Marks, Scars, Bite Marks, Tattoo Marks, Fingerprints, Footprints, Lip Prints, Nails, Handwriting, Deformities and Others.

UNIT - IV:

Serology: Identification and Individualization of bloodstain, urine, semen and saliva. Forensic Odontology-Tooth Structure and Growth, Bite Marks, and DNA Profiling.

PRACTICAL

1. Study of Human Long Bones. Estimation of age, sex and stature from bones.
2. Somatometric and Somatoscopic Observation on living persons.
3. Identification of bloodstain, urine, semen and saliva.
4. Examination & of Fingerprints and Handwriting.

Text book recommended :

1. Mukherji, D., D. Mukherjee and P. Bharti and A. Mukhopadhya. 2018. *Laboratory Manual for Biological Anthropology: Revised and Enlarged 2nd Edition*. SCHOLAR Booksellers & Publishers, Kolkata.

Suggested Readings :

- Bass W.M. (1971). Human Osteology: A Laboratory and Field manual of the Human Skeleton. Columbia: Special Publications Missouri Archaeological Society.
- Black S. and Ferguson E. (2011). *Forensic Anthropology 2000 to 2010.* CRC Press, London.
- Byers, S. N. (2008). Forensic Anthropology. Boston: Pearson Education LTD.
- Gunn A. (2009) *Essential Forensic Biology* (2nd ed). Chichester: Wiley-Blackwell
- Modi, R. B. J. P. (2013). *A Textbook of Medical Jurisprudence and Toxicology*. Elsevier.
- Reddy V. R. (1985). Dental Anthropology, Inter-India Publication, New Delhi.
- Spencer, C. (2004). Genetic Testimony: A Guide to Forensic DNA Profiling, Pearson, New Delhi.
- Vats Y., Dhall J.K. and Kapoor A.K. (2011). Gender Variation in Morphological Patterns of Lip Prints among some North Indian Population. *J. Forensic Odontology*, 4: 11-15.
- Wilkinson, C. (2004). *Forensic facial reconstruction*. Cambridge University Press.
- Nath, Surendra. Forensic Anthropology. Kitab Mahal, New Delhi.

C-6.2 : FIELD WORK AND DISSERTATION

Full Marks – 100

Empirical study among the tribal, rural and urban communities of Odisha is to be conducted for a minimum period of 21 days in semester VI under the guidance of a teacher or teachers. Two copies of dissertations are to be submitted for examination on the basis of fieldwork and presentation of seminar. The Examination of Dissertation shall be conducted by an internal and an external examiner.

Mid-term Examination **= 15 marks**
(Seminar presentation by the student based on his/her fieldwork/field topic)

End-term Examination
Dissertation based on 21 days fieldwork **= 60 marks**
Field diary (15 marks) and Viva-voce (10 marks) **= 25 marks**

*The dissertation has to be submitted by the student positively before the end semester examination. The dissertation will be evaluated both by the internal and external examiners

DSE-6.3(A) : ANTHROPOLOGY OF INDIA

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT - I :

Origin, history and development of Anthropology in India, approaches to study Indian society and culture-traditional and contemporary Racial and linguistic elements in Indian population. Understanding the diversity of Indian social structure - concept of Varna, Jati, Caste, Ashram or purusharatha, gender hierarchies - their economic and cultural impact, origin and evolution of social structures and their underlying philosophies; Contribution of contemporary biological, social and archaeological anthropologists in India.

UNIT - II :

Aspects of Indian Village –social organisation, agriculture and impact of market economy on villages; Tribal situation in India- biogenetic variability, linguistic and socio-economic characteristics; Problems of tribal peoples, land-alienation, indebtedness, lack of educational facilities, shifting-cultivation, migration, forests and tribal unemployment, health and nutrition, tribal movement and quest for identity

UNIT - III:

Developmental projects- tribal displacements and rehabilitation problem; Impact of culture-contact, urbanization and industrialization on tribal and rural Population; Basic concepts -Great tradition and little tradition, sacred complex, Universalization and parochialization, Sanskritization and Westernization, Dominant caste, Tribe-caste; continuum, Nature-Man-Spirit complex, pseudotribalism.

UNIT - IV :

Problems of exploitation and deprivation of scheduled caste/ tribe and Other Backward Classes. Constitutional Provisions for the Scheduled caste and scheduled tribes, Evaluation and Development of Indian Population; Human Rights, Protection and enforcement of human rights, Human rights of special category and marginal groups, Emerging trends of human rights with respect to terrorism, globalization and environment.

PRACTICAL

1. Identify various traits/variables which can be used in racial classification and comment on its relevance.
2. Review a book/edited volume on Indian social structure such as caste, religion, tribe or rural population and give its salient features.
3. Explore the biological diversity of any population group considering a minimum of five genetic traits.
4. Highlight the contributions of any two contemporary Indian anthropologists.

Text book recommended :

1. Dube SC. (1992). Indian Society. National Book Trust, India : New Delhi.
2. Malhotra K.C. (1978). Morphological Composition of people of India. J. Human Evolution.
3. Trautmann T.R (2011). India: Brief history of Civilization. Oxford University Press : Delhi

Suggested Reading :

- Nichola, S D. (2001). Castes of Mind: Colonialism and the Making of Modern India. Princeton University Press.
- Bernard C.S. (2000). India: The Social Anthropology of Civilization. Delhi: Oxford University Press.
- Bhasin M.K, Watter H and Danker-Hopfe H. (1994). People of India – An Investigation of Biological variability in Ecological, Ethno-economic and Linguistic Groups. Kamla Raj Enterprises, Delhi
- Lopez D.S. (1995). Religions of India in Practice. Princeton University Press

DSE-6.4 : MUSEUM AND MUSEOLOGY

Full Marks – 100
Mid Sem – 15/1 hr
End Sem Project – 85/3 hrs

A report will be prepared by visiting an Anthropological Museum and doing empirical study on ethnographic specimens of material cultures of tribal, rural communities of Odisha. The museum visit is to be conducted for a minimum period of 10 days in Semester V under the guidance of a teacher or teachers. Two copies of report are to be submitted for examination on the basis of museum visit. The Examination of Report shall be conducted by an internal and an external examiner.

Mid- term Examination (Each student has to answer one elective question of **15 marks** from the two units on Museum and Museology given below for the Mid Term Examination) **= 15 marks**

End – term Examination=85 marks

Report* on 10 days Museum visit of anthropological /tribal/cultural museums **= 60 marks**
Practical Record on ethnographic Specimens of material culture **= 15 marks**
Viva- Voce **= 10 marks**

The Report on 10 days Museum visit of an Anthropological Museum has to be submitted by the student positively before the end semester examination. The Report* will be evaluated both by the internal and external examiners.

MUSEOLOGY: The students are to be taught on the following aspects **Museum and of Museology** pertaining to perspectives of Museology and the basic principles of museum:

Unit – I : Museums : Meaning and scope; History and development of museums in India; Types of Museums in India; Role of Anthropological museums in education.

Unit –II: Museology and Basic Principles of Museum: Modes and ways of acquisition of museum specimens; Principles of display and arrangement in museum; Basic principles of museum, Documentation, labeling, display of the museum specimens of material cultures of tribal and rural people.

Each student has to answer one elective question of **15 marks** from the above aspects of Museum and Museology in the Mid Term Examination.

The students are required to learn the basic principles of museum, documentation, labelling and display of the museum specimens of material cultures of tribal and rural people. Each student has to apply the above methods, whichever is applicable, on specimens of following materials.

a. Plant remains: Wood, Bamboo
b. Fibre remains: Cloth/ Linen
c. Metal remains: iron, brass, copper, silvers.
d. Animal remains: Bone, antler, horn, leather/hide

Maintaining proper **Laboratory Record** is compulsory. Each student has to submit a proper and complete Laboratory Record is compulsory. Each student has to submit a proper and complete laboratory record duly signed by the teacher who is assigned to teach this aspect. The students are required to submit their Laboratory Records at least five days before the conduct of practical examination. Defaulters of the same are neither allowed to appear the practical examination nor entitled to get the marks assigned to Practical Records.

Books Recommended:

1. Basa K.K., Md. Rehan, R.K. Gupta 2007, *Museology A Comprehensive Bibliography and Webliography*, Serial Publications, New Delhi.
2. Behera B.K. and S.K. Mohanty, 2007 *Museology and Museum Management in India*, Mayur Publications, Bhubaneswar, Odisha
3. Bhatnagar, A. 1999, *Museum, Museology and new Museology, Sandeep Prakashan*, New Delhi.

Suggested Readings:

- Aiyappan, A. and S.T. Satyamurti (Ed), 1960, *Handbook of Museum Technique*, Government Museum, Madras.
- Diwvedi, V.P. and G.N Pant (Ed) 1980, *Museum and Museology: New Horizon*, Agam Kala Prakashan, New Delhi.
- Ghoshmaulik, and S.K Mishra 1987, *Practical Anthropology*, SAAS, Orissa.
- Ghoshmaulik, S.K and K.K Basa (Ed)2001, *Understanding Heritage; Role of Museum, Academic staff college*, Utkal University, Bhubaneswar, India.
- Nair, S.M., *Bio-Deteriorations of Museum Materials*, Agam Kala Prakashan, New Delhi.
- Nigam,M.L. 1985 *Fundamentals of Museology*, Deva Publications, Hydrabad.
- Renfraw, C. and P. Bahn *Archaeology; Theories, Methods and Practice*
- Shankalia, H.D. *Stone Age Tools and Techniques*, Deccan college Poona, India

SEMESTER-II

C-2.1 : MYCOLOGY AND PHYTOPATHOLOGY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

i. Introduction to true fungi: Definition, General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification.
ii. Zygomycota: General characteristics; Ecology; Thallus organisation; Life cycle with reference to *Rhizopus*.
iii. Ascomycota: General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; life cycle and classification with reference to *Saccharomyces, Aspergillus, Penicillium*, and *Neurospora*.
iv. Basidiomycota: General characteristics; Ecology and Classification; Life cycle of *Puccinia* and *Agaricus*.

UNIT-II

i. Allied Fungi: General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.
ii. Oomycota: General characteristic; Ecology; Life cycle and classification with reference to *Phytophthora*, and *Albugo*.
iii. Symbiotic associations: Lichen – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction. Mycorrhiza-Ectomycorrhiza, Endomycorrhiza and their significance. Economic importance of Lichens.

UNIT-III

Applied Mycology: Role of fungi in biotechnology, Mushroom cultivation, Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology.

UNIT-IV

Phytopathology: Terms and concepts; General symptoms; Geographical distribution of diseases; etiology; symptomology; Host- Pathogen relationships; disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine. Bacterial diseases – Citrus canker and angular leaf spot disease of Cotton. Viral diseases – Tobacco Mosaic, Vein Clearing. Fungal diseases – Early blight of potato, Loose and covered smut.

PRACTICAL

i. Introduction to the world of fungi (Unicellular, coenocytic/ septate mycelium, ascocarps & basidiocarps).
ii. *Rhizopus*: study of asexual stage from temporary mounts and sexual structures through permanent slides.
iii. *Aspergillus, Penicillium* and *Saccharomyces* : study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.
iv. *Puccnia :* Study of different stages from temporary mounts and permanent slides.
v. *Agaricus*: Specimens of button stage and full grown mushroom; sectioning of gills of *Agaricus*, and fairy rings are to be shown.
vi. *Albugo:* Study of symptoms of plants infected with *Albugo*; asexual phase study through section/ temporary mounts and sexual structures through permanent slides.
vii. *Phytopathology*: Herbarium specimens of bacterial diseases; Citrus Canker; Viral diseases: Mosaic disease of ladies finger, papaya, cucurbits, moong, black gram, Fungal diseases: Blast of rice, Tikka disease of ground nut, powdery mildew of locally available plants and White rust of crucifers.

Text Books:

1. Mishra, B. K. (2017), Mycology and Phytopathology, Kalyani Publishers, New Delhi.

Reference Books:

❖ Sharma, P. D. (2017). Mycology and Phytopathology Rastogi Publication, Meerut.
❖ Agrios, G.N. (1997) Plant Pathology, 4th edition, Academic Press, U.K.
❖ Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition.
❖ Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.
❖ Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
❖ Mehrotra, R. S.(2011). Plant Pathology. Tata Mc Graw-Hill Publishing Company Limited, New Delhi

C-3.2 : ECONOMIC BOTANY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

i. Origin of Cultivated Plants: Concept of Centres of Origin, their importance with reference to Vavilov's work. Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity.
ii. Cereals: Cultivation and brief account of Wheat, Rice and millets.
iii. Legumes: General account, importance to man and ecosystem.
iv. Sugars & Starches: Morphology, cultivation and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, cultivation, propagation & uses.

UNIT-II

i. Spices: Listing of important spices, their family and part used, economic importance with special reference to fennel, saffron, clove and black pepper Beverages: Tea, Coffee (morphology, processing & uses)
ii. Drug-yielding plants: Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis.
iii. Tobacco: Tobacco (Morphology, processing, uses and health hazards)

UNIT-III

i. Oils & Fats: General description, classification, extraction, their uses and health implications groundnut, coconut, linseed and *Brassica* (Botanical name, family & uses)
ii. Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.

UNIT-IV

i. Natural Rubber: Para-rubber: tapping, processing and uses.
ii. Timber plants: General account with special reference to teak and pine. Fibers: Classification based on the origin of fibers, Cotton and Jute (morphology, extraction and uses).

PRACTICAL

1. Cereals: Rice (habit sketch, study of paddy and grain, starch grains).
2. Legumes: Soya bean/moong bean/black gram, Groundnut, (habit, fruit, seed structure, micro-chemical tests).
3. Sugars & Starches: Sugarcane (habit sketch; cane juice- micro-chemical tests), Potato (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, starch grains, micro-chemical tests).
4. Spice and Beverages: clove, black pepper,Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).
5. Oils & Fats: Groundnut, Mustard–plant specimen, seeds; tests for fats in crushedseeds.
6. Drug-yielding plants: Specimens of *Digitalis, Papaver* and *Cannabis.*
7. Woods: *Tectona*, *Pinus*/Sal: Specimen, Section of young stem.
8. Fiber-yielding plants: Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).

Text Books:

1. B. P. Pandey, (2017) Economic Botany. S. Chand Publication, New Delhi.

Reference Books:

- Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
- Samba Murty, A.V.S.S. and Subrahmanyam, N.S. (2011). Text Book of Modern Economic Botany, CBS Publishers and Distributors, New Delhi.
- Hill, Albert F. Economic Botany, Tata Mc Grow Hill Publishing Company, Ltd. New Delhi.
- Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
- Singh, V., Pandey, P.C. and Jain, D.K. (2017). Economic Botany, Rastogi Publication, Meerut.
- Baruah, B. (2017). Economic Botany, Kalyani Publishers, New Delhi.

DSE-5.3 : ANALYTICAL TECNIQUES IN PLANT SCIENCES

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

Imaging and related techniques: Principles of microscopy; Light microscopy; Fluorescence microscopy; Flow cytometry (FACS); Transmission and Scanning electron microscopy –sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

UNIT-II

Cell fractionation: Centrifugation: Differential and density gradient centrifugation, sucrose densitygradient, CsCl2gradient, analytical centrifugation, ultracentrifugation. Radioisotopes: Use in biological research, auto-radiography, pulse chase experiment. Spectrophotometry: Principle and its application in biological research.

UNIT-III

Chromatography: Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ion-exchange chromatography; Molecular sieve chromatography; Affinity chromatography. Characterization of proteins and nucleic acids: Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE

UNIT-IV

Biostatistics: Statistics, data, population, samples, variables, parameters; Representation of Data: Tabular, Graphical; Measures of frequency and central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variance, standard deviation; Chi-square test for goodness of fit. Test of significance: comparison of large, small and paired samples (T-Test) and correlation.

PRACTICAL

1. Study of different microscopic techniques for chromosome study
2. Study of PCR Demonstration.
3. To separate pigments by paper chromatography.
4. To separate phytochemicals by thin layer chromatography.
5. To estimate protein through Lowry's methods.
6. To separate proteins using PAGE.
7. To separate DNA (marker) using AGE.
8. Spectrometric estimation of total sugar by Anthrone method.
9. Chi-square analysis of mendelian ratio.
10. T-Test.

Text Books:

1. Patil, C. S. (2017). Advanced Analytical Techniques, ABE Books, New Delhi.

Reference Books:

- Plummer, D.T. (1996). An Introduction to Practical Biochemistry. Tata McGraw-Hill Publishing Co. Ltd. New Delhi. 3rd edition.
- Ruzin, S.E. (1999). Plant Micro technique and Microscopy, Oxford University Press, New York. U.S.A.
- Ausubel, F., Brent, R., Kingston, R. E., Moore, D.D., Seidman, J.G., Smith, J.A., Struhl, K. (1995). Short Protocols in Molecular Biology. John Wiley & Sons. 3rd edition.

- Zar, J.H. (2012). Biostatistical Analysis. Pearson Publication. U.S.A. 4th edition.
- Aneja, K. R. (2014). Laboratory manual of microbiology and biotechnology, Medtech, New Delhi

C-6.2 : PLANT BIOTECHNOLOGY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

Plant Tissue Culture: Historical perspective; Aseptic tissue culture techniques, Composition of media; Nutrient and hormone requirements (role of vitamins and hormones). Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation).

UNIT-II

Recombinant DNA technology-I: Restriction Endonucleases (History, Types I-IV, biological role and application); Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC and briefly PAC, MAC, HAC). Gene Cloning (Recombinant DNA, Bacterial Transformation and selection of recombinant clones, PCR-mediated gene cloning).

UNIT-III

Recombinant DNA technology-II: Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; Probes-oligonucleotide, heterologous, Methods of gene transfer- *Agrobacterium*-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).

UNIT-IV

Applications of Biotechnology: Pest resistant (Bt-cotton); herbicide resistant plants (Round Up Ready soybean); Transgenic crops with improved quality traits (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines; Industrial enzymes (Aspergillase, Protease, Lipase); Genetically Engineered Products–Human Growth Hormone; Humulin; Biosafety concerns.

PRACTICAL

1. a) Preparation of tissue culture (MS) medium.
   b) Demonstration of *in vitro* sterilization and inoculation methods using leaf and nodal explants of tobacco, *Datura*, *Brassica* etc.
2. Study of another culture through photographs.
3. Preparation of artificial seeds.
4. Study of Bt cotton through photographs.
5. Isolation of plasmid DNA.
6. Gel electrophoresis (demonstration).

Text Books:

1. Chawla, H. S. (2010). Introduction to Plant Biotechnology. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Reference Books:

- Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
- Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
- Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A.

DSE-6.3 : HORTICULTURAL PRACTICES AND POST-HARVEST TECHNOLOGY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

i. Introduction: Scope and importance, Branches of horticulture; Role in rural economy and employment generation; Importance in food and nutritional security; Urban horticulture and ecotourism.
ii. Ornamental plants: Types, classification (annuals, perennials, climbers and trees); Identification and salient features of some ornamental plants [rose, marigold, gladiolus, carnations, orchids, poppies, gerberas, tuberose, sages, cacti and succulents (*Opuntia*, *Agave* and spurges)]

UNIT-II

i. Fruit and vegetable crops: Production, origin and distribution; Description of plants and their economic products; Management and marketing of vegetable and fruit crops.
ii. Horticultural techniques: Application of manure, fertilizers, nutrients and PGRs; Weed control; Biofertilizers, biopesticides; Irrigation methods (drip irrigation, surface irrigation, furrow and border irrigation); Hydroponics; Propagation Methods: asexual (grafting, cutting, layering, budding), sexual (seed propagation), Scope and limitations.
iii. Landscaping and garden design : Planning and layout (parks and avenues); gardening traditions - Ancient Indian, European, Mughal and Japanese Gardens; Urban forestry; policies and practices.

UNIT-III

i. Post-harvest technology: Importance of post harvest technology in horticultural crops; Evaluation of quality traits; Harvesting and handling of fruits, vegetables and cut flowers; Principles, methods of preservation and processing; Methods of minimizing loses during storage and transportation;
ii. Disease control and management : Field and post-harvest diseases; Identification of deficiency symptoms; remedial measures and nutritional management practices; Crop sanitation; IPM strategies (genetic, biological and chemical methods for pest control); Quarantine practices;

UNIT-IV

Horticultural crops - conservation and management: Documentation and conservation of germplasm; Role of micropropagation and tissue culture techniques; Varieties and cultivars of various horticultural crops; IPR issues; National, international and professional societies and sources of information on horticulture.

PRACTICAL

1. Identification and description of salient features of ornamental plants included in the syllabus.
2. Horticultural techniques (Drip irrigation, surface irrigation, furrow and border irrigation).
3. Study of practice of asexual propagation methods (grafting, cutting, layering, budding)
4. Planning and layout of parks and avenues
5. Handing of harvested fruits, vegetables and cut flowers
6. Methods of fruit preservation
7. Basic tissue cultures technique

Text Books:

1. Peter, K. V. (2009). Basics of Horticulture, Kalyani Publishers, New Delhi.

Reference Books:

- Singh, D. & Manivannan, S. (2009). Genetic Resources of Horticultural Crops. Ridhi International, Delhi, India.
- Swaminathan, M.S. and Kochhar, S.L. (2007). Groves of Beauty and Plenty: An Atlas of Major Flowering Trees in India. Macmillan Publishers, India.
- NIIR Board (2005). Cultivation of Fruits, Vegetables and Floriculture. National Institute of Industrial Research Board, Delhi.
- Kader, A.A. (2002). Post-Harvest Technology of Horticultural Crops. UCANR Publications, USA.
- Capon, B. (2010). Botany for Gardeners. 3rd Edition. Timber Press, Portland, Oregon.
- Pandey, P. H. (2007). Principles and Practices of Post Harvest Technology, Kalyani Publishers, New Delhi.

DSE-6.4 : INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

i. Scope of microbes in industry and environment: Bioreactors/Fermenters and fermentation processes: Solid-state and liquid-state (stationary and submerged) fermentations; Batch and continuous fermentations. Components of a typical bioreactor, Types of bioreactors- laboratory.

ii. Microbial production of industrial products: Microorganisms involved, media, fermentation conditions, downstream processing and uses; Filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilization, spray drying.

UNIT-II

Microbial enzymes of industrial interest and enzyme immobilization: Microorganisms for industrial applications and hands on screening microorganisms for casein hydrolysis; starch hydrolysis; cellulose hydrolysis. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase).

UNIT-III

Microbes and quality of environment: Distribution of microbes in air; Isolation of microorganisms from soil, air and water. Microbial flora of water: Water pollution, role of microbes in sewage and domestic waste water treatment systems. Determination of BOD, COD, TDS and TOC of water samples; Microorganisms as indicators of water quality.

UNIT-IV

Microbes in agriculture and remediation of contaminated soils: Biological fixation; Mycorrhizae; Bioremediation of contaminated soils. Isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.

PRACTICAL

1. Principles and functioning of instruments in microbiology laboratory
2. Hands on sterilization techniques and preparation of culture media
3. Screening microorganisms for industrial use.
4. Mycorrhiza, arbuscular mycorrhizal colonization in plant roots
5. Determination of BOD, COD, TDS and TOC of water samples;
6. Microorganisms as indicators of water quality

Text Books:

1. P. D. Sharma. (2017) Environmental Microbiology. Rastogi Publications, Meerut.

Suggested Readings

- Pelzar, M.J. Jr., Chen E.C. S., Krieg, N.R. (2010). Microbiology: An application based approach. Tata McGraw Hill Education Pvt. Ltd., Delhi.
- Tortora, G.J., Funke, B.R., Case. C.L. (2007). Microbiology. Pearson Benjamin Cummings, San Francisco, U.S.A. 9th edition.
- Pradipta K. Mohapatra (2008). Text Book of Environmental Microbiology, I.K. International Publishing House, New Delhi
- A. K. Rath (2018). Industrial and Environmental Microbiology, Kalyani Publishers, New Delhi.

