CHOICE BASED