DSE-5.3 : ANALYTICAL TECNIQUES IN PLANT SCIENCES

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

Imaging and related techniques: Principles of microscopy; Light microscopy; Fluorescence microscopy; Flow cytometry (FACS); Transmission and Scanning electron microscopy –sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

UNIT-II

Cell fractionation: Centrifugation: Differential and density gradient centrifugation, sucrose densitygradient, CsCl2gradient, analytical centrifugation, ultracentrifugation. Radioisotopes: Use in biological research, auto-radiography, pulse chase experiment. Spectrophotometry: Principle and its application in biological research.

UNIT-III

Chromatography: Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ion-exchange chromatography; Molecular sieve chromatography; Affinity chromatography. Characterization of proteins and nucleic acids: Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE

UNIT-IV

Biostatistics: Statistics, data, population, samples, variables, parameters; Representation of Data: Tabular, Graphical; Measures of frequency and central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variance, standard deviation; Chi-square test for goodness of fit. Test of significance: comparison of large, small and paired samples (T-Test) and correlation.

PRACTICAL

1. Study of different microscopic techniques for chromosome study
2. Study of PCR Demonstration.
3. To separate pigments by paper chromatography.
4. To separate phytochemicals by thin layer chromatography.
5. To estimate protein through Lowry's methods.
6. To separate proteins using PAGE.
7. To separate DNA (marker) using AGE.
8. Spectrometric estimation of total sugar by Anthrone method.
9. Chi-square analysis of mendelian ratio.
10. T-Test.

Text Books:

1. Patil, C. S. (2017). Advanced Analytical Techniques, ABE Books, New Delhi.

Reference Books:

- Plummer, D.T. (1996). An Introduction to Practical Biochemistry. Tata McGraw-Hill Publishing Co. Ltd. New Delhi. 3rd edition.
- Ruzin, S.E. (1999). Plant Micro technique and Microscopy, Oxford University Press, New York. U.S.A.
- Ausubel, F., Brent, R., Kingston, R. E., Moore, D.D., Seidman, J.G., Smith, J.A., Struhl, K. (1995). Short Protocols in Molecular Biology. John Wiley & Sons. 3rd edition.

SEMESTER-III

C-3.1 : INORGANIC CHEMISTRY-II

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I : General Principles of Metallurgy

Chief modes of occurrence of metals based on standard electrode potentials. Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agent. Electrolytic Reduction, Hydrometallurgy. Methods of purification of metals: Electrolytic process, Parting process, van Arkel-de Boer process and Mond's process, Zone refining.

Acids and Bases

Bronsted-Lowry concept of acid-base reactions, solvated proton, relative strength of acids, types of acid-base reactions, Lewis acid-base concept, Classification of Lewis acids, Hard and Soft Acids and Bases (HSAB) application of HSAB principle.

UNIT-II : Chemistry of *s* and *p* Block Elements - I

Inert pair effect, Relative stability of different oxidation states, diagonal relationship and anomalous behaviour of first member of each group. Allotropy and catenation. Complex formation tendency of *s* and *p* block elements. Hydrides and their classification ionic, covalent and interstitial. Basic beryllium acetate and nitrate.

UNIT-III : Chemistry of *s* and *p* Block Elements - II

Study of the following compounds with emphasis on structure, bonding, preparation, properties and uses. Boric acid and borates, boron nitrides, borohydrides (diborane) carboranes and graphitic compounds, silanes. Oxides and oxoacids of nitrogen, Phosphorus and chlorine. Peroxo acids of sulphur, interhalogen compounds, polyhalide ions, pseudohalogens and basic properties of halogens.

UNIT-IV : Noble Gases

Occurrence and uses, rationalization of inertness of noble gases, clathrates; preparation and properties of XeF_2, XeF_4 and XeF_6; Nature of bonding in noble gas compounds (Valence bond treatment and MO treatment for XeF_2). Molecular shapes of noble gas compounds (VSEPR theory).

Inorganic Polymers:

Types of inorganic polymers, comparison with organic polymers, synthesis, structural aspects and applications of silicones and siloxanes. Borazines, silicates and phosphazenes, and polysulphates.

Recommended Text Books:

1. Lee J. D., Concise Inorganic Chemistry Wiley India, 5th Edn., 2008.
2. Huheey J. E., Keiter E. A. and Keiter R. L., Inorganic Chemistry – Principles of structure and reactivity, Pearson Education, 4th Ed. 2002.
3. Puri, Sharma, Kalia, Principles of Inorganic Chemistry, Vishal Pub. Co., 13th Ed., 2017.
4. Shriver D. E., Atkins P. W., Inorganic Chemistry, Oxford University Press, 5th Edn. (2010).

Reference books

- Das Asim K., Fundamentals of Inorganic Chemistry, Vol. I, CBS Publications, 2nd Ed. 2010.
- Pradeep's Inorganic Chemistry, Vol. I & II, Universal Book seller, 14th Ed. 2017.

PRACTICAL

Iodometric / Iodimetric titrations

1. Standardization of sodium thiosulphate solution by standard of $K_2Cr_2O_7$ solution. (ii) Estimation of Cu(II) using standard sodium thiosulphate solution (Iodimetrically).
2. Estimation of available chlorine in bleaching powder iodometrically.

Inorganic preparations

1. Cuprous oxide (Cu_2O)
2. Cuprous chloride (Cu_2Cl_2)
3. Manganese (III) phosphate ($MnPO_4.H_2O$)
4. Aluminium potassium sulphate ($K_2SO_4.Al_2(SO_4)_3.24H_2O$ - Potash alum).
5. Lead chromate ($PbCrO_4$)

Reference Books:

- Mendham, J., A. I. Vogel's Quantitative Chemical Analysis, 6th Ed., Pearson, 2009.
- Ahluwalia, V.K., Dhingra, S. and Gulati A, College Practical Chemistry, University Press (2005).
- Gulati Shikha, Sharma Gulati .R. and Manocha, Shagun, Practical Inorganic Chemistry, 1st Edn., CBS Publishers & Distributors Pvt. Ltd., (2017).

C-3.2 : ORGANIC CHEMISTRY-II

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I : Chemistry of Halogenated Hydrocarbons

Alkyl halides: Methods of preparation, nucleophilic substitution reactions – S_N1, S_N2 and S_Ni mechanisms with stereochemical aspects and effect of solvent etc.; nucleophilic substitution vs. elimination.

Aryl halides: Preparation, including preparation from diazonium salts, nucleophilic aromatic substitution; SN_Ar, Benzyne mechanism.

Relative reactivity of alkyl, allyl/benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Organometallic compounds of Mg and Li – Use in synthesis of organic compounds.

UNIT-II : Alcohols, Phenols, Ethers and Epoxides

Alcohols: preparation, properties and relative reactivity of 1°, 2°, 3° alcohols, Bouveault-Blanc Reduction; Preparation and properties of glycols: Oxidation by periodic acid and lead tetraacetate, Pinacol-Pinacolone rearrangement;

Phenols: Preparation and properties; Acidity and factors effecting it, Ring substitution reactions, Reimer–Tiemann and Kolbe's–Schmidt Reactions, Fries and Claisen rearrangements with mechanism;

Ethers and Epoxides: Preparation and reactions with acids. Reactions of epoxides with alcohols, Ammonia derivatives and $LiAlH_4$

UNIT-III : Carbonyl Compounds

Structure, reactivity and preparation

Nucleophilic additions, Nucleophilic addition-elimination reactions with ammonia derivatives with mechanism; Mechanisms of Aldol and Benzoin condensation, Knoevenagel condensation, Perkin, Cannizzaro and Wittig reaction, Beckmann rearrangements, α halo form reaction and Baeyer Villiger oxidation, - substitution reactions, oxidations and reductions (Clemmensen, Wolff-Kishner, $LiAlH_4$, $NaBH_4$, MPV.; Addition reactions of unsaturated carbonyl compounds: Michael addition.

Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of diethyl malonate and ethyl acetoacetate.

UNIT-IV : Carboxylic Acids and their Derivatives

Preparation, physical properties and reactions of monocarboxylic acids: Typical reactions of dicarboxylic acids, hydroxy acids and unsaturated acids: succinic, lactic, malic, tartaric, citric, maleic and fumaric acids;

Preparation and reactions of acid chlorides, anhydrides, esters and amides; Comparative study of nucleophilic substitution at acyl group -Mechanism of acidic and alkaline hydrolysis of esters, Claisen condensation, Dieckmann and Reformatsky reactions, Hofmann-bromamide degradation and Curtius rearrangement.

Sulphur containing compounds: Preparation and reactions of thiols and thioethers.

Recommended Text Books:

1. Morrison, R. N. & Boyd, R. N., Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Bhal and Bhal, Advanced Organic Chemistry, 2nd Edition, S. Chand Publisher, 2012.
3. Mendham, J., A. I. Vogel's Quantitative Chemical Analysis, 6th Ed., Pearson, 2009.

SEMESTER-IV

C-4.1 : INORGANIC CHEMISTRY-III

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I : Coordination Chemistry

Werner's theory, valence bond theory (inner and outer orbital complexes), electroneutrality principle and back bonding. IUPAC nomenclature of coordination compounds, isomerism in coordination compounds. Stereochemistry of complexes with 4 and 6 coordination numbers. Chelate effect, Labile and inert complexes.

Crystal field theory, measurement of CFSE weak and strong fields, pairing energies, factors affecting the magnitude of 10 Dq in octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry, Jahn-Teller theorem, square planar geometry. Qualitative aspect of ligand field and MO Theory.

UNIT-II : Transition Elements-I

General group trends with special reference to electronic configuration, colour, variable valency, magnetic and catalytic properties, and ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer & Ebsworth diagrams). Difference between the first, second and third transition series.

UNIT-III : Transition Elements-II

Chemistry of Ti, V, Cr, Mn, Fe and Co in various oxidation states (excluding their metallurgy).

Lanthanoids and Actinoids

Electronic configuration, oxidation states, colour, spectral and magnetic properties, lanthanide contraction, separation of lanthanides (ion-exchange method only). General features of actinoids, separation of Np, Pu, Am from U.

UNIT-IV : Bioinorganic Chemistry

Metal ions present in biological systems, classification of elements according to their action in biological system. Na/K-pump, carbonic anhydrase and carboxypeptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity. Use of chelating agents in medicine. Iron and its application in bio-systems, Haemoglobin and myoglobin.

Recommended Text Books:

1. Lee J. D., Concise Inorganic Chemistry, Wiley India, 5th Edn., 2008.
2. Huheey J. E., Keiter E. A. and Keiter R. L., Inorganic Chemistry – Principles of structure and reactivity, Pearson Education, 4th Ed. 2002.
3. Puri, Sharma, Kalia, Principles of Inorganic Chemistry, Vishal Pub. Co., 33rd ed., 2017.
4. Shriver D. E. Atkins P. W., Inorganic Chemistry, Oxford University Press, 5th Edn.

Reference books :

- Das Asim K., Fundamentals of Inorganic Chemistry, Vol. II, CBS Publications, 2nd Ed. 2010.
- Bioinorganic Chemistry, Asim Kumar Das, Books & Allied (P) Ltd. 1st Ed. 2015.
- Selected Topic in Inorganic Chemistry, Malhok, Madan and Tuli, S. Chand Publisher. 17th Ed. 2010.
- Pradeep's Inorganic Chemistry, Vol. I & II, Universal Book seller, 14th Ed. 2017.

PRACTICAL

Inorganic preparations

Preparation of complexes:

i. Hexaamine nickel(II), $[Ni(NH_3)_6]Cl_2$
ii. Potassium trioxalatoferrate (III) trihydrate
iii. Tetraamminecopper (II) sulphate, $[Cu(NH_3)_4]SO_4.H_2O$
iv. Tetraamminecarbonatocobalt (III) nitrate

Complexometric titration

i. Estimation of Ca by EDTA
ii. Estimation of Mg by EDTA

Gravimetric Analysis:

i. Estimation of nickel (II) using dimethylglyoxime (DMG).
ii. Estimation of copper as CuSCN
iii. Estimation of iron as Fe_2O_3 by precipitating iron as $Fe(OH)_3$.
iv. Estimation of Al(III) by precipitating with oxine and weighing as Al(oxine)$_3$ (Aluminium Oxinate).

Chromatography of metal ions

Principles involved in chromatographic separations. Paper chromatographic separation of following metal ions:

i. Ni(II) and Co(II)
ii. Fe(III) and Al(III)

Reference Books:

- Vogel, A.I. A Textbook of Quantitative Inorganic Analysis, ELBS (1978).
- Ahluwalia, V.K., Dhingra, S. and Gulati A, College Practical Chemistry, University Press (2005).
- Gulati Shikha, Sharma Gulati JL and Manocha, Shagun, Practical Inorganic Chemistry, 1st Edn., CBS Publishers & Distributors Pvt Ltd., (2017).

C-4.2 : ORGANIC CHEMISTRY-III

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I : Nitrogen Containing Functional Groups

Preparation and important reactions of nitro and compounds, nitriles. Amines: Effect of substituent and solvent on basicity; Preparation and properties: Gabriel phthalimide synthesis, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction; Distinction between 1°, 2° and 3° amines with Hinsberg reagent and nitrous acid.

UNIT-II : Diazonium Salts

Preparation and their synthetic applications.

Polynuclear Hydrocarbons

Reactions of naphthalene and anthracene Structures, Preparation and structure elucidation and important derivatives of naphthalene and anthracene. Polynuclear hydrocarbons.

UNIT-III : Heterocycle Compounds

Classification and nomenclature, Structure, aromaticity in 5-membered and 6-membered rings containing one heteroatom; Synthesis, reactions and mechanism of substitution reactions of: Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis). Thiophene, Pyridine (Hantzsch synthesis), Pyrimidine. Fischer indole synthesis and Madelung synthesis. Derivatives of furan: Furfural and furoic acid (preparation only).

UNIT-IV : Alkaloids

Natural occurrence, General structural features, Isolation and their physiological action. Hoffmann's exhaustive methylation, Emde's modification, Structure elucidation and synthesis of Hygrine and Nicotine. Medicinal importance of Nicotine, Hygrine, Quinine, Morphine, Cocaine, and Reserpine.

Terpenes

Occurrence, classification, isoprene rule; Elucidation of structure and synthesis of Citral, Neral and α- terpineol.

Recommended Text Books:

1. Morrison, R. N. & Boyd, R. N., Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Advanced Organic Chemistry, 2nd Edition, Arun Bahl & B S Bahl, S. Chand Publisher, 2012.

Reference Books:

- Graham Solomons T. W., Fryhle, Craig B., Snyder Scott A, Organic Chemistry, Wiley Student Ed, 11th Edition (2013)

GE-3.4 : OPTICS, SPECIAL THEORY OF RELATIVITY, ATOMIC PHYSICS, QUANTUM MECHANICS AND NUCLEAR PHYSICS

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

Optics-I: Elementary ideas of monochromatic aberrations and their minimization, chromatic aberration, achromatic combination, Theory of formation of primary and secondary rainbow, condition of interference, coherent sources, Youngs double slit experiment, biprism and measurement of wave length of light of by it, color of thin films and Newton's rings, Fresnel and Fraunhoffer diffraction, diffraction by single slit plane transmission grating.

Optics-II : Electromagnetic nature of light, polarized and unpolarized light, polarization by reflection and refraction, Brewster's Law, Mauls Law, Double refraction, Ordinary and extraordinary rays.

UNIT-II Atomic Physics

Inadequacy of classical physics, brief outline of Rayleigh Jeans theory and Planck's quantum theory of radiation, particle nature of electromagnetic radiation photo electric effect, Compton effect, dual nature of radiation, wave nature of particles, de-Broglie hypothesis, matter wave, wave-particle duality, Davisson- Germer experiment. Bohr's theory of Hydrogen atom, explanation of Hydrogen Spectra, correction for finite mass of the nucleus, Bohrs correspondence principle, limitations of Bohr's theory, Discrete energy, exchange by atom Frank Hertz experiment.

UNIT-III

Quantum Mechanics : Heisenberg's Uncertainty relation, Time dependent Schrodinger's wave equation in one dimension and three dimensions, The physical interpretation of the wave function, Probability density and probability current density, Equation of continuity, Normalization of the Wave function, Expectation value of an observable, Ehrenfest's theorem. Time independent Schrodinger's wave equation in one dimension particle in a box, energy eigen values and eigen functions.

UNIT-IV

Nuclear Physics : Properties of the nucleus Charge, Size, Spin, Magnetic Moment, Mass, Mass defect, Binding energy, Packing fraction, Nuclear force and its characteristics features, Radioactive decay laws, average life, half life, nuclear fission, nuclear fusion, Linear accelerators, and cyclotron.

Relativity: Galilean transformation, Newtonian relativity and its limitation, Michelson Morley experiment and it's consequence, postulates of special theory of relativity. Lorentz transformation, length contraction, time dilation, relativistic mass and momentum, mass energy relation.

Text Books:

1. University Physics, H. D. Young, R. A. Freedman (Person)-2017
2. Fundamentals of Physics, Resnick, Halliday, Walker (WIley)-2015

Reference Books:

- A Text Books book of Optics N. Subrahmanyam and Brij Lal (S.Chand Publishing)-2006
- Introduction to Special Relativity-R. Resnick (John Wiley)-2007
- Concepts of Modern Physics Arthur Beiser (McGraw Hill)-2017
- Modern Physics H.S. Mani and G.K.Mehta-2018.

DSE-5.3 : POLYMER CHEMISTRY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

Introduction and history of polymeric materials:
Different schemes of classification of polymers, Polymer nomenclature, Molecular forces and chemical bonding in polymers, Texture of Polymers.

Functionality and its importance:
Criteria for synthetic polymer formation, classification of polymerization processes, Relationships between functionality, extent of reaction and degree of polymerization. Bifunctional systems, Poly-functional systems.

UNIT-II

Mechanism & Kinetics of Polymerization:
Polymerization reactions – addition and condensation, mechanism and kinetics of step growth, radical chain growth, ionic chain (both cationic and anionic) and coordination polymerizations, Mechanism and kinetics of copolymerization, polymerization techniques.

Crystallization and crystallinity:
Determination of crystalline melting point and degree of crystallinity, Morphology of crystalline polymers, Factors affecting crystalline melting **point**.

UNIT-III

Molecular weight of polymers and their determination (M_n, M_w, M_v, M_z) by end group analysis, viscometry and osmotic pressure methods. Molecular weight distribution and its significance. Polydispersity index.

Glass transition temperature (T_g) and it determination: WLF equation, Outlines of factors affecting glass transition temperature (T_g).

UNIT-IV

Properties of polymers (physical, thermal and mechanical properties)

Preparation, structure, properties and applications of the following polymers: polyolefins (polyethylene, polypropylene), polystyrene, polyvinyl chloride, polyvinyl acetate, polyacrylamide, fluoro polymers (Teflon),

polyamides (nylon-6 and nylon 6, 6). Thermosetting polymers - phenol formaldehyde resins (Bakelite, Novalac), polyurethanes, conducting polymers (polyacetylene, polyaniline). Brief outline of biodegradable polymers.

DSE-5.4 : INDUSTRIAL CHEMICALS AND ENVIRONMENT

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

Industrial Gases and Inorganic Chemicals

Industrial Gases: Large scale production uses storage and hazards in handling of the following gases: oxygen, nitrogen, argon, hydrogen, acetylene, carbon monoxide, chlorine, sulphur dioxide.

Inorganic Chemicals: Manufacture, application and hazards in handling the following chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, potassium dichromate and potassium permanganate.

Industrial Metallurgy

Preparation of metals (ferrous and nonferrous) and ultrapure metals for semiconductor technology.

UNIT-II

Environment and its segments

Ecosystems. Biogeochemical cycles of carbon, nitrogen and sulphur.

Air Pollution: Major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature; Photochemical smog: its constituents and photochemistry. Environmental effects of ozone. Major sources of air pollution. Pollution by SO_2, CO_2, CO, NO_x, and H_2S and control procedures. Effects of air pollution on living organisms and vegetation. Greenhouse effect and global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and halogens, removal of sulphur from coal.

UNIT-III

Water Pollution: Hydrological cycle, water resources, aquatic ecosystems, Sources and nature of water pollutants, Techniques for measuring water pollution, Impacts of water pollution on hydrological and ecosystems. Water purification methods. Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluents from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, fertilizer. Sludge disposal. *Industrial waste management:* incineration of waste. Water treatment and purification (reverse osmosis, ion exchange). Water quality parameters for wastewater, industrial water and domestic water.

UNIT-IV

Energy and Environment

Sources of energy: Coal, petrol and natural gas. Nuclear fusion/fission, solar energy, hydrogen, geothermal, tidal and hydel. Nuclear Pollution: Disposal of nuclear waste, nuclear disaster and its management.

Biocatalysis

Introduction to biocatalysis: Importance in green chemistry and chemical industry.

DSE-6.4 : GREEN CHEMISTRY

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

Introduction to Green Chemistry

What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry. Limitations/Obstacles in the pursuit of the goals of Green Chemistry.

Principles of Green Chemistry and Designing a Chemical synthesis- I

Twelve principles of Green Chemistry. Explanations of principle with special emphasis on - Designing green synthesis processes: Prevention of Waste/ by-products; maximize the incorporation of the materials used in the process into the final products (Atom Economy) with reference to rearrangement, addition, substitution and elimination reactions; Prevention/minimization of hazardous/ toxic products; Designing safer chemicals; Use of safer solvents and auxiliaries (e.g. separating agent) - green solvents (supercritical CO_2, water, ionic liquids), solvent less processes, immobilized solvents.

UNIT-II

Principles of Green Chemistry and Designing a Chemical synthesis-II

Explanation of green chemistry principles with special emphasis on: Energy efficient processes for synthesis - use of microwaves and ultrasonic energy. Selection of starting materials (use of renewable feedstock); avoidance of unnecessary derivatization (e.g. blocking group, protection groups, deprotection); Use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; designing of biodegradable products use of chemically safer substances for prevention of chemical accidents, inherent safer design greener – alternative to Bhopal Gas Tragedy (safer route to carcarbaryl) and Flixiborough accident (safer route to cyclohexanol); real-time, in-process monitoring and control to prevent the formation of hazardous substances; development of green analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes.

UNIT-III

Examples of Green Synthesis/ Reactions and some real world cases-I

Green Synthesis of the following compounds: adipic acid, catechol, methyl methacrylate, urethane, disodium iminodiacetate (alternative to Strecker synthesis), paracetamol, furfural. *Microwave assisted reactions:* Applications to reactions (i) in water: Hofmann Elimination, hydrolysis (of benzyl chloride, methyl benzoate to benzoic acid), Oxidation (of toluene, alcohols); (ii) reactions in organic solvents: Diels-Alder reaction and Decarboxylation reaction. *Ultrasound assisted reactions:* Applications to esterification, saponification, Simmons-Smith Reaction (Ultrasonic alternative to Iodine).

UNIT-IV

Examples of Green Synthesis/ Reactions and some real world cases- II

Surfactants for carbon dioxide – replacing smog producing and ozone depleting solvents with CO_2 for precision cleaning and dry cleaning of garments; Designing of Environmentally safe marine antifoulant; Right fit pigment: synthetic azopigments to replace toxic organic and inorganic pigments; Synthesis of a compostable and widely applicable plastic (poly lactic acid) from corn; Development of Fully Recyclable Carpet: Cradle to Cradle Carpeting

Future Trends in Green Chemistry

Oxidizing and reducing reagents and catalysts; multifunctional reagents; Combinatorial green chemistry; Proliferation of solvent less reactions; Green chemistry in sustainable development. (Bio-diesel, bio-ethanol and biogas).

Recommended Text Books:

1. Anastas P.T. & Warner J.K.: Green Chemistry- Theory and Practical, Oxford University Press (2000).
2. Ahluwalia V.K. & Kidwai M.: New Trends in Green Chemistry, Anamalaya Publishers, New Delhi (2004).
3. Kumar V., An Introduction to Green Chemistry, Vishal Publishing Co., (2015).

Reference Books:

- Matlack A.S. Introduction to Green Chemistry, Marcel Dekker (2001).
- Das Asim K. and Das Mahua, Environment Chemistry with Green Chemistry, Books and Allied (P) Ltd. (2010)

DSE-6.3 : INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

Silicate Industries

Glass: Glassy state and its properties, classification (silicate and nonsilicate glasses). Manufacturing and processing of glass. Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass.

Ceramics: Important clays and feldspar, ceramic, their types and manufacture. High technology ceramics and their applications, superconducting and semiconducting oxides, fullerenes carbon nanotubes and carbon fibre.

Cements: Classification of cement, ingredients and their role, Manufacture of cement and the setting process, quick setting cements.

UNIT-II

Fertilizers: Different types of fertilizers. Manufacture of the following fertilizers: Urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphates; polyphosphate, superphosphate, compound and mixed fertilizers, potassium chloride, potassium sulphate.

Batteries: Primary and secondary batteries, battery components and their role, Characteristics of Battery. Working of following batteries: Pb acid, Li-Battery, Solid state electrolyte battery. Fuel cells, Solar cell and polymer cell.

UNIT-III

Surface Coatings:

Objectives of coatings surfaces, preliminary treatment of surface, classification of surface coatings. Paints and pigments-formulation, composition and related properties. Oil paint, Vehicle, modified oils, Pigments, toners and lakes pigments, Fillers, Thinners, Enamels, emulsifying agents. Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint), Dyes, Wax polishing, Water and Oil paints, additives, Metallic coatings, metal spraying and anodizing.

UNIT-IV

Alloys: Classification of alloys, ferrous and non-ferrous alloys, Specific properties of elements in alloys. Manufacture of Steel (removal of silicon, decarbonization, demanganization, desulphurization, dephosphorisation) and surface treatment (argon treatment, heat treatment nitriding, carburizing). Composition and properties of different types of steels.

Chemical explosives: Origin of explosive properties in organic compounds, preparation and explosive properties of lead azide, PETN, cyclonite (RDX). Introduction to rocket propellants.

Recommended Text Books:

1. Stocchi E., *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.
2. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
3. P. C. Jain, M. Jain: Engineering Chemistry, Dhanpat Rai & Sons, Delhi.

Reference Books:

- Felder R.M. and Rousseau R.W., *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
- Dara S. S., *A Textbook of Engineering Chemistry*, S. Chand & Company Ltd. New Delhi.
- A. Kent: Riegel's Handbook of Industrial Chemistry, CBS Publishers, New Delhi.
- R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi.

PRACTICAL

List of Practicals

1. Determination of free acidity in ammonium sulphate fertilizer.
2. Estimation of Calcium in Calcium ammonium nitrate fertilizer.
3. Estimation of phosphoric acid in superphosphate fertilizer.
4. Determination of composition of dolomite (by complexometric titration).
5. Analysis of (Cu, Ni); (Cu, Zn) in alloy or synthetic samples.
6. Analysis of Cement.
7. Estimation of Iron from Cement Volumetrically
8. Preparation of pigment (zinc oxide).

C-2.2 : ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ ଓଡ଼ିଆ ସାହିତ୍ୟ

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

୧ମ ଏକକ / ୟୁନିଟ୍ – ୧ :

ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ ଓଡ଼ିଆ କବିତା

୨ୟ ଏକକ / ୟୁନିଟ୍ – ୨ :

ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ ଓଡ଼ିଆ କଥା ସାହିତ୍ୟ

୩ୟ ଏକକ / ୟୁନିଟ୍ – ୩ :

ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ ଓଡ଼ିଆ ନାଟକ ଓ ଏକାଙ୍କିକା

୪ର୍ଥ ଏକକ / ୟୁନିଟ୍ – ୪ :

ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ ଓଡ଼ିଆ ଗଦ୍ୟ ସାହିତ୍ୟ (ପ୍ରବନ୍ଧ, ଜୀବନୀ, ଆତ୍ମ ଜୀବନୀ ଓ ସମାଲୋଚନା)

ସହାୟକ ଗ୍ରନ୍ଥପୁଟୀ:

୧. ସବୁଜରୁ ସାଂପ୍ରତିକ - ନିତ୍ୟାନନ୍ଦ ଶତପଥୀ, ଗ୍ରନ୍ଥ ମନ୍ଦିର, କଟକ
୨. ସତୁରୀରୁ ସହସ୍ରାବ୍ଦୀ - ନିତ୍ୟାନନ୍ଦ ଶତପଥୀ
୩. ଶହେ ବର୍ଷର ଓଡ଼ିଆ କ୍ଷୁଦ୍ରଗଳ୍ପ ଏକ ତାତ୍ତ୍ୱିକ ବିଶ୍ଳେଷଣ - କବିତା ବାରିକ, ବିଦ୍ୟାପୁରୀ, କଟକ
୪. ଉପନ୍ୟାସ ସାହିତ୍ୟର ପରିଚୟ - ସଂକଳନ - ପଠାଣି ପଟ୍ଟନାୟକ ଓ ଗୋଚାନାଥ ରାଉତ (୧ମ ଓ ୨ୟ ଭାଗ) ଓଡ଼ିଶା ବୁକ୍ ଷ୍ଟୋର, କଟକ
୫. ଓଡ଼ିଆ କ୍ଷୁଦ୍ର ଗଳ୍ପର ଇତିବୃତ୍ତ - ବୈଷ୍ଣବ ଚରଣ ସାମଲ, ବୁକ୍ ଆଣ୍ଡ୍ ବୁକ୍, କଟକ
୬. ସ୍ୱାଧୀନତା ପରବର୍ତ୍ତୀ ଓଡିଆ ସାହିତ୍ୟର ଭୂମି ଓ ଭୂମିକା- ସଂ. ବୈଷ୍ଣବ ଚରଣ ସାମଲ, ଓଡିଶା ବୁକ୍‌ଷ୍ଟୋର, କଟକ
୭. ଓଡ଼ିଆ ନାଟକର ଉତ୍ତର ଆଧୁନିକ ପର୍ବ – ହେମନ୍ତ କୁମାର ଦାସ, ବିଦ୍ୟାପୁରୀ, କଟକ
୮. ସ୍ୱାଧୀନତୋର ଓଡିଆ ନାଟକ - ନାରାୟଣ ସାହୁ, ଓ. ରା. ପା. ପ୍ର. ଓ ପ୍ରକାଶନ ସଂସ୍ଥା, ଭୁବନେଶ୍ୱର
୯. ଓଡିଆ ନାଟ୍ୟସାହିତ୍ୟ - ସର୍ବେଶ୍ୱର ଦାସ, ଓ. ରା. ପା. ପ୍ର. ଓ ପ୍ରକାଶନ ସଂସ୍ଥା, ଭୁବନେଶ୍ୱର
୧୦. ଓଡିଆ ନାଟକର ଉଦ୍ଭବ ଓ ବିକାଶ - ରତ୍ନାକର ଚଉନି,
୧୧. ଓଡିଆ ଐତିହାସିକ ନାଟକର ମୂଳସୂତ୍ର - ନୀଳାଦ୍ରିକୃଷ୍ଣ ହରିଚନ୍ଦନ
୧୨. ନାଟକର ବ୍ୟାପ୍ତି ଓ ଦୀପ୍ତି - ସଂଘମିତ୍ରା ମିଶ୍ର, ଅଗ୍ରଦୂତ, କଟକ
୧୩. ନାଟ୍ୟସୃଷ୍ଟି ଓ ନାଟ୍ୟଦୃଷ୍ଟି - ବିଷ୍ଣୁପ୍ରିୟା ଓଡା, ଶିଶୁକଲମ, ଭୁବନେଶ୍ୱର
୧୪. ଓଡ଼ିଆ ସାହିତ୍ୟର ଇତିହାସ – ବାଉରୀ ବନ୍ଧୁ କର, ଫ୍ରେଣ୍ଡସ୍ ପବ୍ଲିଶର୍ସ, କଟକ
୧୫. ଓଡ଼ିଆ ଚରିତ ସାହିତ୍ୟ – ଲାବଣ୍ୟ ନାୟକ
୧୬. ଓଡ଼ିଆ ସମାଲୋଚନା ସାହିତ୍ୟ - ଅସିତ କବି
୧୭. ଆଧୁନିକ ଉତ୍ତର ଆଧୁନିକ – ଡକ୍ଟର ଦେବାଶିଷ ପାତ୍ର, ସତ୍ୟନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର, କଟକ
୧୮. ଗଳ୍ପ ଗାଣ୍ଡିକ ଗଳ୍ପାୟନ - ଡକ୍ଟର ଦେବାଶିଷ ପାତ୍ର, ସତ୍ୟନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର, କଟକ

SEMESTER-V

C-5.1 : ଓଡ଼ିଆ ନାଟକ ଓ ଏକାଙ୍କିକା

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

୧ମ ଏକକ / ୟୁନିଟ୍ – ୧ :

ରକ୍ତମାଟି - କାଳୀଚରଣ ପଟ୍ଟନାୟକ

୨ୟ ଏକକ / ୟୁନିଟ୍ – ୨ :

ନନ୍ଦିକା କେଶରୀ - ମନୋରଞ୍ଜନ ଦାସ

୩ୟ ଏକକ / ୟୁନିଟ୍ – ୩ :

ରୁଖା – ମଙ୍ଗରୁ ଚରଣ ବିଶ୍ୱାଳ

୪ର୍ଥ ଏକକ / ୟୁନିଟ୍ – ୪ :

ଏକାଙ୍କିକା - ସ୍ୱତି ବିଭ୍ରାଟ - ପ୍ରାଣବନ୍ଧୁ କର ଓ ଛଦ୍ମବେଶୀ - ବିଶ୍ୱଜିତ୍ ଦାସ

ସହାୟକ ଗ୍ରନ୍ଥସୂଚୀ :

୧. ରକ୍ତମାଟି - କାଳୀଚରଣ ପଟ୍ଟନାୟକ

୨. ନନ୍ଦିକା କେଶରୀ - ମନୋରଞ୍ଜନ ଦାସ

୩. କୋକୁଆ – ବିଜୟ କୁମାର ଶତପଥୀ, ଅଭ୍ରଦୂତ, କଟକ

୪. ଅଶ୍ରୁ ନୁହେଁ ଅନଳ - ହେମନ୍ତ କୁମାର ଦାସ

୫. ସ୍ୱାଧୀନୋତ୍ତର ଓଡିଆ ନାଟକର ମନସ୍ତାତ୍ତ୍ୱିକ ବିଶ୍ଳେଷଣ - ରଶ୍ମିତା ରାଉତରାୟ, ବିଜୟିନୀ ପବ୍ଲିକେସନ, କଟକ

C-6.2 : ଓଡ଼ିଆ ଭାଷାର ବ୍ୟାବହାରିକ ପ୍ରୟୋଗ

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

୧ମ ଏକକ / ୟୁନିଟ୍ – ୧ :

ଭାଷଣ କଳା, ଦଳଗତ ଆଲୋଚନା ଓ ସାକ୍ଷାତକାର

୨ୟ ଏକକ / ୟୁନିଟ୍ – ୨ :

ସମ୍ବାଦ ପ୍ରସ୍ତୁତି, ଫିଚର୍ ରଚନା ଓ ବିଜ୍ଞାପନ ପ୍ରସ୍ତୁତି

୩ୟ ଏକକ / ୟୁନିଟ୍ – ୩ : କାର୍ଯ୍ୟାଳୟରେ ଓଡ଼ିଆ ଲିଖନ ବିଧି

ନଥି ପ୍ରସ୍ତୁତି, ଅନୁବିଧି, ଟିପ୍ପଣୀ, ପ୍ରସ୍ତାବ, ଅନୁମୋଦନ, ଚିଠା ପ୍ରସ୍ତୁତି, ଅଧିସୂଚନା, ବିଜ୍ଞପ୍ତି, ଘୋଷଣା ଲିଖନ, ପତ୍ରଲିଖନ (ବ୍ୟକ୍ତିଗତ, ବ୍ୟାବସାୟିକ ଓ ସମ୍ପାଦକଙ୍କୁ ପତ୍ର)

୪ର୍ଥ ଏକକ / ୟୁନିଟ୍ – ୪ :

ଓଡ଼ିଆ ଭାଷାର କମ୍ପ୍ୟୁଟରୀକରଣ, ସଫ୍ଟୱେୟାର୍ ଏବଂ ହାର୍ଡୱେୟାର୍, ଓଡ଼ିଆ ଫଣ୍ଟସ୍, କୀ-ବୋର୍ଡ, ୱାର୍ଡ ପ୍ରୋସେସିଂ, ବନାନ ଓ ବ୍ୟାକରଣଯାଞ୍ଚକ ପ୍ରକ୍ରିୟା, ଓଡ଼ିଆରେ ଇଣ୍ଟରନେଟ୍‌ର ବ୍ୟବହାର, ଓଡ଼ିଆ ସାମାଜିକ ୱେବ୍‌ସାଇଟ୍

ସହାୟକ ଗ୍ରନ୍ଥସୂଚୀ :

୧. ଯୋଗାଯୋଗମୂଳକ ମାତୃଭାଷା – ବିରଞ୍ଚି ନାରାୟଣ ସାମଲ, ସତ୍ୟନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର, କଟକ

୨. ଭାଷଣ କଳା ଓ ଅନ୍ୟାନ୍ୟ ପ୍ରସଙ୍ଗ - କୃଷ୍ଣଚନ୍ଦ୍ର ପ୍ରଧାନ, ସତ୍ୟନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର୍, କଟକ

୩. ସମ୍ବାଦପତ୍ର ଓ ଗଣମାଧ୍ୟମ - ମୃଣାଳ ଚାଟାର୍ଜୀ, ଶେଫାଳୀ କମ୍ୟୁନିକେଶନ, ସଞ୍ଚାରମାର୍ଗ, ଡେଙ୍କାନାଳ

୪. ପ୍ରାୟୋଗିକ ଭାଷା ଓ ବିଜ୍ଞାପନର ଦିଗବିଦିଗ - କେ.ବି. ପଟ୍ଟନାୟକ, ଓ.ରା.ପା.ପ୍ର. ଓ ପ୍ରକାଶନ ସଂସ୍ଥା, ଭୁବନେଶ୍ୱର

୫. ସଂଯୋଗ ଅନୁବିଧି - ସନ୍ତୋଷ କୁମାର ତ୍ରିପାଠୀ, ନାଳନ୍ଦା, କଟକ

୬. କାର୍ଯ୍ୟାଳୟ ନଥି - ଓଡ଼ିଆ ଭାଷା ପ୍ରତିଷ୍ଠାନ, ଭୁବନେଶ୍ୱର

୭. ଓଡ଼ିଆରେ କମ୍ପ୍ୟୁଟର ଶିକ୍ଷା – ରୁଦ୍ରନାରାୟଣ ମହାପାତ୍ର, ସତ୍ୟନାରାୟଣ ବୁକ୍ ଷ୍ଟୋର୍, କଟକ

୮. ଓଡ଼ିଆ ଭାଷାରେ କମ୍ପ୍ୟୁଟରର ପ୍ରୟୋଗ - ସୁଧୀର ଚନ୍ଦ୍ର ମହାନ୍ତି, ଏ.ଜେ. ମିଶ୍ର ପବ୍ଲିକେଶନ, ଭୁବନେଶ୍ୱର

୯. କମ୍ପ୍ୟୁଟରରେ ଓଡିଆ ଭାଷାର ବ୍ୟବହାର ଓ ପ୍ରୟୋଗ, ରୁଦ୍ରପ୍ରସାଦ ମିଶ୍ର, ଆଇଅରା ପବ୍ଲିଶର୍ସ, ଜଗତସିଂହପୁର

CC- 1.3 : PUBLIC ADMINISTRATION : CONCEPTS AND ISSUES

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I

Meaning, Nature, Scope and Significance of Public Administration
Evolution of the Discipline, New Public Administration

UNIT– II

Principles of Organization:
Hierarchy, Span of Control, Unity of Command, Centralization and Decentralization

UNIT– III

Theoretical Perspectives: Scientific Management Theory (F. W. Taylor), Human Relations Theory (Elton Mayo), Ecological approach (Fred Riggs), Bureaucratic Theory (Max Weber)

UNIT– IV

Leadership: Theories of Leadership
Theories of Motivation: Maslow, McGregor, Herzberg
Decision-making Theory: Herbert Simon

UNIT– V

Major Issues in Administration: Good Governance, Corruption, Relationship between Permanent Executive and Political Executive, Employee-employer relationships

Suggested Readings:

1. Agarwal, D.V., Human Relations and Organisation Behaviour (New Delhi, 1988).
2. Avasthi, Amareswar and Maheswari, S.R., Public Administration Agra, 1986).
3. Bhattacharya, Mohit, Public Administration (Calcutta, 1981).
4. Dimmock, M.E. and Dimmock, G.V., Public Administration (New York, 1975).
5. Maheswari, S.R., Theories and Concepts in Public Administration (New Delhi, 1991).
6. Mehta, Prayag, Bureaucracy, Organisational Behaviour and Development (Sage, 1989).
7. Sharma, R.D., Advanced Public Administration (New Delhi, 1990).
8. Simon, Herbert, Administrative Behaviour (London, 1976).

CC- 1.4 : INTERNATIONAL POLITICS : THEORIES AND CONCEPTS

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I : Concepts of International politics:

Power, balance of power, national interest, collective security

UNIT– II : Theories of International politics:

Idealist, Realist, Systems, Game Theory

UNIT– III

World War I – Causes and Consequences
World War II – Causes and Consequences
Cold War – Causes and Phases

UNIT– IV : Major issues of world politics:

Cuban Missile Crisis, Vietnam War, Collapse of the Soviet Union, Afghan Crisis

UNIT– V : Global Concerns:

Human Rights, Ecology, Disarmament and Arms Control

Suggested Readings:

1. Bandhopadhyay, J., General Theory of International Relations, Allied Publishers, New Delhi.
2. Holsti, K.J. International Politics: A Framework for Analysis, Prentice Hall.
3. Kumar, Mahendra, Theoretical Aspects of International Politics, Shivlal Aggarwal & Co. Agra, 1967.
4. Morgenthau, Hans J, Politics among Nations: The Struggle for Power and Peace, New York, 1985.
5. Jackson, R. and George Sorensen, Introduction to International Relations: Theories and Approaches, OUP, 2003.

CC-1.5 : INDIAN GOVERNMENT AND POLITICS

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I : Key Features of the Indian Constitution :
The Preamble, Fundamental Rights, Amendment procedure & Basic Structure, Emergency Provisions

UNIT– II : Governmental structure and Process in Centre :
President, Prime Minister, Parliament, Supreme Court - Judicial Review and Judicial Activism

UNIT– III : Federalism :
Nature of Indian Federalism, Centre-State relations, Areas of Cooperation and Conflict, Demand for Special Category Status

UNIT– IV : Statutory institutions/commissions :
UPSC, Election Commission, Comptroller and Auditor General, Finance Commission, National Human Rights Commission

UNIT– V : Party System :
Political Parties (Congress &BJP - Leadership, Ideology, Social base and Electoral performance); Regional Parties; Coalition politics; Pressure groups

Suggested Reading:

1. Austin Granville, 1972, The Indian Constitution: Cornerstone of a Nation, New Delhi, OUP
2. Austin Granville, 1999, Working a Democratic Constitution: The Indian Experience, New Delhi, OUP
3. Basu D.D., 1999, Introduction to the Constitution of India, Calcutta, Prentice Hall (latest edition)
4. Hasan Zoya, E. Shridharan and R. Sudarshan (eds.) 2002, India's Living Constitution, New Delhi, Permanent Black
5. Kapur Devesh and Pratap Bhanu Mehta (eds.), 2005, Public Institutions in India, New Delhi, OUP
6. Saez Lawrence, 2004, Federalism without a Center, New Delhi, Sage.
7. Sharma Brij Kishor, 2002, Introduction to the Constitution of India, New Delhi, Prentice Hall

CC- 2.3 : INDIA'S FOREIGN POLICY

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I

Historical origins, determinants, Principles, continuity and change

UNIT– II

India and Major Powers: US, China and Russia

UNIT– III

India and Neighbours: Pakistan, Bangladesh, Nepal and Sri Lanka

UNIT– IV

India and NAM : India's Contribution to NAM; Its contemporary relevance
India's Act East Policy and ASEAN

UNIT– V

India and the UN System : India's role in UN Peace Keeping and Global Disarmament
India's Nuclear Policy

Suggested Readings:

1. Bandopadhyaya, J., 1980 Making of India's Foreign Policy, New Delhi, Allied Publications Pvt. Ltd.
2. Harsh V. Pant (ed), Indian Foreign Policy in Unipolar World, Routledge, Taylor and Francis Group, London, 2009.
3. Raja Mohan, C., Crossing the Rubicon: The Shaping of India's New Foreign Policy, Penguin Books, New Delhi, 2003.
4. Appadorai, A and Rajan M.S., 1985, India's Foreign Policy and Relations, South Asian Publishers, New Delhi, 1985.
5. Harshe, Rajan and Seethi, K.M (Eds), 2005, Engaging with the World: Critical Reflections on India's Foreign Policy, Orient Longman, New Delhi.
6. Ganguly, Sumit (Ed), 2010, India's Foreign Policy: Retrospect and Prospect, Oxford University Press, New Delhi.
7. Dutt, V.P(2000) India's Foreign Policy in a Changing World, Vikas, New Delhi, 2010.
8. Dixit, J.N. India's Foreign Policy and its Neighbours, Gyan Publishing House, New Delhi, 2001.

CE- 3.4 : INDIA AND REGIONAL ORGANISATIONS

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I

Regionalism and Regional Organisations: Understanding the conceptual and theoretical aspects of Process of Regionalism

Regional Organisations: Growth and Classification

Significance of Regional Organisations in India's Foreign Policy

UNIT– II

India and SAARC

SAARC: Genesis and growth, Issues and Concerns, Summit Diplomacy

India's Role in SAARC

UNIT– III

India and ASEAN

Background and Civilizational Ties; Look East Policy of India

India's Priorities: Security, Energy and Trade

UNIT– IV

India and BRICS:

Understanding BRICS: Origins, Agenda and Influence

India – BRICS Engagement

New Development Bank and Impact of BRICS on India's overall Strategic interests

UNIT– V

India and European Union

Suggested Readings:

1. Oliver Stuenkel (2015) The BRICS and the future of Global Order, Lexington Press.
2. Uwe Becker, (2014), The BRICS and Emerging Economics in Comparative Perspectives: Political Economy, Liberalisation and Institutional Change, Routledge, New York.
3. Bhabani Sen Gupta (1993) "SAARC: Asian Prospect and Problems of Intra-regional Cooperation". South Asian Publishers, New Delhi.
4. Bhargava, K.K. and Lama M.P (2008) SAARC, 2015: Expanding Horizons and Forging Cooperation in a Resurgent Asia, New Delhi, Friedrich Ebert Stiflung.

CE- 4.3 : INDIAN POLITICS: ISSUES AND PROBLEMS

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I

Nation Building in India: Approaches, Debate and Political Culture in India

UNIT– II

Challenges to National Integration: Casteism, Communalism, Terrorism

UNIT– III

Good Governance: Issues and Challenges, Corruption, Citizens's charter, Right to Information

UNIT– IV

Parliamentary Democracy in India: Party System, Pressure Groups, Politics of Defection, Coalition Politics

UNIT– V

Politics of Regionalism in Politics: Sub-Regionalism, Creation of new states, Politics of Special category status, Politics of Language

Suggested Readings:

1. Bardhan Pranab, The Political Economy of Development in India, Blackwell 1984
2. Brass, Paul, Caste, Faction and Party in India Politics, Chankya, Delhi.
3. Frankal, Francine et.al(ed.) Transforming India: Social and Political Dynamics of Democracy, OUP, 2000.
4. Jalan Bimal (ed) The Indian Economy: Problems and Prospect, Viking, Delhi, 1992.
5. Kothari Rajni, Caste in Indian Politics, Orient Longman
6. Roy, A.B., Society, Religious and Politics in India
7. Rudolph and Rudolph, The Modernity of Tradition: Political Development in India, Orient Longman
8. Singh, G. And H.L. Sharma, Reservation Politics in India: Mandalization of the Society.

CC- 2.5 : GOVERNMENT AND POLITICS IN ODISHA

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I

Movement for separate state of Odisha. Freedom Movement and Praja Mandal Movements in Odisha; Integration of Princely States in Odisha

UNIT– II

Political Culture of Odisha, Regional Political Parties, Coalition Politics in Odisha, Problem of factionalism and Defection, The Opposition in Odisha politics

UNIT– III

The Governor of Odisha, President's rule in the state, Chief Minister, Odisha Legislative Assembly

UNIT– IV

Panchayati Raj Institutions (PRIs) in Odisha: Organisation, functions, problems and prospects

UNIT– V

Regional Disparity: Issue of Backwardness of the state, Regional Backwardness and Development. Odisha Agricultural policy, Odisha Industrial policy

Suggested Readings:

1. A. P. Padhy, Indian State Politics, (ed.) B. R. Publishing Corporation, Delhi, 1985.
2. B. K. Patnaik, "The Politics of Floor Crossing in Odisha", Santosh Publication, Berhampur, 1985.
3. B.B Jena and J. K. Baral, "Government and Politics in Odisha", (ed), Print House, Lucknow: 1988.
4. D. Bhuyan, and S. Muni, Coalitional Politics in Odisha, Abhijeet Publications, New Delhi: 2010.
5. D. Bhuyan, Dayanidhi Parida, "Role of Regional Parties in Odisha", Abhijeet Publication, New Delhi: 2010.
6. D. Bhuyan, Government and Politics in Odisha, Abhijeet Publication, New Delhi: 2014.
7. Harihara Das, B.C. Choudhury, "Federal and State Politics in India, Discovery Publication, New Delhi, 1990.
8. J.K.Mahapatra, "Factional Politics in India", Chugh Publication, Allahabad, 1985.
9. Sukadev Nanda, Coalition Politics in Odisha, Sterling Publishers, New Delhi, 1979.

C-1.2 : DISCRETE MATHEMATICS

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

Objective: This is a preliminary course for the basic courses in mathematics and all its applications. The objective is to acquaint students with basic counting principles, set theory and logic, matrix theory and graph theory.
Expected Outcomes: The acquired knowledge will help students in simple mathematical modeling. They can study advance courses in mathematical modeling, computer science, statistics, physics, chemistry etc.

UNIT-I

Sets, relations, Equivalence relations, partial ordering, well ordering, axiom of choice, Zorn's lemma, Functions, cardinals and ordinals, countable and uncountable sets, statements, compound statements, proofs in Mathematics, Truth tables, Algebra of propositions, logical arguments, Well-ordering property of positive integers, Division algorithm, Divisibility and Euclidean algorithm, Congruence relation between integers, modular arithmetic, Chinese remainder theorem, Fermat's little theorem

UNIT-II

Principles of Mathematical Induction, pigeonhole principle, principle of inclusion and exclusion Fundamental Theorem of Arithmetic, permutation combination circular permutations binomial and multinomial theorem, Recurrence relations, generating functions, generating function from recurrence relations

UNIT-III

Matrices, algebra of matrices, determinants, fundamental properties, minors and cofactors, product of determinant, adjoint and inverse of a matrix, Rank and nullity of a matrix, Systems of linear equations, row reduction and echelon forms, solution sets of linear systems, applications of linear systems, Eigen values, Eigen vectors of a matrix

UNIT-IV

Graph terminology, types of graphs, sub-graphs, isomorphic graphs, Adjacency and incidence matrices, Paths, Cycles and connectivity, Eulerian and Hamiltonian paths, Planar graphs

Books Recommended :

1. Edgar G. Goodaire and Michael M. Parmenter, Discrete Mathematics with Graph Theory, 3rd Ed., Pearson Education (Singapore) P. Ltd., Indian Reprint, 2005.
2. Kenneth Rosen Discrete mathematics and its applications Mc Graw Hill Education 7th edition.
3. V Krishna Murthy, V. P. Mainra, J. L. Arora, An Introduction to Linear Algebra, Affiliated East-West Press Pvt. Ltd.

Reference Books :

❖ J. L. Mott, A. Kendel and T.P. Baker: Discrete mathematics for Computer Scientists and Mathematicians, Prentice Hall of India Pvt Ltd, 2008.

DSE-5.3 : LINEAR PROGRAMMING

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

Objective: The objective of this course is to familiarize industrial problems to students with various methods of solving Linear Programming Problems, Transportation Problems, Assignment Problems and their applications. Also, students will know the application of linear Programming method in Game Theory.

Expected Outcomes: More knowledge on this topic in higher studies will help students to deal industrial models. This is also prerequisite for studying advanced courses in Nonlinear Programming Problems, Inventory Control Problem and Queuing Theory etc.

UNIT-I

Introduction to linear Programming problem, Theory of simplex method, optimality and unboundedness, the simplex algorithm, simplex method in tableau format, introduction to artificial variables, two-phase method, Big-M method and their comparison.

UNIT-II

Duality, formulation of the dual problem, primal-dual relationships, Fundamental Theorem of Duality, economic interpretation of the dual.

UNIT-III

Transportation problem and its mathematical formulation, northwest-corner method least cost method and Vogel approximation method for determination of starting basic solution, algorithm for solving transportation problem. Assignment problem and its mathematical formulation, Hungarian method for solving assignment problem.

UNIT-IV

Game theory: formulation of two person zero sum games, solving two person zero sum games, games with mixed strategies, graphical solution procedure, linear programming solution of games.

Books Recommended :

1. Kanti Swarup, Operations Research, Sultan Chand & Sons, New Delhi. Books.

Reference Books :

- S. Hillier and G.J. Lieberman, *Introduction to Operations Research- Concepts and Cases* (9th Edition), Tata McGraw Hill, 2010.
- Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, *Linear Programming and Network Flows* (2nd edition), John Wiley and Sons, India, 2004.
- G. Hadley, *Linear Programming*, Narosa Publishing House, New Delhi, 2002.
- Hamdy A. Taha, *Operations Research: An Introduction* (10th edition), Pearson, 2017.

DSE-5.4 : PROBABILITY AND STATISTICS

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

Objective: The objective of the course is to expertise the student to the extensive role of statistics in everyday life and computation, which has made this course a core course in all branches of mathematical and engineering sciences.
Expected Outcome: The students shall learn probability and statistics for various random variables, multivariate distributions, correlations and relations. He shall learn law of large numbers and shall be able to do basic numerical calculations.

UNIT-I

Probability: Introduction, Sample spaces, Events, probability of events, rules of probability, conditional probability, independent events, Bayes's theorem, Probability distributions and probability densities: random variables, probability distributions, continuous random variables, probability density functions, Multivariate distributions, joint distribution function, joint probability density function, marginal distributions, conditional distributions, conditional density, The theory in practice, data analysis, frequency distribution, class limits, class frequencies, class boundary, class interval, class mark, skewed data, multimodality, graphical representation of the data, measures of location and variability.

Population, sample, parameters

UNIT-II

Mathematical Expectation: Introduction, expected value of random variable, moments, Chebyshev's theorem, moment generating functions, product moments, moments of linear combinations of random variables, conditional expectations, the theory in practice, measures of location, dispersion

UNIT-III

Special probability distributions: Discrete Uniform distribution, binomial distribution, Negative binomial, geometric, hypergeometric, poisson, multinomial distribution, multinomial. Special probability densities; Uniform distribution, gamma, exponential, gamma, chi-square, beta distribution, normal, normal approximation to binomial, bivariate normal, Functions of random variables, distribution function technique, transformation technique-one variable, several

variables, moment generating function technique

UNIT-IV

Sampling distributions: population distribution, random sample, sampling distribution of mean, Central Limit theorem, Sampling distribution of the mean: finite populations, chi-square, t, F distributions, regression and correlation: Bivariate regression, regression equation, Linear regression, method of least squares.

Books Recommended :

1. Irwin Miller and Marylees Miller, *John E. Freund's Mathematical Statistics with Applications* (8th Edition), Pearson, Asia, 2014.

Reference Books :

- Robert V. Hogg, Joseph W. McKean and Allen T. Craig, *Introduction to Mathematical Statistics*, Pearson Education, Asia, 2007.
- Alexander M. Mood, Franklin A. Graybill and Duane C. Boes, *Introduction to the Theory of Statistics*, (3rd Edition), Tata McGraw- Hill, Reprint 2007.
- Sheldon Ross, *Introduction to Probability Models* (9th Edition), Academic Press, Indian Reprint, 2007.

C-3.3 : ANALOG SYSTEMS AND APPLICATIONS

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

Semiconductor Diodes: P and N type semiconductors, energy level diagram, conductivity and Mobility, Concept of Drift velocity, PN junction fabrication (simple idea), Barrier formation in PN Junction Diode, Static and Dynamic Resistance, Current flow mechanism in Forward and Reverse Biased Diode, Drift velocity, derivation for Barrier Potential, Barrier Width and current Step Junction.

Two terminal device and their applications: (1) Rectifier Diode: Half-wave Rectifiers. center-tapped and bridge type Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, L and C Filters (2) Zener Diode and Voltage Regulation, Principle and structure of LEDS, (2) Photo diode (3) Solar Cell.

UNIT II

Bipolar Junction Transistors: n-p-n and p-n-p transistors, Characteristics of CB, CE and CC Configurations, Current gains a and b, Relation between a and b, Load line analysis of Transistors, DC Load line and Q-point, Physical mechanism of current flow, Active, Cut-off and Saturation Regions.

Transistors Biasing: Transistor Biasing and Stabilization circuits, Fixed Bias and Voltage Divider Bias.

Amplifiers: Transistors as 2-port network h-parameter Equivalent Circuit, Analysis of a single stage CE amplifier using Hybrid Model, Input and Output impedance, Current, Voltage and Power Gains, Classification of class A, B and C amplifiers, Push-pull amplifier (class B)

UNIT-III

Coupled Amplifier: RC-coupled amplifier and it's frequency response.

Feedback in Amplifiers: Effect of Positive and Negative Feedback on In- put Impedance, Output Impedance, Gain Stability, Distortion and Noise. Sinusoidal Oscillations: Barkhausen's Gaterian for self-sustained oscillations. RC Phase shift oscillator, determination of Frequency, Hartley and Colpitt's oscillators.

UNIT-IV

Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical OP-AMP (IC741). Open-loop and Closed loop Gain. Frequency Response. CMRR, Slew Rate and concept of virtual ground.

Application of Op-Amps: (1) Inverting and non-inverting amplifiers (2) Adder (3) Subtractor (4) Differentiator, (5) Integrator (6) Log amplifier, (7) Zero crossing detector (8) Wein bridge oscillator.

Text Books:

1. Foundations of Electronics-Raskhit and Chattopadhyay (New age International Publication), 15th Edition-2018
2. Concept of Electronics- D.C. Tayal (Himalay Publication)-2018

Reference Books:

- Electronic devices and circuits R.L. Boylstad (Pearson India)-2009
- Electronic Principles- A.P. Malvino (Tata McGraw Hill)-2008
- Electronic Devices and Circuits- S. Salivahar and NS Kumar -(Tata McGraw Hill) 3rd Edition-2012
- OP-Amps and Linear Integrated Circuit-R. A. Gayakwad (Prentice Hall) 4th Edition, 2000
- Physics of Semiconductor devices, Donald A Neamen (Prentice Hall)

PRACTICAL

(Minimum 5 experiments are to be done)

1. To study the V-I characteristics of a Zener diode and its use as voltage regulator.
2. Study of V-I and power curves of solar cells, and find maximum power point and efficiency.
3. To study the characteristics of a Bipolar Junction Transistor in CE configuration and draw load line
4. To study the various biasing configurations of BJT for normal class A operation.
5. To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
6. To design and study OP Amp-IC (741/351) as inverting and non inverting amplifier
7. To design and study OP Amp-IC (741/351) as integrator and differentiation and study frequency response.
8. To design and study OP Amp-IC (741/351) as adder and subtractor.

C-4.3 : DIGITAL SYSTEMS AND APPLICATIONS

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

Integrated Circuits (Qualitative treatment only): Active and Passive Components, Discrete components, Wafer Chip, Advantages and Drawbacks of ICs, Scale of Integration: SSI, MSI, LSI and VLSI (basic idea and definitions only), Classification of ICs, Examples of Linear and Digital ICs.

Digital Circuits: Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversation, BCD, Octal and Hexadecimal numbers, AND, OR and NOT. Gates (realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gates and application as Parity Checkers.

UNIT-II

Boolean algebra: De Morgans Theorems: Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Fundamental Products, Idea of Minterms and Maxterms, Conversion of a Truth table into Equivalent Logic Circuit by

(1) Sum of Products Method and (2) Karnaugh Map.

Introduction to CRO: Block Diagram of CRO, Electron Gun, Deflection system and Time Base, Deflection Sensitivity,

Applications of CRO: (1) Study of Wave Form, (2) Measurement of Volt- age, Current, Frequency and Phase Difference.

UNIT-III

Data Processing Circuits: Basic Idea of Multiplexers, De-multiplexers, Decoders, Encoders.

Arithmetic Circuits: Binary Addition. Binary Subtraction using 2s complement. Half and Full Adders. Half and Full Subtractors, 4 bit binary Adder/Subtractor.

Timers: IC 555: block diagram and application is Astable multivibrator and Monostable multivibrator.

UNIT-IV

Introduction to Computer Organization: Input/output Devices, Data storage (idea of RAM and ROM), Computer memory, Memory organization and addressing, Memory Interfacing, Memory Map.

Shift registers: Serial-in-serial-out, Serial-in-Parallel-out, Parallel-in-Serial- out and Parallel-in-Parallel-out. Shift Registers (only up to 4 bits)

Counters (4 bits): Ring Counter, Asynchronous counters, Decade Counter. Synchronous Counter.

Text Books:

1. Foundation of Electronics-Rakshit Chattopadhaya (New Age) -2015
2. Digital Circuits and Logic design: Samuel C. Lee (Printice Hall)-1976
3. Digital Principles and Applications - A.P. Malvino, D.P. Leach and Saha (Tata McGraw)- 7th Edition 2011

Reference Books:

- The Art of Electronics by Paul Horowitz and Wilfield Hill, Cambridge University -2006
- Electronics by Allan R. Hambley, Prentice Hall - 1994
- Digital Logic and Computer design M. Morris Mano (Pearson) -2016
- Concepts of Electronics D.C. Tayal (Himalaya Publishing house) -2018

PRACTICAL

(Minimum 6 experiments are to be done):

1. Student should know how to measure (a) Voltage, and (b) Time period of a periodic waveform using CRO and to test a Diode and Transistor using a Millimeter.
2. To design a switch (NOT gate) using a transistor.
3. To verify and design AND, OR, NOT and XOR gates using NAND gates.
4. Half Adder, Full Adder and 4-bit binary Adder.
5. Half Subtractor, Full Subtractor, Adder- Subtractor using Full Adder I.C.
6. To build Flip-Flop (RS, Clocked RS, D- type and JK) circuits using NAND gates.
7. To design an stable multivibrator of given specifications using 555Timer.
8. To design a monostable multivibrator of given specifications using 555 Timer.

Reference Books:

- Basic Electronics: A Text Books lab manual, P.B. Zbar, A.P. Malvino,
- M.A. Miller, 1994, Mc-Graw Hill.
- OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
- Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill. Electronic Devices and circuit Theory, R.L. Boylestad and L.D. Nashelsky, 2009, Pearson

C-5.2 : SOLID STATE PHYSICS

Full Marks – 100
Mid Sem – 15/1hr
End Sem Theory – 60/3 hrs
End Sem Practical – 25/3 hrs

THEORY

UNIT-I

Crystal Structure: Solids, Amorphous and Crystalline Materials, Lattice translation Vectors, Lattice with a Basis. Central and Non-Central Elements. Unit Cell, Miller Indices, Types of Lattices, Reciprocal Lattice, Brillouin zones, Diffraction of Xrays by crystals, Bragg Law, Atomic and Geometrical Factor

UNIT-II

Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear, Monotomic and Diatomic Chains, Acoustical and Optical Phonons, Qualitative Description of the phonon spectrum in solids, Dulong and Petits Law, Einstein and Debye theories of specific heat of solids, T^3 Law

Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials, Classical Langevins theory of dia and Paramagnetic Domains, Curies law, Weiss Theory of Ferro magnetism and Ferro magnetic Domains, Discussion of B-H Curve, Hysteresis and Energy Loss.

UNIT-III

Dielectric Properties of Materials: Polarization Local Electrical Field at an Atom, Depolarization Field, Electric Susceptibility, Polari ability, Clausius Mosotti Equation, Classical theory of Electronic Polarizability.

Lasers: Einsteins A and B coefficients, Meta stable States, Spontaneous and Stimulated emissions, Optical Pumping and population Inversion, Three Level and Four Level Lasers, Ruby Laser and He-Ne Laser.

UNIT-IV

Elementary band theory: Kronig-Penny model of band Gap, Conductor, Semiconductor (P and N type) and insulator, Conductivity of Semiconductor, mobility, Hall Effect, Measurement of conductivity (04 problem method) and Hall Coefficient.

Superconductivity: Experimental Results, Critical Temperature, Critical magnetic field, Meissner effect, Type I and type II Superconductors, Londons Equation and Penetration Depth, Isotope effect, Idea of BCS theory (No derivation)

Text Books:

1. Introduction to Solid State Physics- Charles Kittel (Wiley India) 8th Edition 2012
2. LASERS: Fundamentals and Applications-Thyagarajan and Ghatak (McMillan India)-2011

Reference Books:

- Solid State Physics-N. W. Ashcroft and N.D. Mermin (Cengage)-2003
- Solid State Physics- R.K.Puri and V.K. Babbar (S.Chand Publication)-2010
- Solid State Physics S. O. Pillai (New Age Publication)-2008
- Lasers and Non linear Optics B.B.Laud (Wiley Eastern)-2011
- Elements of Solid State Physics-J.P. Srivastava (Prentice Hall of India)-2014
- Elementary Solid State Physics-Ali Omar (Addison Wiley)-2002

DSE-5.4 : NUCLEAR AND PARTICLE PHYSICS

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT-I

General properties of Nuclei: Constituents of nucleus and their intrinsic properties, Quantitative facts about mass, radius, charge density (matter density), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment electric moments, nuclear excites states.

Radioactivity decays: (a) Alpha decay: basics of alpha- decay processes, theory of alpha-emission, Gamow factor, Geiger Nuttall law (b) beta-decay: energy kinematics for beta-decay, positron emission, electron capture, neutrino hypothesis. (c) Elementary idea of Gamma decay.

UNIT-II

Nuclear Models: Liquid drop model approach, semi empirical mass formula and significance of its various terms, conditions of nuclear stability, two nucleon separation energies, evidence for nuclear shell structure, nuclear magic number, basic assumption of shell models.

UNIT-III

Detector for nuclear radiations: Detector for nuclear radiations: Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic Principle of Scintillation Detectors and Construction of photomultiplier tube (PMT). Semiconductor Detectors (Si and Ge) for charge Particle and photo detection (Concept of charge carrier and mobility), neutron detector.

Particle Accelerators: Van-de Graff generator (Tandem Accelerator), Linear accelerator, Cyclotron, Synchrotrons

UNIT-IV

Particle Physics: Particle interactions, basic features, types of particles and its families,

Symmetries and conservation laws: Energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, strangeness and charm, Elementary ideas of quarks and gluons.

Text Books:

1. Introduction to Nuclear Physics by Roy and Nigam-2014
2. Atomic and Nuclear Physics- N. Subramanyam, Brij Lal and Jivan Seshan (S. Chand Publishing)-2007

Reference Books:

- Introduction to Modern Physics- H.S. Mani and G.K. Mehta (Affilated east and west) -2018
- Introductory nuclear Physics-Kenneth S. Krane (Wiley India Pvt. Ltd)-1987
- Introduction to Elementary Particles-D. Griffith (John Wiley and Sons)-2008
- Concepts of Nuclear Physics - Bernard L. Cohen. (Tata Mcgraw Hill). -2017
- Concepts of Modern Physics-Arthur Beiser (McGraw Hill)-2017

DSE-6.3 : NANO MATERIALS AND APPLICATIONS

Full Marks – 100
Mid Sem – 20/1hr
End Sem – 80/3 hrs

UNIT-I

Nanoscale Systems: Length scales in physics, Nanostructures: 1D, 2D and 3D nanostructures (nanodots, thin films, nanowires, nanorods), Band structure and density of states of materials at nanoscale, size effects in nano systems, Quantum confinement Applications of Schrodinger equation-infinite potential well, potential step, potential box, quantum confinement of carriers in 3D, 2D, 1D nanostructure and its consequences.

UNIT-II

Synthesis of Nanostructure Materials: Top down and bottoms up approach, Photo lithography Ball milling. Gas phase condensation, Vacuum deposition, Physical vapour deposition (PVT): Thermal evaporation, E-beam evaporation, Pulsed Laser deposition, Chemical vapour deposition (CVD), Sol-Gel Electro deposition, Spray pyrolysis, Hydrothermal synthesis, Preparation through colloidal methods, MBE growth of quantum dots.

UNIT-III

Characterization: X-Ray Diffraction, Optical Microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy, Atomic Force Microscopy, Scanning Tunneling Microscopy

UNIT-IV

Applications: Applications of nano particles, quantum dots, nanowires and thin films for photonic devices (LED, solar cells). Single electron devices (no derivation). CNT based transistors. Nonmaterial Devices: Quantum dots hetero structure lasers, optical switching and optical data storage. Magnetic quantum well; magnetic dots magnetic data storage. Micro Electromechanical Systems (MEMS), Nano Electromechanical Systems (NEMS)

Text Books:

1. S.K. Kulkarni, Nanotechnology: Principles and Practices (Capital Publishing Company)-3rd Edition 2014
2. Nano science and nano technology, K.K. Choudhary (Narosa)-2016

Reference Books:

- Nano Science and nano technology, Sundar Singh (Pragati Prakashan)-2017
- C.P. Poole, Jr. Frank J. Owens, Introduction to Nanotechnology (Wiley India Pvt. Ltd.)-2007
- Richard Booker, Earl Boysen, Nanotechnology (John Wiley and Sons)-2005
- M. Hosokawa, K. Nogi, M. Naita, T. Yokoyama, Nanoparticle Technology Handbook (Elsevier, 2007)
- K.K. Chattopadhya and A. N. Banerjee, Introduction to Nanoscience and Technology (PHI Learning Private Limited)-2009

CC– 1.3 : PREHISTORIC ARCHAEOLOGY – I

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT – I

Introduction, Definition and Scope of Prehistoric Archaeology; Relation with other disciplines, Methods of studying Prehistoric Archaeology

UNIT – II

Methods of Estimation of Time and Reconstruction of the Past, Dating Methods: i) Absolute dating methods: Radiocarbon^{14} dating (C^{14}), Potassium– Argon, Thermolumniscence method; ii) Relative dating methods: Stratigraphy, Palaeontology, Palynology

UNIT – III

A brief outline on the origin of the earth and life, geological time scale, Geochronology of Pleistocene Epoch, Glacial and Interglacial; Pluviation and Inter Pluviation

UNIT – IV

Typology and Technology in Prehistoric Archaeology:

Typology of stone tools: Paleolithic (Choppers, Hand axes, Cleavers and Scrapers), Mesolithic (Non–geometric and Geometric microliths), Neolithic (Axe, Adze, Chisel, Ring stones)

Prehistoric Technology: Manufacturing techniques of Prehistoric stone tools: primary and combination fabrication techniques.

Suggested Readings / Books Recommended:

1. Aiyappan, A. and S.T. Satyamurti (Ed), 1960, *Handbook of Museum Technique*, Government Museum, Madras.
2. Banerjee N. R. *Museum and Cultural Heritage in India*
3. BasaK.K., Md. Rehan, R.K. Gupta 2007, *Museology A Comprehensive Bibliography and Webliography,* Serial Publications, New Delhi.
4. Behera, B.K. and S.K. Mohanty, 2007 *Museology and Museum Management in India,* Mayur Publications, Bhubaneswar, Orissa.
5. Bhattacharya, D.K. *An Introduction to Prehistoric Archaeology*
6. Bhattacharya, D.K. , *The Old Stone Age Tools*
7. Bhatnagar, A. 1999, *Museum, Museology and New Museology, Sandeep Prakashan*, New Delhi.
8. Burkitt, M.C. *The Old Stone Age*
9. Diwvedi, V. P. and G.N. Pant(Ed) 1980, *Museum and Museology: New Horizon*, Agam Kala Prakashan, New Delhi.
10. Ghoshmaulik, and S.K. Mishra 1987, *Practical Anthropology*, SAAS, Orissa.
11. Ghoshmaulik, S.K. and K. K. Basa (Ed) 2001, *Understanding Heritage: Role of Museum, Academic staff Collage*, Utkal University, Bhubaneswar, India.
12. Joukowsky, Martha *Field Archaeology: Tool and Techniques of Field Work for Archaeologists.*
13. Nair, S. M., *Bio– Deteriorations of Museum Materials*, Agam Kala Prakashan, New Delhi.
14. Nigam, M. L., 1985 *Fundamentals of Museology,* Deva Publications, Hyderabad.
15. Oakley, K. P. 1975, *Man the Tool– maker, Trustees of British Museum (Natural History)*, London
16. Rammi Reddy, V. *Elements of Prehistory*
17. Renfrew, C. and P. Bahn *Archaeology: Theories, Methods and Practice*
16. Shankalia, H.D. *Stone Age Tools and Techniques*, Deccan Collage Poona. India

CC– 1.4 : TRIBES OF INDIA

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT – I

Concept of tribes and its problematic nature, General and specific characteristics of tribes, Classification and distribution of tribes based on Territory, Language, Economy, Religion and Race, Particularly Vulnerable Tribal Groups (PVTGs)

UNIT – II

Constitutional safeguards for Scheduled Tribes, History of administration of tribal areas, tribal policies, plans, programmes of tribal development, Problems of exploitation and deprivation of scheduled caste/ tribe and Other Backward, Role of anthropology in tribal and rural development

UNIT – III

Problems of the tribal Communities—Land alienation, poverty, indebtedness, low literacy, poor educational facilities, unemployment, under– employment, health and nutrition. Development of forest policy and tribals, Impact of Urbanisation and Industrialization on tribal populations

UNIT – IV

Social change among the tribes during colonial and post– Independent India, Social change and contemporary tribal societies: Impact of modern democratic institutions, development programmes and welfare measures on tribals and weaker sections, Tribal movements

Suggested Readings

1. Gupta D. (1991). Social Stratification. Oxford University Press: Delhi.
2. Madan V. (2002). The Village in India. Oxford University Press: Delhi.
3. Nathan D. (1998). Tribe– Caste Question. Simla: IIAS.
4. National Tribal Policy (draft). (2006). Ministry of Tribal Affairs. Government of India.
5. Patnaik S.M. (1996). Displacement, Rehabilitation and Social change. Inter India Publication, Delhi.
6. Shah G. (2002). Social Movement and the State. Delhi: Sage.
7. Shanin T. (1987). Peasants and Peasantry. New York, Blackwell.
8. Vidyarthi L.P. and Rai B.K. (1985) Tribal Culture in India, New Delhi, Concept Publishing Company.
9. Wolf E. (1966). Peasants. NJ, Prentice Hall.

CC– 2.2 : BIOLOGICAL ANTHROPOLOGY–II

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT – I

Concept of Race & UNESCO Statement on Race, Characteristics of Major races of the world: Caucasoid; Negroid; Mongoloid; Racial classifications by Hooton; Coon, Garn and Birdsell; Racial classification of Indian Population by Risley, Guha and Sarkar; Relevance of race in 21st Century

UNIT – II

Concept of Biological Variability; Race, Hardy– Weinberg Law; Sources of Genetic Variation; Structuring Genetic Variation; Interpretation of Human Variation, Polymorphism (Physiological, Serological, Biochemical and DNA Markers)

UNIT – III

Demographic Anthropology: Meaning of Demography, The scope and methods of population study, Principle of Population Study; Sources of Demographic Data: Census, Registration, Dual Registration, Life Tables; Demographic Processes: Fertility, Mortality and Migration, Demographic profile of Indian populations and its growth structure

UNIT – IV

Nutritional Anthropology: Meaning of Nutrition, Evolution of Human diet, Concept of balanced diet, Bio– cultural factors influencing the diseases and nutritional status. Concept of Human Growth, development, differentiation and maturation; Prenatal and Postnatal Period of growth; Bio– Cultural factors (genetic, social, and ecological factors) influencing growth and variation

Suggested Reading

1. Bhende A. and T. Kantikar (2006) *Principles of Population Studies*. Himalayan Publishing House, Mumbai
2. Bogin B. (1999). *Pattern of Human Growth*. 2nd edition CUP.
3. Cameron Noel and Barry Bogin (2012) *Human Growth and development*. Second edition, Academic Press Elsevier.
4. Cameron Noel and Barry Bogin (2012) *Human Growth and development*. Second edition, Academic Press Elsevier.
5. Cummings Michael R. (2009). Human Genetics. Cengage Learning India Pvt. Ltd, Delhi.
6. Cummings MR (2011). Human Heredity: Principles and Issues. Brooks/Cole, Cengage Learning
7. Harrison G.A., Tanner, J.M., Pilbeam, D.R., Baker, P.T. (1988) *Human Biology*. Oxford University Press.
8. Jurmain R, Kilgore L, Trevathan W. Essentials of physical anthropology. Wadsworth publishing.
9. Standford C.; Allen J.S. and Anton S.C. (2012). *Biological Anthropology: The Natural History of Mankind*. PHI Learning Private Limited, New Delhi.
10. Statement on Race: Annotated Elaboration and Exposition of the Four Statements on Race (1972). Issued by UNESCO. Oxford University Press.
11. Stein P.L. and B.M. Row. 1974. Physical Anthropology. McGraw– Hill Inc., USA.
12. Swindler D. R. (2009). *Introduction to the Primates*. Overseas Press India Pvt. Ltd., New Delhi.
13. Das B.M. 2008. Outlines of Physical Anthropology. Kitab Mahal, New Delhi.

CC– 2.3 : PREHISTORIC ARCHAEOLOGY-II & MUSEOLOGY

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT – I

Palaeolithic Cultures of Africa and South Asia (India): Pebble tool Culture in Africa (evidences from Olduvai Gorge); Pebble tool culture in India (evidences from Sohan Valley); Acheulian Culture of Peninsular India.

UNIT – II

Mesolithic Cultures of Europe and India: (evidences from Azilian, Tardenoisean, Austurian, Sauveterranean, Larnian, Meglemosean, Kitchen – Midden, Champignian and Ertboll)

Mesolithic Cultures in India: (evidences from Teri Sites, Birbhanpur, Bagor, Bhimbetka, Adamgarh, Sarai Nahar Rai, Chopani Mando, Mahadaha.)

Neolithic Culture of Indian Subcontinent (evidences from Northern, Southern, Eastern and Northeastern India)

UNIT – III

Proto– historic Cultures of South Asia (India): Chalcolithic Cultures of India – Central Indian Chalcolithic; Deccan Chalcolithic;

Harappan Civilization: Origin, Extent, distribution, Salient features, Causes of decline and Chronology of the Indus Civilization.

UNIT – IV

Museum, Museology

Museum and Museology: Meaning, Definition, Nature and Scope; Classification of Museums in India— National Museum, State Museum, University Museum, Specialized Museums in India.

Conservation of Cultural Resources in Museum:

Causes of Decay and Deterioration, Care and Handling, Cleaning and Repairing, Packing and Shifting of Museum Objects; Preservation of Organic and Inorganic Objects in Museums.

Suggested Readings / Books Recommended:

1. Aiyappan, A. and S.T. Satyamurti (Ed), 1960, *Handbook of Museum Technique*, Government Museum, Madras.
2. Banerjee N. R. *Museum and Cultural Heritage in India*
3. BasaK.K., Md. Rehan, R.K. Gupta 2007, *Museology A Comprehensive Bibliography and Webliography*, Serial Publications, New Delhi.
4. Behera, B.K. and S.K. Mohanty, 2007 *Museology and Museum Management in India*, Mayur Publications, Bhubaneswar, Orissa.
5. Bhattacharya, D.K., *An Introduction to Prehistoric Archaeology*
6. Bhattacharya, D.K., *The Old Stone Age Tools*
7. Bhatnagar, A. 1999, *Museum, Museology and New Museology, Sandeep Prakashan*, New Delhi.
8. Burkitt, M.C. *The Old Stone Age*
9. Diwvedi, V. P. and G.N. Pant(Ed) 1980, *Museum and Museology: New Horizon*, Agam Kala Prakashan, New Delhi.
10. Ghoshmaulik, and S.K. Mishra 1987, *Practical Anthropology*, SAAS, Orissa.
11. Ghoshmaulik, S.K. and K. K. Basa (Ed) 2001, *Understanding Heritage: Role of Museum, Academic staff Collage*, Utkal University, Bhubaneswar, India.
12. Joukowsky, Martha *Field Archaeology: Tool and Techniques of Field Work for Archaeologists.*
13. Nair, S. M., *Bio– Deteriorations of Museum Materials*, Agam Kala Prakashan, New Delhi.
14. Nigam, M. L., 1985 *Fundamentals of Museology*, Deva Publications, Hyderabad.
15. Oakley, K. P. 1975, *Man the Tool– maker, Trustees of British Museum (Natural History)*, London
16. Rammi Reddy, V. *Elements of Prehistory*
17. Renfrew, C. and P. Bahn *Archaeology: Theories, Methods and Practice*
18. Shankalia, H.D. *Stone Age Tools and Techniques*, Deccan Collage Poona. India

SEMESTER – III

CC– 3.1 : RESEARCH METHODOLOGY

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT – I

Field work tradition in Anthropology; Ethnographic approach, contribution of Malinowski, Boas and other pioneers; cultural relativism, ethnocentrism, etic and emic perspectives, techniques of rapport establishment identification of representative categories of informants,

UNIT – II

Research Design; Review of literature, conceptual framework, formulation of research problem, formulation of hypothesis, sampling, tools and techniques of data collection: Survey method, Observation, Questionnaire, Schedule, Interview, Case study, Life history and Genealogy; data analysis and report writing– Chapterization, preparing a text for submission and publication, concepts of preface, notes (end and footnotes), glossary, prologue and epilogue, appendix, bibliography(annotated) and references cited, review and index.

UNIT – III

Ethics and Politics of Research; Identify, define, and analyze ethical issues in the context of human subject research; Ethical importance of consent, privacy and confidentiality in research; Issues of academic fraud and plagiarism, conflicts of interest, authorship and publication.

UNIT – IV

Bio– Statistics; Guiding ideals and critical evaluation of major approaches in research methods, basic tenets of qualitative research and its relationship with quantitative research; Types of variables, presentation and summarization of data (tabulation and illustration).Descriptive statistics– Measurers of Central Tendency, Measure of Variation, Tests of Inference– Variance ratio test, Student's 't' tests, Chi–square test.

Suggested Readings

1. Garrard E and Dawson A. What is the role of the research ethics committee? Paternalism, inducements, and harm in research ethics. Journal of Medical Ethics 2005; 31: 419– 23.
2. Bernard H.R. Research Methods in Anthropology, Qualitative and Quantitative Approaches. Jaipur: Rawat Publications. 2006.
3. Madrigal L. Statistics for Anthropology. Cambridge: Cambridge University Press. 2012.
4. Zar JH. Biostatistical Analysis. Prentice Hall. 2010.
5. Michael A. The Professional Stranger. Emerald Publishing. 1996.
6. Bernard R. Research Methods in Anthropology: Qualitative and Quantitative Approaches. Alta Mira Press. 2011.
7. Emerson RM, Fretz RI and Shaw L. Writing Ethnographic Field notes. Chicago, University of Chicago Press. 1995.
8. Lawrence NW. Social Research Methods, Qualitative and Quantitative Approaches. Boston: Allyn and Bacon. 2000.

SEMESTER – IV

C– 4.1 : FORENSIC ANTHROPOLOGY

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT – I

Introduction to Forensic Anthropology: Definition, Brief History, Scope, Applications and Integration of Forensic Anthropology.

UNIT – II

Basic Human Skeletal Biology, Identification of Human and Non– Human Skeletal Remains, Ancestry, age, sex and stature estimation from bones, Discovery and Techniques for recovering skeletonized Human Remains.

UNIT – III

Personal Identification, Complete and Partial Identification, Methods of Identification in Living Persons: Somatometry, Somatoscopy, Occupational Marks, Scars, Bite Marks, Tattoo Marks, Fingerprints, Footprints, Lip Prints, Nails, Handwriting, Deformities and Others.

UNIT – IV

Serology: Identification and Individualization of bloodstain, urine, semen and saliva.
Patterns of Bloodstains; Individualization: Forensic Odontology– Tooth Structure and Growth, Bite Marks, Facial Reconstruction, DNA Profiling.

Suggested Readings:

1. Bass W.M. (1971). Human Osteology: A Laboratory and Field manual of the Human Skeleton.
2. Columbia: Special Publications Missouri Archaeological Society.
3. Black S. and Ferguson E. (2011). Forensic Anthropology 2000 to 2010. CRC Press, London.
4. Byers, S. N. (2008). Forensic Anthropology. Boston: Pearson Education LTD.
5. Gunn A. (2009) Essential Forensic Biology (2nd ed). Chichester: Wiley– Blackwell
6. Modi, R. B. J. P. (2013). A Textbook of Medical Jurisprudence and Toxicology. Elsevier.
7. Reddy V. R. (1985). Dental Anthropology, Inter– India Publication, New Delhi.
8. Spencer, C. (2004). Genetic Testimony: A Guide to Forensic DNA Profiling, Pearson, New Delhi.
9. Vats Y., Dhall J.K. and Kapoor A.K. (2011). Gender Variation in Morphological Patterns of Lip Prints among some North Indian Population. J. Forensic Odontology, 4: 11– 15.
10. Wilkinson, C. (2004). Forensic facial reconstruction. Cambridge University Press.

CE– 4.4A : FIELDWORK AND DISSERTATION

Full Marks: 100
End Sem : 100/6 hrs

Empirical study among the tribes and castes of Odisha is to be conducted for a minimum periods of 30 days(1 month) in semester IV under the guidance of a teacher or teachers. Two copies of dissertation are to be submitted for examination. The Examination of Dissertation shall be conducted by an internal and an external examiner.

CC- 1.3 : INTERNATIONAL ECONOMICS-I

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I : Theory of International Trade-I

The pure theory of international trade – Theories of absolute advantage, comparative advantage and opportunity costs; Empirical testing of classical theory; Trade equilibrium under constant, increasing and diminishing cost conditions, and imperfect competition

UNIT– II : Theory of International Trade-II

Heckscher–Ohlin theory of trade, Leontief paradox, Theorem of factor price equalization, Stolper–Samuelson theorem, Rybczynski theorem, Kravis and Linder theorem of trade. Technological change and international trade

UNIT– III : Gains from trade

Gains from trade: their measurement and distribution; Concept of terms of trade, their uses and limitations; Hypothesis of secular deterioration of terms of trade, its empirical relevance and policy implications for less developed countries; Terms of trade and income distribution; Trade as an engine of economic growth; Concept and policy implications of immiserising growth

UNIT– IV : Interventions in trade

Theory of interventions: Tariffs, Quotas and Non-tariff barriers; Effects of tariffs under partial and general equilibrium perspectives; Tariff and income distribution; Optimum tariff

UNIT– V : Trade Integrations

Types of regional economic integration; Theory of customs union: Viner's partial equilibrium approach to welfare effects of customs union; General equilibrium analysis of customs union – Lipsey model and Vanek model; Empirical findings and dynamic considerations of customs union and free trade area.

Reference Books :

1. Bhagwati, J. (Ed.) (1981), International Trade, Selected Readings, Cambridge, University Press, Massachusetts.
2. Carbough, R.J. (1999), International Economics, International Thompson Publishing, New York.
3. Chacholiades, M. (1990), International Trade : Theory and Policy, McGraw Hill, Kogakusha, Japan.
4. Dunn, R.M. and J.H. Mutti (2000), International Economics, Routledge, London.
5. Kenen, P.B. (1994), The International Economy, Cambridge University Press, London.
6. Kindleberger, C.P. (1973), International Economics, R.D. Irwin, Homewood.
7. Krugman, P.R. and M. Obstfeld (1994), International Economics: Theory and Policy, Glenview, Foreman.
8. Salvatore, D. (1997), International Economics, Prentice Hall, Upper Saddle River, N. J., New York.
9. Soderston, Bo (1991), International Economics, The Macmillan Press Ltd., London.
10. Nichans, J. (1984), International Monetary Economics. John Hopkins University Press, Baltimore.
11. Yeager, L.B. (1976), International Monetary Relations, Theory, History and Policy, Harper and Row, New York.
12. Aggarwala, M.R. (1979), Regional Economic Cooperation in South Asia, S. Chand and Co., New Delhi.
13. Brahmananda, P.R. (1982), The IMF loan and India's Economic Future, Himalaya Publishing House, Bombay.
14. Kenen, P.B. (1995), Economic and Monetary Union in Europe, Cambridge University Press, U.K.
15. Kindleberger, C.P. (1996). A History of Financial Crisis : Manias, Panics and Crashes, (3rd Edition), John Wiley and Sons, New York.

CC- 1.4 : MATHEMATICAL TECHNIQUES FOR ECONOMICS-I

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I : Number System and Equations

Types of number-real number, complex number, solutions of equations: linear, quadratic equations, simultaneous equations.

UNIT– II : Co-ordinate Geometry

Rectangular Co-ordinate system-ordinate and abscissa, straight lines, parabola, hyperbola and rectangular hyperbola; economic applications-demand functions, supply functions, production functions, cost and revenue functions.

UNIT– III : Differential Calculus

Basic concepts-functions-types-polynomial, logarithmic, exponential, and trigonometric; Limit and Continuity, and differentiability; Derivatives-definitions and rules, simple derivatives, partial derivatives, and total derivatives; Total differential-definition, 2nd order differential, rules of differential; Curvature of functions-convex sets, concave and convex functions, quasi-concave and quasi-convex functions, quadratic form-positive and negative definite quadratic forms

UNIT– IV : Vectors and Matrices

Vector-definition, geometric description, vector operations-addition, scalar multiplication, vector space, linear independence of a set of vectors, basis and rank of vector space; Matrix-definitions and types, operations on matrix-transposition, addition, matrix multiplication, matrix inversion-definition, determinant, Laplace expansion of Determinant, Cramer's rule; solution of a set of homogenous and non-homogeneous equations systems.

UNIT– V : Optimisations

Optimisation-definitions, necessary and sufficient conditions; free optimisations of functions of single and several independent variables; constrained optimization-Lagrange multiplier method; Economic examples-utility maximization, output maximization and cost minimisation.

Reference Books :

1. Chiang, A.C (1986), "Fundamental Methods of Mathematical Economics", McGraw Hill.
2. Allen, R G D : Mathematical Analysis for Economists
3. Yamane, Taro (1975), "Mathematics for Economists", Prentice Hall of India, New Delhi

CC- 1.5 : STATISTICAL TECHNIQUES FOR ECONOMICS

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I : Set theory and Probability

Set-definitions and types, set operations-union, intersection, difference; Cartesian products; Probability-classical, axiomatic and subjective definitions; permutations and combinations; random variable-definitions, probability distributions-discrete and continuous probability distributions; Mathematical expectations-definition of mean and variance of a random variable in terms of mathematical expectations; conditional probability and Bayes theorem.

UNIT– II

Bivariate distribution- Correlation and regression analysis; correlation coefficient and its properties, Rank correlation coefficient, concept of least squares and lines of regression, standard error of estimate, methods of estimation of non-linear regression equations: parabolic, exponential, geometric, modified exponential, gompertz and logistic relationships.

UNIT– III

Theoretical probability distributions: Binomial, possion and Normal probability distributions, significance, properties, application.

Sampling; concept of an estimator and its sampling distributions, desirable properties of an estimator; Interval estimation: statistical hypothesis-Null and alternative, Type-I & Type-II errors, confidence intervals and hypothesis testing based on z, t, chi-square and F distribution.

UNIT– IV

Index Numbers Definition, construction of index numbers-methods, chain index number

UNIT– V : Time Series

Definition, components-seasonal, cyclical, trends and irregular; plotting of time series on natural and logarithmic scale

Reference Books :

1. Gupta, A.C. (1986), Fundamental Methods of Mathematical Economics, McGraw Hill, New York.
2. Croxton, Crowden and Klein (1971), Applied General Statistics, Prentice Hall of India, New Delhi. Dowling, E.D. (1986).
3. Gupta, S.C. (1993), Fundamentals of Applied Statistics, S. Chand & Sons, New Delhi.
4. Gupta, S.P.( ), Statistical Methods, Kothari, C.R.(1992).
5. Monga, G.S. (1971), Mathematical and Statistics for Economists, Vikas Publishing House, New Delhi.
6. Speigel, M.R(1992), "Theory and problems of statistics" McGraw Hill Book Co.
7. W: Allen Webster (1997), Applied Statistics for Business & Economics, An essential version, 3rd edition, McGraw – Hill.
8. K & P: P.H. Karmel & M. Polasek (1978), Applied Statistics for Economists, 4th edition, Pitman.

SEMESTER-III

CC- 3.1 : PUBLIC FINANCE THEORY AND PRACTICE

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I : INTRODUCTION

The role of Govt. in a Changing perspective., Fiscal functions of the Govt., Provision of Pvt. Goods, Public goods Social goods merit goods, mixed goods, Externality & the role of the Govt.

UNIT– II : PRINCIPLES OF TAXATION

Benefit Principle, Bowen & Lindahl's model, Principle of equity, Ability to pay Principle, Excess burden doctrine, Principle of fiscal neutrality, Administrative efficiency, Application of taxation Principles in developing countries: Taxable capacity- Meaning, Types & Measurement; Impact & incidence of Tax, Shifting of Tax incidence under different market conditions.

UNIT– III : PUBLIC EXPENDITURE

Wagner's Law of increasing state activities, Peacock-wiseman hypothesis, Effects of public expenditure on production, distribution & other economic activities; Public sector pricing policy-average cost & marginal cost, Criteria for public investment-social cost benefit analysis.

UNIT– IV : PUBLIC DEBT& BUDGET

Sources of public borrowing, effects of public debt, tax Vs debt, burden of public debt, shifting of debt burden, debt redemption & management.

Budget-Balanced Vs unbalanced budget, budget deficits & their limitations, budget as an instrument of economic policy, zero based budgeting, PPBS.

UNIT– V : Issues in Indian Public Finance

Tax reforms in India, DTC & GST, Tax evasion. Principles of Federal Finance, Fiscal Federalism in India, Centre- State financial relation, financial autonomy of states, shrinking size of development finance through budgets.

Reference Books :

1. Musgrave R.A & P-Musgrave Public Finance theory & Practice, McGraw Hill.
2. Ghosh, Ambar & Chandana Ghosh (2008), Economics of the Public Sector, PHI
3. Due John F & Friedlander, Government Finance.

CE- 3.4B : FINANCIAL ECONOMICS

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I : Introduction to Financial Markets

Capital markets, consumption and investments with and without capital markets, market places and transaction costs and the breakdown of separation; Fisher separation theorem; the agency problem; Maxim-ization of shareholder's wealth

UNIT– II : Theory of Uncertainty

Axioms of choice under uncertainty; utility functions; expected utility theorem; certainty equivalence, measures of risk-absolute and relative risk aversions; stochastic dominance-first order, second order and third order; measures of investment risk-variance of return, semi-variance of return, shortfall probabilities

UNIT– III : Variance Portfolio Theory

Measuring portfolio return and risks, effect of diversification, minimum variance portfolio, perfectly correlated assets, minimum variance opportunity set, optimal portfolio choice; mean variance, Frontier of risky and risk-free asset, portfolio weights

UNIT– IV : Index Models, CAPM & APT

Models of asset returns, multi index models, single index model, systematic and specific risk, equilibrium models-capital asset pricing model, capital market line, security market line, estimation of beta,; arbitrage pricing theory

UNIT– V : Fixed Income Securities

Bond prices, spot prices, discount factors, and arbitrage, forward rates and yield-to-maturity, Price sensitivity, Hedging

Reference Books :

1. Copeland, T. E. and J. F. Weston, Financial Theory and Corporate Policy, Addison Wesley, 1992
2. Brealey, R. and S. Myers, Principles of Corporate Finance, fifth edition, New York, McGraw Hill, 1997.
3. Elton, E.J and M.J. Gruber, Modern Portfolio Theory & Investment Analysis, (fourth edition) John Wiley & Sons 1991.
4. Houthakker, H.S. and P.J. Williamson, Economics of Financial Markets, Oxford University Press, 1996
5. Johnston (1991), "Economic Methods", McGraw Hill Book Co.
6. Koutsoyiannis, A (1992), "Introduction to Econometrics", OUP
7. Dougherty, C (1992), "Introduction to Econometrics", OUP
8. Gujurati, D & Sangeetha (2007), "Basic Econometrics", McGraw Hill Book Co.

CE- 4.2B : INTERNATIONAL FINANCE

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I : International Finance: Importance, Types and Scope

International Finance-Importance to Business firms, Investors, Banks, Speculators and Regulators. Types of International transactions- International Trade, F.D.I, FIIs. Risks in International finance-Political, Exchange rate, Counter-party, Liquidity risk, Scope of International finance.

UNIT– II : Financial markets & related concepts

Financial markets- Derivatives market, Money market, Foreign exchange market, Capital market, Integration of Capital and foreign exchange market. Indian foreign exchange market- Structure, participants. Concepts of Currency convertibility-Capital account convertibility-Specific to Indian context.

UNIT– III : Foreign Exchange Rates and related concepts

Foreign exchange rate-Direct & indirect quote, Two-way quote, Cross-rate, Spot rate and inter-Bank rate. Direct and indirect exchange rate in two way quote. Forward rate and calculation of forward rate, Currency derivatives, Forward contract Vrs futures contract.

UNIT– IV : Sources of International finance and its regulation

Factors affecting financing decisions, Sources of international finances-Loans, Euro-securities, foreign bonds, Depository receipts (DRs)-Types, impact of DR issue on domestic float. ECBs of India.

Exchange rate management By R.B.I.NEER, FERA (1973) and FEMA(1999)-A comparison

UNIT– V : International Financial institutions

International banking-factors leading to its growth. Types of international banking offices-offshore financial centres, Non-Banking Financial companies.

Evolution of International financial system-Pre & Post Bretton woods System, IBRD, IDA, ADB, IFC

Euro-dollar and Euro-currency market-Evolution, Growth and prospects.

Reference Books :

1. Levi, M.D-International finance: The markets and financial management of multinational business, 3rd edition, McGraw Hill Int. Editions. 1996
2. Heller, Roberth. International monetary Economics, Prentice Hall, Engelwood cliffs.
3. Verghese, S.K:- Foreign exchange and Financing of Foreign Trade, Vikas Publishing House, New Delhi.
4. Kohn , M(1996)-"Financial institutions and markets", Tata McGraw Hill , New Delhi.
5. Varshney R.L, Bhashyam S (2001)-International financial management, Sultan Chand and Sons, New Delhi.
6. Shailaja, G (2008)-International Finance, Universities Press Pvt. Limited.

SEMESTER-IV

CC- 4.1 : INDIAN ECONOMIC PROBLEMS AND POLICY

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT– I : Economic Development & Planning

Factors affecting economics development in India, Problems of poverty, Inequality and un employment and various programmes of the Govt., Planning in India, Objectives and strategy of planning, failures and achievements of plan, Recent Plan-objectives, allocation and targets, NITI Ayog

UNIT– II : Demographic Features, Resource Base and Infrastructure.

Broad Demographic features of Indian population, Theory of Demographic transition and its applicability in India context, Population policy, Migration and urbanization, Resource Base in India Physical structure-Energy, transport, Communication, social infra structure-Education and Health, issues and policies in financing infrastructure development, Growth of the service sector

UNIT– III : Issues in Agriculture & Industrial Sector

The Agricultural sector-Role of agricultural sector in India's economic development, Critical evaluation of land reforms in India and recent initiative, need for second green revolution, New agricultural policy, PDS system, Industrial sector, Scenario since industrial policy of 1991, Public sector enterprises and their

performance, Privatization and disinvestment debate, Problem of sick units in India and Govt. policy, revival of small scale sector, land acquisition, SEZ and industrialization

UNIT– IV : Financial Fiscal and External sector in India

Issues relating to reforms in Banking & insurance structure and direction of foreign trade, Balance payments, export-import policy and trade liberalization foreign exchange management-FERA & FEMA foreign capital & MNCs in India

UNIT– V : Economic Reforms

Rationale of internal and external reforms, Liberalization, Privatization and Globalization, WTO & its impact on different sectors of the economy, Financial sector reforms fiscal reforms.

Reference Books :

1. Chakravarly. S (1987), development Planning: The Indian experience, Oxford University Press, New Delhi.
2. Brahmananda, P R and V R Panchmukhi (Eds) (2001), Development experience in the Indian Economy: Inter-stali perspective, Bookwell, Delhi.
3. Government of India, Economic Survey (Annual), Ministry of Finance, New Delhi.
4. Hand book of Indian Economy-RBI publication.
5. Dalt, R (Ed) (2001) Second generation economic reforms in India, Deep & deep publications, New Delhi.
6. Bhagwati, Jagdish N and Srinivasan T N (1975) foreign trade Regimes and Economic development: India, National Bureau of Economic Research.
7. Hanumantha Rao CH (1991), Rural Society and Agricultural Development in Course of Industrialisation: Case of India case of India, Economic and political weekly 26 (11/26):691-96.
8. Anagariya, Arvind 2008- India the emerging Giant, Oxford University Press, New Delhi.

CC-1.4 : ELECTRODYNAMICS

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT- I : Maxwell's equations and Potential formulation of ED

Maxwell's equations in free space, Maxwell's equations inside matter, Vector and Scalar Potentials, Gauge Invariance, Wave equation for Potentials ,Lorentz and Coulomb gauge conditions.

Green's function solution of Maxwell's equations

Plane waves in non-conducting media:

Plane electromagnetic waves & their propagation in non-conducting media, Linear & circular polarization in electromagnetic waves. Stokes Parameter

UNIT- II : Dispersion in electromagnetism:

Dispersion in electromagnetism, Lorentz dispersion equation. Frequency dispersion characteristic of dielectric, conductor & plasma. Behavior of waves in a dispersive or conducting medium. Kramer-Kronig relations

UNIT- III : Wave Guide:

Different modes of electromagnetic wave, B.C. for TE & TM waves, TE & TM mode in rectangular wave Guide.

Resonant cavity:

TE & TM mode in rectangular cavity resonator

UNIT- IV : Radiation by moving charges:

Retarded potentials, L.W. potential. Field of a point charge in uniform & accelerated motion, power radiated by an accelerated point charge (Larmor's formula). Radiation due to an oscillating electric dipole, Radiation due to an oscillating electric quadrupole

UNIT- V : Scattering:

Different Scattering cross section, Scattering by a free electron (Thomson scattering), Scattering by a bound electron (Rayleigh scattering), Kirchhoff's formula for diffraction

Text book:

1. Classical Electricity and Magnetism by W. K. H. Panofsky and M. Phillips (Addition-Wesley)

Reference books:

- Classical Electrodynamics- J.D. Jackson, John Wiley and Sons.
- Introduction to electrodynamics- D.J. Griffiths, Pearsons Publishers.
- Classical Electrodynamics by Satyaprakash

CC-1.5 : COMPUTATIONAL PHYSICS (PRACTICAL)

Full Marks: 100
End Sem : 100/6hrs

A) Preliminaries of running computers taking out print out etc.
B) Exercises to study various features of C-Language.
C) Programming using C language

1. Numerical integration by trapezoidal method
2. Numerical integration by Simpson method
3. Solution of first and second order differential equation by Runga Kutta Method
4. Matrix addition, subtraction, multiplication and manipulation
5. Matrix inversion
6. Finding the roots of an equation by Newton-Raphson method
7. Least square fitting of linear parameters
8. Determination of prime numbers.
9. To arrange a set of numbers in increasing or decreasing order

10. Sum of A.P and G.P series, Sine and Cosine series
11. Factorial of a number
12. Evaluation of log and exponentials by summing of series
13. Any other suitable experiments.

Any other experiments that may be set up from time to time

CC-2.3 : NUCLEAR PHYSICS

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT- I : Nuclear momentum Theory:

Rotational invariance in 3D, Eigen value and Eigen function of angular momentum operator, Explicit representation of the rotation matrices, addition of angular momenta, C.G. coefficient, irreducible spherical tensor, matrix element of tensor operators, Weigner-Eckart theorem

UNIT- II : Two Nucleon system:

Ground and excited state of the deuteron, Tensor forces and quadrupole moment of deuteron, Photodisintegration of the deuteron

UNIT- III : Nuclear models:

Shell model, analysis of shell predictions, extreme single particle model. Configuration mixing, individual particle model, L.S and J.J coupling scheme

UNIT- IV : Scatters:

Neutron-proton scattering at low energy, scattering C.S. Scattering length, Spin dependence of neutron-proton scattering, Effective range theory

UNIT- V : Nuclear disintegration:

Gamow's theory of alpha decay, Geiger-Nuttal law, Beta decay, Fermi's theory of beta decay, Parity violation, Selection rules for allowed transition

Nuclear Reaction:

Energetics of nuclear reaction, Compound nucleus theory, resonance scattering, Briet-Wigner formula

Text Book:

1. Nuclear Physics by R.R. Roy and B.P. Nigam (John Wiley)

Reference Books:

- Physics of the nucleus by M.A. Preston (Addison Wesley)
- Nuclear Physics by S.S.M. Wong (Prentice Hall)
- Introduction to Nuclear Physics by H. A. Enge (Addison Wesley)
- Introductory Nuclear theory – Elton
- Theoretical Nuclear Physics - Blatt & Weisskopf.
- Nuclear Physics - D.C. Tayal
- Atomic and Nuclear Physics Vol - II by Ghoshal.
- Theory of Nuclear Structure - M.K. Pal
- Introductory Nuclear Physics - Y. R. Waghmare.

CC-2.4 : ATOMIC AND MOLECULAR PHYSICS

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT- I : Magnetic Dipole Moments

Magnetic Dipole Moments, Electron Spin, Vector Atom Model
Spin – orbit Interaction, Hydrogen Fine Structure

UNIT- II : Spectroscopic terms

Spectroscopic terms, spin-orbit coupling, L-S and J-J Coupling

UNIT- III :

Normal and Anomalous Zeemann effect, Paschen Back effect, Stark effect, Hyperfine Structure of Spectral lines

UNIT- IV : Spectra of Alkali elements

Spectra of Alkali elements, Spectra of Alkaline earth elements and Complex Spectra

UNIT- V : Vibrational and Rotational Spectra

Vibrational and Rotational Spectra, Molecule as Harmonic Oscillator, Molecule as an harmonic Oscillator, Vibrational frequency and Force Constant for A.H.O., Isotope effect on vibrational levels, Fine structure of I-R Bands, Molecule as a vibrating Rotator, Diatomic molecule as a symmetric top

Text Book:

1. Atomic and Molecular Spectroscopy by Raj Kumar (Kedar Nath Ram Nath)

Reference Books:

- Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill.
- Modern Physics by S.P. Kuila, NCBA Publication

CC-2.5 : MODERN PHYSICS /EMT/OPTICS (PRACTICAL)

Full Marks: 100
End Sem : 100/6hrs

1. B-H Curve, Oscilloscopic display
2. Determination of 'h' by Photoelectric effect
3. L C R Bridge
4. Optical bench: Biprism, straight edge

5. Spectrometer: Single and double slit
6. Michelson Interferometer: Determination of A and α, thickness of Mica sheet
7. Fabry perot Interferometer.
8. Polarisation: Babinet's Compensator
9. Dielectric Constant of a liquid by electrically maintained tuning fork.

Any other experiments that may be set up from time to time

CC-3.2 : BASIC ELECTRONICS

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT- I : Amplifiers :

Frequency response of linear amplifiers. RC coupled transistor amplifier, Transformer coupled transistor amplifier. Frequency response, Gain, Bandwidth, Gain bandwidth product, Feedback in amplifiers, Effects of negative feedback

UNIT- II :

Oscillator circuits : Feedback criteria for oscillation, Nyquist criterion, Phase shift Oscillator, Wein Bridge Oscillator, Crystal Oscillator, Klystron Oscillator

Multivibrators : Astable, Bistable, Monostable Multivibrators

UNIT- III :

Operational amplifier : Differential amplifier (Circuit configuration and properties, ideal operational amplifier input and output impedances)

Application of OP-AMP : Inverting amplifier, Non-inverting amplifier, adder, substractor, integrator, differentiator, logarithmic amplifier, comparator (Principle, basic circuit operation and theory)

UNIT- IV :

Integrated circuits : Types of components of ICs ,Fabrication of monolithic ICs , Scale of Integration of Circuit Components , Classification of ICs Limitations of ICs

Flip-Flop: RS, Clocked RS, JK, master-slave edge-triggered, Conversion of flip-flops, Application of flip-flops

A/D and D/A converters

Shift registers, Counters: Asynchronous, Synchronous

UNIT- V :

Radio Communication : Modulation and Demodulation, Ionospheric Propagation

Antenna Theory: Antenna: Basic antenna action, current and voltage distribution in linear antenna, dipole antenna, power radiator, radiation resistance and directional pattern. Different types of antenna: (Only descriptive study of practical antenna) Horn antennas, Reflector antennas, Yagi antenna

Text Book:

1. Electronic fundamental and application by J.D. Ryder, PHI, Learning Pvt Ltd.
2. Fundamentals of digital circuits by A. Anand Kumar, PHI, Learning Pvt Ltd.

References:

- Foundation of electronics – Chattopadhyay, Rakshit, Saha and Purkait, New age International publisher
- Electronics principles-Albert Malvino, Tata McGraw-Hill Edition
- Modern Digital Electronics-R.P Jain, Tata McGraw-Hill Edition
- Handlook of Electronics : Gupta Kumar (Pragati)
- Digital Electronics : Gothmann
- Operational Amplifier – Trunde
- Functional Electronics – Ramana
- Microwave Technology – Sarkar

CC-3.3 : BASIC ELECTRONICS (PRACTICAL)

Full Marks: 100
End Sem : 100/6hrs

1. Characteristics of vacuum tubes and transistors
   i) Diode, Triode and Pentode
2. Setting up an oscillator (A.F. & R.F.)
3. Setting up of an amplifier and study of its characteristics
4. Characteristics of Diode and Zener diode
5. Study of logic gates AND, OR, NOT, NAND, NOR, EXOR
6. Making AND, OR, NOT Gates using NAND Gates
7. Verification of Boolean Algebra

8. Study of different flip-flops
9. Verification of Dual nature
10. Characteristics of FET (Field Effect Transistor)

Any other experiments that may be set up from time to time

CE-3.4 : ELECTRONICS (SPECIAL PAPER)-I

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT- I : Networks Theorem

Network and Network theorems : Mesh and node circuit analysis, reduction of complicated network, conversion between T and TT section, The bridged T- network, the lattice network, The superposition theorem, The reciprocity theorem, Thevenin theorem, Norton's theorem, the maximum power-transfer theorem

Resonant Circuit : Series resonance and parallel resonance. Behavior of system involving resonant primary and resonant secondary circuit. Microwave Source : Reflex Klystron, Magnetron, Traveling wave tube

UNIT- II : Transmission line

Calculation of line parameters of parallel wire lines and coaxial line. Voltage and current relations on Radio Frequency Transmission line in terms of traveling waves, propagation constant attenuation constant, phase constant. Line distortion and alternative line termination for zero load, finite load and infinite load, standing wave ratio

UNIT- III : Wave Guide and Cavity Resonators

Physical picture of propagation in Rectangular wave guides, circular wave guides, standing wave ratio in wave guides, wave guide behavior at wave lengths greater than cut off, wave guide coaxial coupling, Directional couplers, (Wave guide tee junction, Theorems on Tee junctions, H-Plane Tee, E- Plane Tee, Magic Tee-Microwave) Resonators:- Rectangular resonator, cylindrical resonator, spherical resonator (modes and Q of all resonators) Excitation and coupling of cavities. Application of Resonators

UNIT- IV : Wave shaping circuits

Linear wave shaping – R.C. circuit. High pass and low pass R-C with different input voltage, Non linear wave shaping-shunt diode clippers, series diode clippers, double ended clippers (PN junction diode & Zener diode) D-C Resistor clamping circuit

UNIT- V : Voltage and current sweep generator :

Transistor constant sweep generator, Miller integrating sweep circuit, Boot strap sweep generator current time base generator, Blocking oscillator, Triggered transistors, blocking oscillator

Text Book:

1. Networks, lines and fields :- J.D. Ryder (PHI)

Reference Books :

- Microwave circuits and passive devices : M.L. Sisodia & G.S. Raghuvanshi (Willy Ester Ltd.)
- Handbook of Electronics : Gupta and Kumar (Pragati Prakashan)

CE-4.2A : CONDENSED MATTER AND MATERIAL SCIENCE (SPECIAL PAPER)-II

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT- I :

Imperfection in crystals

Classification of imperfection, Crystallographic imperfections, Point defects, Shottkey and Frenkel defect, Colour centre, Line defect, Plane defect

UNIT- II : Energy bands

General Properties of energy bands, Tight binding methods, Orthogonalised plane waves, pseudo potential methods of energy band calculations, de-Hass-Vaan Alphen effect.

Representation of theory

Wannier functions, Equation of motion in Wannier representation, equivalent Hamiltonian and impurity levels

UNIT- III : Semiconductors :

Intrinsic and extrinsic semiconductors, Band gap, law of mass action, intrinsic carrier concentration, Mobility in the intrinsic region, Energy bands in Si and Ge, P-N junctions. Hall effect

UNIT- IV : Superconductivity:

Experimental survey, Meissner effect, Type-I and Type – II superconductors, Thermodynamics of super conductors, London's theory, Josephson effect, flux quantization, BCS theory, High temperature superconductors (elementary ideas).

UNIT- V : Solid state device

Tunnel diode, Solar cells, photo voltaic detectors and cells, Schottky barriers, gun effect oscillators, photo diode, photo resistors, Infrared and ultraviolet detector, Avalanche photodiode, photo transistor.

Text books:

1. Introduction to Solid State Physics - C. Kittel

Reference Books

- Solid State Physics - Aschroft and Mermin
- Solid State Physics - A. Omar
- Solid State Physics - A.J. Dekker
- Introduction to Solid State Physics - C. Kittel
- Solid State Physics - A.O.E. Animalu
- Physics of semiconductor devices - Michael Shur (PHI).
- Quantum theory of solids - C. Kittel.

CE-4.2B : ELECTRONICS (SPECIAL PAPER)-II

Full Marks: 100
Mid Sem : 20/1hr
End Sem : 80/3hrs

UNIT- I : Application of op-AMP

Scale changing, phase shifting, voltage follower, voltage to current converter, current to voltage converter, analog computation, logarithmic and antilogarithmic amplifier, bridge amplifier, voltage comparator, Schmitt trigger, op-AMP voltage regulator, Sawtooth wave generator, multivibrators, 555 – IC timer, Boot strap sweep generator

UNIT- II : Digital circuit and computer

Half adder, full adder, parallel binary adder, primary subtraction simplification of digital circuits using Kamaugh maps, (Two, three, four variables), Quads, Octets, Don't care condition/ decoder/encoder, BCD to 7 segment decoder, digital computer, multiplexer/demultiplexer, characteristics of logic families. Digital to Analog converter with ladder networks, Analog to Digital converter :- Ramp conversion, Dual slope integration, successive approximation, parallel/series conversion

UNIT- III : Microprocessor

Basic concepts of Microprocessor, Microprocessor architecture, qualitative idea on 8085, Motorola M6800 microprocessors (Block diagram only)

UNIT- IV : Quantum Electronics

Basic principle of Maser operation, spontaneous and stimulated emission, gas maser, solid state maser, optical maser (Laser), Laser oscillation condition-Gain and population inversion- Oscillation frequency frequency-frequency pulling, Ruby laser, Gas laser, application of laser.

Light Source and Display : Electro luminescent, light emitting diode, semiconductor injection laser, LED displays, liquid crystal displays

UNIT- V : Opto electronic device

Photodetector-Photodiodes-Phototransistors, photo field effect transistors, solar cells, infrared detector, ultraviolet detector, photo position detectors, photo conductor.

Opto-isolator : Photoconductor opto-isolator, LED/ phototransistor, opto-isolator.

Text Books:

1. Digital Electronics : Willium H. Gothmann (PHI)
2. Optical electronics –Ajay Ghatak & K. Tyagarajan. (Cambridge University Press.)

Reference Books:-

- Integrated Circuits and Semi conductor devices : Deboo/ Burrous Theory and Application : G.J.C.N. (McGraw Hill)
- Fundamental of Computers : V. Rajaraman (PHI)
- Introduction of Microprocessor : Aditya P. Mathur (McGraw Hill)
- Modern Digital Electronics : R.P. Jain, M.M.S. Anand
- Electronics Fundamentals & Application : D. Chattopadhya & Rakhit
- Handbook of Electronics : Gupta Kumar
- Optoelectronics an Introduction : J. Wilson, J.H. B. Hawkes. Eastern economy edition (Prentice Hall)

CE-4.3A : CONDENSED MATTER AND MATERIALS SCIENCE (SPECIAL PAPER)-II (PRACTICAL)

Full Marks: 100
End Sem : 100/6hrs

1. Determination of energy gap of a given semiconductor by four probe method
2. Determination of Hall constant of a sample and its identification
3. Determination of energy gap by p-n junction method
4. Study of dispersion relation of an electric analog of mono atomic linear chain
5. Study of dispersion relation of an electric analog of diatomic linear chain
6. Determination of specific heat of a given sample using a thermocouple
7. Determination of dielectric constant of a given sample by lecher wire method
8. Determination of B-H curve of a given ferromagnet

Any other experiments that may be set up from time to time

CE-4.3B : ELECTRONICS (SPECIAL PAPER)-II (PRACTICAL)

Full Marks: 100
End Sem : 100/6hrs

1. Study of the various stages of a regulated power supply and find its regulation and ripple factor.
2. Design and assemble of a single stage transistor amplifier and study of its frequency response.
3. Study of phase transition using feed- Back amplifier circuit.
4. Study of multivibrator-Astable.
5. Study of multivibrator-Bistable.
6. Study of multivibrator-Monostable.
7. Design of operational amplifier circuit.

8. Use of operational amplifier for integration and differentiation.
9. Use of operational amplifier for addition and subtraction.
10. Study of various stages of a digital voltmeter.
11. Study of various stages of digital frequency counter.
12. Study of various stages of a CRO and calibrate it for measurement of frequency and amplitude.
13. Determination of Hall voltage and Hall coefficient.
14. Study of different gates.
15. Programming using into 8085 microprocessor.

Any other experiments that may be set up from time to time

CE-4.4 : PROJECT AND SEMINAR

Project: 50 Marks
Seminar: 50 Marks

Students will be assigned topics for project and seminar under the supervision of teachers of the department.

SEMESTER-I

1.1: ENGLISH FOR TECHNICAL COMMUNICATIONS

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Grammar: Articles, tenses, voice, prepositions.

UNIT-II

Vocabulary & Usages: Pairs and groups of words, synonyms; antonyms; idioms and phrases; one-word substitution.

UNIT-III

Reading & Comprehension: Correct pronunciation; note making, reporting

UNIT-IV

1. Letter Writing
2. Composition writing (of not more than 250 words)

Books Recommended :

1. A practical English grammar By A.J. Thomson & A.N. Martinet (Oxford University Press)
2. Strengthen your writing By V.R. Narayan Swamy. (Orient Longman)Chapters-2, 3, 6, 9.
3. Spoken English Highery By V. Sasikumar & P.V. Dhamija (Tata McGraw Hill).
4. Higher Secondary practical English Grammar By R.N. Panda (Banirupa, Buxi Bazar, Cuttack) Chapters-3, 4, 5, 10, 12, 14, 15, 16.

1.2: COMPUTER FUNDAMENTALS

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Introduction: Basic anatomy of a computer; input and Output, Control unit; ALU and memory; working of a computer History of computer; classification of computer; working of Micro computer, Input and Output devices and secondary storage devices

UNIT-II

Data Representation: Number system; decimal, octal, hexadecimal and binary, conversions 01 number system, Binary arithmetic, BCD, ASCII, EBCDIC codes

UNIT-III

Computer Software and Hardware: Meaning of computer software hardware; difference between software and hardware, types of software, firmware, computer language, Machine level, assembly language and high level language. Translators, assemblers, interpreters and compilers

Operating System: Definition and function; Batch processing, Spooling; Multiprogramming Multiprocessing; Time sharing; Online and real time processing; Library and Utility programs

UNIT-IV

Data Communication & Computer Networks: Element of a communication system, Data transmission modes; media and speed; digital and analog transmission; communication processors. Asynchronous and synchronous transmission; Switching technique; Network technologies; LAN & WAN; Communication protocols; Distributed Data Processing

Books Recommended :

1. Computer Fundamental By P.K. Sinha Chapters: 1-5, 7-10, 12, 14-16.
2. Computer for Beginner By V.P. Jaggi and S. Jain. Chapters : 1, 2, 3, 5, 7.

1.3: APPLICATION SOFTWARES

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Word Processing (MS-Word): Basics of word processing, text selection, opening document and creating document, sharing document, quitting document, cursor control, printing documents' using the interface (menu, toolbar), editing text (copy, delete, move etc.) finding and replacing text, spell check feature, auto correct feature, grammar facility, auto text, character formatting, page formatting, document enhancement, creating tables and news paper columns adding borders and shading, adding headers and footers, setting up multiple columns, sorting blocks, adjusting margins and hyphenating documents creating master documents, creating data source, merging documents using mail merge feature for labels and envelopes, graphics, using documents and wizards, introductions to desk publishing (PM 7)

UNIT-II

Spreadsheet (MS-Excel): Work sheet basics, data entry cells, entry of numbers, text and formulae, moving data in worksheet, moving around the work sheet, selecting data range, using the interface (tool bar, menus) Editing basics, Working with workbooks, saving & quitting, call referencing, formatting and calculations, calculations and worksheet using auto fill, working with formulae, efficient data display with data formatting (number formatting, date formatting etc.) working with ranges, worksheet printing, working with graphics & charts, adding formatting text data with auto format, creating embedded chart using chart wizard, sizing and moving parts, updating charts, changing chart types creating separate chart sheets, adding titles, legend and grid lines, printing charts, intro to Macros.

UNIT-III

Introduction to MS-Power Point : How to create a simple presentation in power point and present the power point show through power point view.

UNIT-IV

MS-Access: Introduction to Database, Generating tables & Forms, Query & Report, Forms & Query. Single Column report, Groups/totals reports, summary reports, Tabular reports Customizing report, Creating forms without using wizard, customizing forms, Modifying Forms, How to import & Exports, using condition in a Macro, Data transfer using macro. Introduction to Access Basic, Event procedure, Access basic Constructs etc.

Books Recommended:

1. Microsoft Office by Dinesh Maidisani
2. Microsoft Office by Ramesh Bangia

1.4: LAB - I

Full Marks - 100
End Sem Practical – 100/6 hrs

Application Software: Practical using MS-Word, MS-Excel, MS- Power Point and MS-Access of 1.3 Unit.

SEMESTER-II

2.1: DISCRETE MATHMATIC-I

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Propositions and Logical operators, construction of truth table, Tautology, Contradiction, Implication, NAND and NOR, principle of induction, Normal forms, Set Operation, Relation, properties and Operations of Relation, Function, Different Types of Function

UNIT-II

Simple Problems of Permutations and Combinations, Definition of Matrix, Types, Operation and Properties of Matrix, Inverse and Rank of Matrix, Solution of System of Equation. Eigen Values, Eigen Vectors and Characteristics, Equation of Matrix

UNIT-III

Recursion, Recursion relation, binary operations, Algebraic System, Group and its properties, sub-group, permutation group, cosset, Lagrange's Theorem, Group partial Order set, Lattices, Concept of Boolean Algebra, Basic Laws and Expression, Transformations of Expression as sum of product forms

UNIT-IV

Basic concept of Graph Theory. Connectedness in Directed Graphs. Eulerian and Hamiltonian Graphs

Books Recommended:

1. Discrete Mathematics by N. Ch, S.N Lyengar, V.M Chandrasekaram, K.A Venkatesh and P.S Arunachalam (Vikas publishing House, New Delhi) . Chapters-1,2,3,4,5,6 & 7
2. Fundamental Approach to Discrete Mathematics by D.P Acharya Sreekumar (New Age int. Publishers, New Delhi)

2.2: 'C' LANGUAGE

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Introduction of 'C' Basic structure of 'C' Programs Programming style & Executing C Program. Introduction to character Set, C' Tokens, Keywords & Identifiers, Constants, variables & Data type uses & declaration. Introduction of operators, Type conversions in expressions, operator procedure and associavity mathematical functions.

UNIT-II

Introduction to decision making with IF statement, The if-else statement, Nesting of If-else statement and the Else... if ladder. The switch statement, the? Operators and go to statement. Introduction to while statement, the Do statement, the four statements and Jump in loops.

UNIT-III

Introduction to Arrays, declaration and initialization of one-dimension Array, Dynamic Arrays, and more about Array. Declaring and initializing string variables, Reading strings from Terminal, writing to string, string handling functions and table of strings.

UNIT-IV

Introduction of user-defined function definition of function and its declaration, Nesting of functions. Passing Arrays to function and passing strings to function. Introduction of structure variables and its declare and initiazation. Accessing structure members. Array of structures, with in structures and structure & functions, Unions, size of structure and Bit field.

Introduction to pointers, Declaring Pointer variables, Initialization 'pointer variables, chain of pointer, pointer expression, Array of pointers, pointers

Books Recommended:

1. ANSI C by E. Balaguruswamy

2.3: OPERATING SYSTEM (CUL, GUI)

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Evolution of operating System, Resident monitor, batch processing, multiprogramming, multiprocessing time sharing, real-time System, I/O interrupts, DMA, dual mode operation operating system services.

UNIT-II

File System, File concepts, file Attributes, File operation, File type, File Structure, access methods, sequential access, index sequential access and direct access, directory structure, structure, single level, two level, tree structure, file protection and access control.

UNIT-III

Process concepts, process state transition diagram, process control block, process scheduling schedulers, CPU scheduling to functions, pointers and structures. Introduction to defining and opening a file: Closing a file, Input/output operation on file. Error handling during I/O operations and Random access to files.

CPO/IO brust cycle, scheduling algorithms; FCFS, SJF, Priority, round robin. Deadlock, resource allocation graph, deadlock prevention, detection and recover.

UNIT-IV

Logical verses physical address space, overlays, swapping, contiguous allocations single partition and multiple partition, internal and external memory fragmentation, non-contiguous allocation, paging, demand paging, concept of virtual memory, page replacement algorithms FIFO, Optimal and LRU.

Books Recommended:

1. Operating system concept By A. Sibernchatz and Peter B. Galvin (Addition Wesley) Chapters: 1-5, 7-10
2. Operating system By Andrews S. Tanenbaum (PHI)
3. An Introduction to operating system By H.M Dietel (Addition Wesly)

2.4 : LAB-II (C - Language)

Full Marks - 100
End Sem Practical – 100/6 hrs

C - Language

SEMESTER-III

3.1: NUMERICAL ANALYSIS AND STATISTICAL METHOD (MATH-II)

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Interpolation, Polynomial Interpolation, Langrage Interpolation, difference Table, Newton's Forward and Backward Interpolation, Numerical Integration by Simpson's 1/3 Rule and Trapezoidal Rule.

UNIT-II

Solution of algebraic and transcendental equation, bisection method, Method of false Position, Newton-Raphson Method, Convergence of the above Methods. Solution of simultaneous of linear equations: Gauss-Jordan Method, Gauss-Seidal method.

Classification and tabulation of data, Diagrammatic and graphical presentation of data, Measure of central value, (Mean, Mode, Median), measure of dispersion (Variance, Standard Deviation)

UNIT-III

Probability and expected values, theoretical distribution, binomial; Poisson and Normal Distribution.

UNIT-IV

Co-efficient of Variance, Skewness and kurtosis, correlation and regression, Analysis Of Variance.

Books Recommended:

1. Numerical Analysis by Dutta & Jena : Chapter. 1, 2(2.1-2.14), 3(3.1-3.3 & 3.7-3.14), 4(4.14-4.6), 5(5.1-5.4) & 6(6.1-6.3)
2. Statistical methods by S.P. Gupta (S. Chand & Sons)

3.3: OBJECT ORIENTED PROGRAMMING LANGUAGE USING C++

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Introduction, data types, keywords, operators, expression conditional, iterative, branching statements, function, pointer, structure.

UNIT-II

OOP in C++, Object, Class

UNIT-III

Constructor, Destructor, Operator, Overloading and type coversion.
Inheritance, Function Overloading

UNIT-IV

Virtual function, input-output files.

Books Recommended :

1. Object Oriented programming with C++ By E. Balaguruswamy (TMH).
2. OOP in Trubo C++ By Robert Lafors (Galgotia publication)

3.4 : LAB - I

Full Marks - 100
End Sem Practical – 100/6 hrs

LAB-I C++ Practical using UNIT-I, UNIT-II, UNIT-III & UNIT-IV of 3.3

SEMESTER-IV

4.1: COMPUTER ORGANISATION

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Combinational and sequential circuits
Boolean algebra, truth tables, synthesis of logic functions using AND, OR, NOT, NAND, NOR, XOR gates, minimization of logical expressions, Kar enough maps, flip-flops, master slave and edge triggered flip-flops, registers and shift registers, counters, decoders, multiplexers

UNIT-II

Arithmetic and logical organization: Addition and subtraction using 1's and 2's complement method, binary adder. Parallel adder, carrylook ahead adder, multiplication, Booth's algorithm, Division, floating point operations

UNIT-III

CPU Organisation: Instruction and instruction sequencing, Instruction formats (Zero, one and two address instruction)
Addressing modes (Register, Absolute, Immediate, Indirect, Indexed, auto increment and auto decrement) stack queue and subroutine

UNIT-IV

Input-Output Organization: Addressing input-Output devices. Intterrupts, handling multiple devices, Vector Interrupts, Simultaneous Request, Direct memory access (DMA). Channels

Books Recommended:

1. Computer Organization By Hamacher (Tata McGraw Hill)
2. Computer System Architecture 3/ed (PHI)

4.2: INTRODUCTION TO RELATIONAL DATABASE MANAGEMENT SYSTEM (RDBMS)

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Basic concept of database system: Advantages of DBMS, 3 level architecture for DBMS, Data independence, Database access, DDL, DML. Database administrator. Data modeling, E-R diagram

UNIT-II

Database file structure: sequential, Indexed-sequential and direct access files, indexed and hasing techniques

UNIT-III

Relational Model: Structure of relational databases, Base table, view
Relational algebra, set operation, relational operation, selection, projection, join and division operations, Normal forms

UNIT-IV

Hierarchical data model: Tree structure diagrams, physical and logical database records, data retrieval, Virtual records. Internal representation like HSAM, HISAM, HDAM and HIDAM. Network data model: Data structure diagrams, DBTG CODASYL MODEL, DBTG retrieval and update facilities

Books Recommended:

1. An Introduction to database system By. C.J. Date (Narosa) Chapters 1-6, 12, 14, 16-19, 24-26.
2. An Introduction to database system By B.C Deasi (Golgatia) Chapter: 2, 4

4.3: HUMAN RESOURCE MANAGEMENT

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Nature and scope of Human Resource Management: Meaning and Definition, scope, functions and objective, Evolution of Human resource management in India. Human Resource Planning
Meaning and Definition, Importance of Human Resource Planning, Factors Affecting Human Resource Planning, Human Resource Planning Process, Requisites for Successful Human Resource Planning, Barriers to Human Resource Planning
Job Analysis: Meaning, Process, Methods of Collecting Job data, Problems with Job Analysis.
Job Design: concept, factors Affecting process, constraints, sources
Selection: Meaning, Role, Process, Barriers to Selection

UNIT-II

Performance Appraisal / Merit Rating: Concept, Meaning, Definition, Objectives, Process, Methods, Merits & Problems of performance Appraisal / Merit Rating
Job Evaluation: Concept, Scope, Process Job Evaluation, Methods, Advantages and Limitations of Job Evaluations

UNIT-III

Wage and Salary Administration: Concept, Principles, Objectives, Theories of Wages - Iron Law, Wages Fund, Residual Claimant, Marginal Productivity, Bargaining Theory, Modern Theory, Types of Wages - Time Wage & Piece Wage System
Incentive Payment : Meaning & Definition, Merits, Demerits, Pre-Requisites for an effective Incentives system, Pre-Requisites for an effective Incentives system, Scope, Types of Incentives, Schemes, Incentives, Schemes in India Industries, Non-Financial Incentive

UNIT-IV

Industrial Relations: Concept, Nature, Importance, Approaches, Parties to IR, IR Strategy, Role of HRM.
Trade Union: Concept, Nature, Why do employees join Union? Strategic Choices, Before Unions, Trade Union Movement in India
Disputes and Their Resolution: Nature of Disputes, cause, settlement of disputes - Collective Bargaining, Code of Discipline, Grievance Procedure

Books Recommended :

1. HRM: K. Aswathapa
2. HRM: P. Subba Rao

4.4 : LAB - II

Full Marks - 100
End Sem Practical – 100/6 hrs

LAB-II (RDBMS): Practical using UNIT-I, UNIT-II, UNIT-III & UNIT-IV of 4.2

5.2: DATA COMMUNICATION AND COMPUTER NETWORK

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Introduction to computer networks: Advantages of networks, structure of the communication network, point-to-point and multi drop circuit, data flow and physical circuits, Network topologies and design goals, switched and non-switched options, channel speed and bit rate, voice communication and analog wave forms, bandwidth and frequency spectrum, digital signals, modem, synchronous and asynchronous transmission Communication. among computers

Traffic control and accountability: WAN and LAN, connection oriented and connection less networks, classification of communication protocols. Time Division Multiple Access (TDMA), Time Division Multiplexing (TDM), Carrier science (Collision) system, token passing, (priority system)

UNIT-II

Layered Protocols, Network and OSI model: Goals of layered protocols, network design problems, communication between layers, layers of OSI, OSI Status, Pooling/Selection Protocols; Character and bit protocols, binary synchronous control (BSC) formats and control cedes HDLC, HDLC Options, HDLC frame format code Transparency and synchronization, HDLC control field, commands and responses, HDLC, transmission process, HDLC subsets

UNIT-III

Local Area Network & Primary attributes of LAN: Broad band and base band LAN, IEEE LAN Standard, Relationship of 802 standards to the ISO/CCITT Model; Connection options with Lans LLC and MAC protocols, data Units. LAN topologies and protocols, CSMA/CD and IELE 805.3. Collisions, token Ring (Priority). IEEE 802.5, Priority scheme, token bus and IEEE 802.4, Switching & Routing

UNIT-IV

TCP/IP, TCP/IP and internetworking, TCP/IP operations and sockets IP address structure, major features of IP, IP datagram, Major IP services. IP source routing value of transport layer, TCP major features of TCP; passive and active opens

Transmission control blocks (TCP), TCP segments, user datagram protocols (UDP) Route discovery protocol. Application layer protocol, Personnel computer as a server. Linked the PC to main frame computer, file transfer in personnel computers, personnel computers and Local Area Network

Books Recommended:

1. Computer Networks 2/e by U. alack (PHI Publication) Chapters. 1-4, 6, 10, 11.
2. Computer Networks By A.S. Tanenbum (PHI Publication) Chapters: 1, 2 (Excluding 2.1 and 1.6), 3.

5.3: VISUAL BASIC, INTERNET AND WEB DEVELOPMENT

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Introduction of Visual Basic- Basic Toolbar, Function of the buttons & Visual Basic Toolbox. Project window, Form Window & Properties Windows & Toolbox, Objects, Events, Properties and Methods, Naming Conventions, Design consideration

Form and controls (Part-1) - Form objects, Picture Box Object, command Button Objects & Menu Object, Listing Code & Safe guarding Project

Form and Controls (Part-2) - Text Box Object. List Box Object, Common Box Object, Label Object & Horizontal and Vertical Scroll Bar Objects and Properties, Events & Methods, Timer Objects, Drive List Box Object, Directory List Box Objects & File List Box Object. Creating Modules & Procedures → Private and public sub procedures, passing parameters to procedures, function procedures, variables, Arrays & constants, Saving & Reading data , data control & database files, Sequential files. Control Arrays. Mouse & Keyboard Events, multiple documents interface. Database in Visual Basic → Table & Queries, Creating database in Access Creating tables, & Queries, Modifying table etc.(Adding, Deleting, Modifying Records in a Table) Moving into Records(First, Previous, Next & Last)

Internet: Introduction to Internet, Understanding Internet, Hardware and software requirement for internet, internet service providers, protocols (HTTP. FTP, TCP/IP) IP address, URL, World Wide, Web Browser, Web Page

UNIT-II

HTML: Standard text formatting tags, color, linking image-Loading, table frame set, form

UNIT-III

DHTML: Java script, Data types, programming logic, functions, use of functions in HTML code, objects in Java script

UNIT-IV

ADOBE PHOTO SHOP: filters, Painting, Retouching, Action, Photoshop files

Books Recommended:

1. The Internet Complete Reference By Hartey Hann (TMH)
2. HTML 4.0 By E. Stephen Mark, Jaaen Plaff BPB Pub.
3. HTML 4.0 By Molly E. Holzschalg. Techmedia
4. Adobe Photoshop Techmedia Pub
5. Visual basic by Mandeep S. Bhatia
6. Visual Basic by Ramesh Bangia

5.4 : LAB - I

Full Marks - 100
End Sem Practical – 100/6 hrs

LAB-I: VB, HTML Practical using UNIT-I, UNIT-II, UNIT-III & UNIT-IV of 5.3

SEMESTER - VI

6.1: SYSTEM ANALYSIS AND DESIGN

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Overview of system analysis and design: Business system concept System development life cycle, project selection, Feasibility study, analysis, design, Implementation testing and maintenance

Feasibility Study: Technical and Economical feasibility cost and benefit analysis

UNIT-II

Project selection: Source of project request, managing project review and selection, preliminary investigation

UNIT-III

System requirement specification and analysis, fact finding technique, data flow diagrams, data dictionary, process organization and integrations

UNIT-IV

Decision tree and tables, structured English detailed design modularization, module specification, file organization and data base design

Book Recommended:

1. Analysis and Design of Information System By James A.S.
2. System Analysis and design By Award EH.
3. System Analysis and Design By Lee B.S (NCC)

6.3: OBJECT ORIENTED PROGRAMMING LANGUAGE (JAVA)

Full Marks - 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Application Program: Overview of Java language, constants, variable, data types, operators, expressions, decision making, branching, loops.

UNIT-II

OOP in Java, class, object and methods, Array, Sting, String buffer, Vectors, Interfaces.

UNIT-III

Package

UNIT-IV

Multi threaded, Managing errors, Exception.

Book Recommended:

1. Java Complete Reference TMI PUBLICATION
2. Programming with Java a Primer By E. Balaguruswamy

6.4 : LAB - II

Full Marks - 100
End Sem Practical – 100/6 hrs

LAB-II: JAVA Programs using in UNIT-I, UNIT-II, UNIT-III & UNIT-IV of 6.3

6.5 : PROJECT

Full Marks – 200

(Project Report - 150, Viva & Presentation on Dissertation - 50)

Each student has to undergo a summer placement training of four weeks at the end of their second year course in an Industry/Business Organisation to gain firsthand experience and knowledge of Practice and prepare a project report at his own cost and has to submit a report within four weeks from the completion of such training to the Principal of the concerned institution. The Report shall be examined jointly by an internal and an external examiner in which the minimum pass marks shall be 50%.

1.1.3 Average percentage of courses having focus on employability/ entrepreneurship/ skill development offered by the institution during the last five years (10)	128	28.25607064
1.2.1 Percentage of new courses introduced of the total number of courses across all programmes offered during the last five years (20)	14	3.090507726

Name of the Program	Name of the Course	Course Code	Activities/Content with direct bearing on Employability/ Entrepreneurship/ Skill development			Year of introduction (during the last five years)	Link to the relevant document
			Employability	Skill Development	Enterpreneurship		
B.A. (Geography)	Cartography	C-1.2	Map Making, Scale Construction, Map Projection, Slope Analysis			2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Climatology	C-2.2	Weather and Climate, Pressure and Wind, Rainfall, Precipitation, Thunderstorm, Cyclone, Weather forecasting				
	Satistical Methods in Geography	C-3.2	Spatial and Attribute Data, Types of Sampling, Measures of Dispersion, Correlation, Regression,				
	Environmental Geography	C-4.3	Ecosystem- Structure and Function of Ecosystems, Environmental Pollution, Degradation, Role of Interational Agency for Environmental Management, Sustainable Development, Green Tribunal and its functions in India				
	Regional Planning and Development	C-5.1	Transport Network Analysis, Nearest Neighbour Analysis, Mapping regiional Disparity based on Socio-Economic Data, Mapping Levels of Development, Policies and Programs for rural and regional development				
	Remote Sensing and GIS	C-5.2	Stereoscopic Vision, Areal Photographs, Satelite Imagerary, Mapping of water Bodies from Satelite Imagery, Digitization of Maps, GIS Data Analysis, GPS, Land use and Land Cover Mapping				
	Population Geography	DSE-5.3	Population Projection, Population Growth, Sex Ratio, Rural/Urban Population, Occupational Structures, Census, NSS				
	Disaster Management	C-6.2	Disaster Vulnerability and Risk, Prevention Mitigation and Management, Disaster Management Cycle, Role of Varius Stakeholders in Disaster Management, Mapping of Hazards and Disasters, Disaster Management Policy				
	Urban Geography	DSE-6.3	Functional Classification of Towns, Projection of Urban Population, Delimitation of C.B.D., Gravity and Population Potential Model				
B.A. (Philosophy)	Logic and Scientific Method	C-1.2	Deductive-Inductive Reasoning, Mediate and Immediate Syllogism, Validity and Invalidity of Arguments, Inductive Reasoning and Scientific Enquiry, Theory of Causation	Inductive Reasoning and Scientific Enquiry, Experimental Methods		2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Symbolic Logic	C-2.2	Calculus of Proposition, Predicate Calculus, Conjunctive Normal Form, Derivation by Substitution, Boolean Algebra, Venn Diagram				
	Ethics	C-3.1	Moral and Non-moral Action, Factual and Moral Judgement, Hiedonism, Rigorism, Perfectionism, Utilitarianism, Retributive Reformative Preventive and capital Punishment	Factual and Moral Judgement, Perfectionism, Theory of Punishment	Professional Ethics,, Business Ethics, Medical Ethics, Environmentsl Ethics		
	Ethics: Theory and Practice	GE-4.4	Environmental Ethics, Anthropocentrism, Biocentrism, Deep Ecology, Egalitarinism, Moral and Non-Moral Judgements	Environmental Ethics,Deep Ecology			

	Applied Ethics	C-6.2	Deontology, Relativism, Subjectivism, Animal rightrs, Reverence for Life, Euthanasia, Abortion, Anthropocentrism, Non-anthropocentrism, Professional Ethics, Business Ethics, CSR, Bio-Medical Ethics, Ethics of Healthcare Professionals	Professional Ethics, Business Ethics, Medical Ethics, Environmentsl Ethics			
	Philosophy of Bhagwad Geeta	DSE- 5.3	Swadharma, swabhaba, Nishkama Karma, Karma Yoga, Bhakti Yoga, Gyana Yoga,	Nishkama Karma, Karma Yoga, Bhakti Yoga, Gyana Yoga,			
B.A. (Pol. Sc.)	Constitutional Government and Democracy in India	C-1.2	Philosophy of Constitution and its Features, Fundamental Rights, Directive Principles of State Policies, Fundamental Duties, Organs of Government- Legislative, Executive, Judiciary			2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Political Process in India	C-2.2	Indian Party System, election Comission, Power and Function, Caste, Class, Gender and Religion, Voting Behaviour and Itys Determinant, Affirmative Action				
	Introduction to Public Administration	C-3.2	Public Policy- formulation and Implementation, New Public Administration, New Public Management, Good Governancce, New				
	Perspective on International Relations	C-3.3	An Overview of 20th Century IR History, World War 1, World War II, Emergence of Third World, National Interest in key Determinant of IR				
	Public Policy and Administration in India	C-4.2	Public Policy Process in India, Decentralisation of Power, Local Self Governance- Rural and Urban, Budget, Social Welfare				
	Global Politics	C-4.3	Migration and Human Security, Proliferation of Nuclear Weapon, Ecological Issue- Intl Environmental Agreement, Climate Change, Global Economy, World Bank, IMF, WTO, TNCs	Ecological Issue- Intl Environmental Agreement, Climate Change, Global Economy, World Bank, IMF, WTO, TNCs			
	India's Foreign Policy in Changing World	DSE-6.3	Indian Foreign Policy- major Determinants, India's Relation with USA and Russia, India China Relations, India and South Asia- SAARC, Act East Policy Look East Policy, UNO				
	Introduction to Human rights	DSE-5.3	Understanding Human Rights, Three Generations of Human Rights, Intl Refuge Law, Intl Humanitarian Law, Universal Declaration of human Rights		Intl Refuge Law, Intl Humanitarian Law		
B.A. (Economics)	Mathematical Methods for Economics-I	C-1.2	Set and Operations, Number Systems, Types of Functions, Limit and Continuity Of Functions, Derivatives and Slope of a Curve, PDE, Demand and Cost Elasticity		Demand and Cost Elasticity	2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Mathematical Methods for Economics-II	C-2.2	Input-Output Model, Optimum Values and Extremum values, Integration by Parts, Optimization with Equality Constraints				
	Research Methodology	C-4.3		Basics of Research, Research Problem, Issues in Research, Actions in Research			
	Introductory Econometrics/Odisha Economy	DSE-5.4	Macroeconomy of Odisha, Agriculture, Industry, infrastructure and Environment in Odisha, Social Sector in Odisha				
	Applied Econometrics/Environmental Economics	DSE-6.3	Regression, Dignostics and Specification, Advanced Topic in Research Analysis, Panel Data Models, Introduction to Econometric Software				
	Introduction to Socio-Cultural Anthropology	C-1.2	Theory and Practice of Ethonographic Fieldwork; Survey Method; Comparative and historical methods				

B.A. (Anthropology)	Archeological Anthropology	C-2.1	Methods of Estimation of Time and Reconstruction of the Past; Absolute dating methods: Radiocarbon14 dating (C14), Potassium-Argon, Dendochronology, Fission Track Dating; Relative dating methods: Stratigraphy, Palaeontology, Palynology, Understanding Culture; Technique of tool manufacture and estimation of their relative efficiency; Classification of tools: primary and combination of fabrication techniques			
	TRIBES AND PEASANTS IN INDIA	C-3.1	Constitutional safeguards; Draft of National Tribal Policy,			
	BIOLOGICAL DIVERSITY IN HUMAN POPULATIONS	C-3.3	Demographic Anthropology: meaning and scope, Sources of Demographic Data, Demographic Processes, Demographic profile of Indian populations and its growth structure. National population policy.			
	HUMAN GROWTH AND DEVELOPMENT	C-4.2	Nutritional epidemiology-concept of balanced diet, impact of malnutrition (over and under) with special reference to obesity, Kwashiorkor and Marasmus. Assessment of nutritional status.			
	RESEARCH METHODS	C-4.3	Research Design, Review of literature, conceptual framework, formulation of research problem, formulation of hypothesis, sampling and reference. Genealogy; data analysis and report writing- Chapterization, preparing a text for submission and publication, concepts of preface, notes (end and footnotes), bibliography (annotated) and references cited, review and index.			
	ANTHROPOLOGY IN PRACTICE	C-5.2		Role of Anthropology in Development; Anthropology and Public Policy, Need Assessment and Community Development, Anthropology of NGO's, Business Anthropology, Environment and Community Health, Social and economic sustainability, Cultural resource management.		2019-20 http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	FORENSIC ANTHROPOLOGY	C-6.1	Personal Identification, Complete and Partial Identification, Methods of Identification in Living Persons: Somatometry, Somatoscopy, Occupational Marks, Scars, Bite Marks, Tattoo Marks, Fingerprints, Footprints, Lip Prints, Nails, Handwriting, Deformities and Others.			
	FIELDWORK AND DISSERTATION	C-6.2	FIELDWORK AND DISSERTATION			
	HUMAN GENETICS	DSE-6.3(B)		Methods of studying heredity: Twin method, Pedigree method and Sib- pair method; Heritability estimate; Human Cytogenetics: Chromosome Karyotypes, Banding Techniques and Molecular cytogenetic, Polygenic Inheritance in Man , Concept of non-mendelian inheritance and complex diseases.		
	MUSEUM AND MUSEOLOGY	DSE-6.4	Museology and Basic Principles of Museum: Modes and ways of acquisition of museum specimens; Principles of display and arrangement in museum; Basic principles of museum, Documentation, labeling, display of the museum specimens of material cultures of tribal and rural people.			
otany)	Mycology and phytopathology	C-2.1	Mushroom cultivation, Fungi in Food industry			2019-20
	Economic Botany	C-3.2	Ruber Processing Jute fibre extraction, purification and use of oil seeds			2019-20
	Analytical Techniques in plant science	DSE-5.3		Techniques in applied biology like Chromatography, Spectroscopy and autoradiography etc.		2019-20
	Plant Biotechnology	C-6.2	Tissue culture, R DNA technology, pest resistant GM crops etc.			2019-20 http://www.govtcollegep

B.Sc. (Bo	Horticultural Practices and Post Harvest Technology	DSE-6.3	Ornamental plants, horticultural crops, post-harvest technology,		Ornamental plants, horticultural crops, post-harvest technology, Intigrated Pest	2019-20	hulbani.org/curriculum/ug-cbcs-syllabus/
	Project Work/Industrial & Environmental Microbiology	DSE-6.4	Project related to industrial or environmental microbiology			2019-20	
	Biostatistics	DSE-5.3		Statistical methods and test of hypothesis		2018-19	
	Nursery and Gardening	AECC-4.5	Gardening methods and nursery		Gardening methods and nursery	2017-18	
B.Sc. (Zoology)	ECONOMIC ZOOLOGY	DSE-5.4(UG)		Epiculture, Sericulture, Dairy & Poultry, Aquacultre		2016-2017	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Quantitative & Logical Thinking	SECC-3.5 (UG)		Quantitative & Logical Thinking		2018-2019	
	Communicative English	SECC-4.5(UG)		Communicative English		2018-2019	
	Environmental Studies	AEEC-2.4 (UG)		Pollution monitoring and impact assessment		2016-2017	
	Public Health and Hygiene	AEEC-4.5(UG)		Diseases and waste management technology		2016-2017	
M.Sc. (Life Science)	Instrumental Techniques	MSC PART-I PAPER-III	Instrumental Techniques			2016-2017	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Bio-technology and Genetic Engineering - I	MSC PART-I PAPER-IV		Bio-technology and Genetic Engineering - I		2016-2017	
	Molecular methodology	MSC PART-II PAPER-X		Molecular methodology		2016-2017	
	INSTRUMENTATION & ANALYTICAL TECHNIQUES	CC-2.3		HPLC, Crystallography, electrophresis etc.		2018-2019	
B.Sc. (Chemistry)	Inorganic Chemistry	C 3.1, C4.1	Synthesis and application			2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Organic Chemistry	C3.2, C4.2	Synthesis and application				
	Chemical Energetics & functional Organic chemistry	GE 3.4, GE 4.4	Reactions and application				
	Polymer Chemistry	DSE 5.3	Preparation, properties and application of synthetic polymers				
	Industrial Chemicals & Environment	DSE 5.4	Waste water treatment, biocatalysis, metallurgy				
	Inorganic materials of Industrial importance	DSE 6.3	Chemistry of Glass, Ceramics, Cements, Surface coatings and alloys				
	Green Chemistry	DSE 6.4	Green synthesis of Pharmaceutical molecules, green chemistry for sustainable development etc.				
B.A. (Odia)	MIL Communication ODIA	AECC-1.4	Sambada Prastuti, Sakhyatkar			2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Odia Nataka o Ekankika	C-5.1		Drama writing and skilled acting			
	Swadhinata Parabarti Odia Nataka o Ekankika	C-2.2		Drama writing and skilled acting			
	Odia Bhasara Byabaharika Prayoga	C-6.2		Computer application in Odia language			
M.A. (Pol. Sc.)	Public Administration Concept and issues	CC-1.3	Major issues in administration			2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	International Politics	CC-1.4	Global concerns on humanity				
	Indian Government and Politics	CC-1.5	Constitution and governance system of India		Leadership, Ideology, political party formation, Pressure group		
	India's foreign Policy	CC-2.3	International relation of major powers: US, China and Russia and ASEAN				
	Indian Politics Issues and Problems	CE-4.3	Challenges to national integration, RTI, Citizen charter				
	India and Regional Organisation	CE-3.4	India and SAARC, BRICS; India and EU; National security				
	Government and politics in Odisha	CC-2.5	Odisha Legislative assembly, Panchayti Raj, CM and Governor				
	Linear Programming	DSE-5.3	Linear Programming			2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Probability and Statistics	DSE-5.4	Probability and Statistics				
	Quantitative and Logical Thinking	AECC 3.5 and 4.5	Quantitative and Logical Thinking				

B.Sc. (Maths)	Discrete Mathematics	C-1.2	Discrete Mathematics				g-cbcs-syllabus/
B.A. (English)	Communicative English	AECC 3.5 and 2.5	Communicative English			2019-20	
BCA	Computer fundamentals	C-1.2	computer fundamental			2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Application Software	C-1.3	Application Software				
	Software Practical	C-1.4	Software Practical				
	English for technical communication	C-1.1			Communication skill		
	Discrete Mathematics	C-2.1			Computation Skill		
	C-Language	C-2.2	C high level langguage				
	Operating System	C-2.3	OS CUI GUI		OS CUI GUI		
	C-Language LAB	C-2.4	Software development				
	Numerical Analysis and Statistical methods	C-3.1			Analytical mathematics		
	OOPS using C++	C-3.3	Software development				
	LAB C++	C-3.4	Software development				
	Introduction to RDBMS	C-4.2	Database Administrator				
	Human Resource Manage ment	C-4.3			HRD		
	RDBMS LAB	C-4.4	Database Administrator				
	Data Communication and Computer Network	C-5.2	Network Administrator				
	VB & Web Development and LAB	C-5.3 & C-5.4	VB & Web Development and LAB				
	System Aalysis and Design	C-6.1	Software analysis and design				
	OOP Langguage JAVA and Lab	C-6.3, C-6.4 & C-6.5	Software development				
B.Sc. (Physics)	Analog Systems and Applications	PHY-C-3.3	Semiconductors, Amplifiers, Operational Amplifiers			2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Digital Systems and Applications	PHY-C-4.3	Integrated Circuits. Digital Circuits, Data Processing Circuits, Computer organization				
	Solid State Physics	PHY-C-5.2	Crystal Structure, XRD, Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials, Classical Langevins theory of dia and Paramagnetic Domains, Curies law, Weiss Theory, Dielectric Theory, Lasers, Superconductivity	X-Ray Diffraction, Lasers	XRD, Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials, Classical Langevins theory of dia and Paramagnetic Domains, Curies law, Weiss Theory, Lasers		
	Nuclear and Particle Physics	PHY-DSE-5.4	Radioactivity Decay, Detector for nuclear radiations, Particle Accelerators,	Detector for Nuclear Radiations, Particle accelerators			
	Nano Materials and Applications	PHY-DSE-6.3	Nanoscale Systems, Synthesis of Nanostructure materials, Characterization of Materials	Synthesis of Nanostructure Materials: Top down and bottoms up approach, Photo lithography Ball milling. Gas phase condensation, Vacuum deposition, Physical vapour deposition (PVT): Thermal evaporation, E-beam evaporation, Pulsed Laser deposition, Chemical vapour deposition (CVD), Sol-Gel Electrodeposition, Spray pyrolysis ,Hydrothermal synthesis, Preparation through colloidal methods, MBE growth of quantum dots. Characterization: X-Ray Diffraction, Optical Microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy, Atomic Force Microscopy, Scanning Tunneling Microscopy			
	PREHISTORIC ARCHAEOLOGY – I	CC-1.3		Typology and Technology in Prehistoric Archaeology: Typology of stone tools, Prehistoric Technology			

M.A. (Anthropology)	TRIBES OF INDIA	CC-1.4		Constitutional safeguards for Scheduled Tribes, History of administration of tribal areas, tribal policies, plans, programmes of tribal development, Problems of exploitation and deprivation of scheduled caste/ tribe and Other Backward, Role of anthropology in tribal and rural development		2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	BIOLOGICAL ANTHROPOLOGY–II	CC-2.2	Demographic Anthropology, Sources of Demographic Data, ; Demographic Processes, Nutritional Anthropology, Concept of Human Growth and Development				
	PREHISTORIC ARCHAEOLOGY-II & MUSEOLO	CC-2.3	Museum, Museology, Conservation of Cultural Resources in Museum				
	RESEARCH METHODOLOGY	CC-3.1	Fieldwork Tradition in Anthropology, Research Design, Tools and techniques of Data Collection, Data Analysis and report writing, Bio-Statistics, Descriptive Satistics				
	FORENSIC ANTHROPOLOGY	CC-4.1	Personal Identification, Methods of Identification in Living Persons				
	FIELDWORK AND DISSERTATION	CE-4.4	FIELDWORK AND DISSERTATION				
M.A. (Economics)	International Economics	CC-1.3	Theory of International Trade, Imperfect competition, Heckscher-Ohlin Theory of Trade, Leontief Paradox, Samuelson Theorem, Liner Theorem of Trade, Gains from Trade, Policy Implications for Less dveloped countries, Trade as an engine of Economic Growth, Tariff quota and Non tariff barriers, Optimum Tariff, Lipsey Model of General Equilibrium analysis.			2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Mathematical Techniques for Economics	CC-1.4	Coordinate Geometry, Differential Calculus, Vectors and Matrices, Optimisations				
	Statistical Techniques for Economics	CC-1.5	Bivariate Distribution- Correlation and regression analysis, Probability Distribution				
	Public Economics	CC-3.1	Fiscal Functions of the Government, Externality and Role of the governament, Ability to pay principle, Application of Taxation Principles in developing countries, Wagner's Law of Increasing State Activities, Effect of Public Expenditure on Production, Sources		Effect of Public Expenditure on Production, Sources of Public Burrowing, Budget, Tax reforms in India- DTC & GST		
	Financial Economics	CE-3.3B	Financial Markets, Utility Functions, Variance Portfolio Theory, Frontier of Risky, Fixed Income Securities				
	International Finance	CE-3.4B	Importance of International Finance to Business Firms, FDI, Money Markets, Foreign Markets, Foreign Exchange Rates, Sources of				
	Environmental Economics	CC-4.1	Economy and Environment, Encironmental Values and Valuations, Willingness to pay and willingness to accept. Market Failure, Coasian Solutions, Fiscal and Financial Instruments, Trade and Environemt, GATT, Economics of Natural Resources, CPR				
	Electrodynamics	CC-1.4	Wave Guide: Different modes of electromagnetic wave, B.C. for TE & TM waves, TE & TM mode in rectangular wave Guide,				
	Computational Physics (Practical)	CC-1.5	Exercises to study various features of C-Language, Programming using C Language				
	Nuclear Physics	CC-2.2	Nuclear disintegration: Gamow's theory of alpha decay, Geiger-Nuttal law, Beta decay, Fermi's theory of beta decay, Parity violation, Selection rules for allowed transition Nuclear Reaction: Energetics of nuclear reaction, Compound nucleus theory, resonance scattering, Briet-Wigner formula				
	Atomic and Molecular Physics	CC-2.4	Spectra Of Alkali metals, Rotational and Vibrating Spectra				

M.Sc. (Physics)	Modern Physics/EMT/Optics (Practical)	CC-2.5		B-H Curve, Oscilloscopic display, Michelson Interferometer: Determination of A and α, thickness of Mica sheet, Dielectric Constant of a liquid by electrically maintained tuning fork		2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	Basic Electronics	CC-3.2	Amplifiers, Oscillators, Multivibrators, Operational Amplifiers, Integrated Circuits, Flip-Flops, A/D and D/A convertors, Counters, Radio Communication, Antenna Theory				
	Basic Electronics (Practical)	CC-3.3		Oscillators, Amplifiers, Op-Amps, Logic Gates, Boolean Algebra			
	Electronics (Special Paper) – I	CE-3.4B	Network theorem, Resonant Circuit, Transmission Line, Wave guide, Cavity Resonators, Wave Shapping Circuits, Voltage and Current Shapping Circuits				
	Condensed Matter & Material Science (Special Paper) – II	CE-4.2A	Semiconductors, Superconductors, Solid State Device				
	Electronics (Special Paper) – II	CE-4.2B	Application of Op-Amp, Digital Circuit, Microprocessors, Quantum Electronics, Opto-electronic Device.				
	Condensed Matter & Material Science (Special Paper) – II (Practical)	CE-4.3B		All the Practicals as listed			
	Electronics (Special Paper) – II (Practical)	CE-4.4		All the Practicals as listed			
B.Com.	FINANCIAL ACCOUNTING	COM-C-1.1	ACCOUNTING WORK			2019-20	http://www.govtcollegephulbani.org/curriculum/ug-cbcs-syllabus/
	COST ACCOUNTING	COM-C-2.2	ACCOUNTING WORK				
	INCOME TAX LAW AND PRACTICE	COM-C-3.2	TAX COMPUTATION AND RETURN FILING				
	GST AND INDIRECT TAXES	COM-C-4.1	TAX COMPUTATION AND RETURN FILING				
	FUNDAMENTALS OF DATA MANAGEMENT	COM-C-4.2	DATA ENTRY				
	MANAGEMENT ACCOUNTING	COM-C-4.3	ACCOUNTING WORK				
	COMPUTERIZED ACCOUNTING AND E-FILIN	COM-C-5.1	ACCOUNTING WORK				
	FUNDAMENTALS OF CORPORATE TAX PLAN	COM-DSE-6.4	TAX COMPUTATION AND RETURN FILING				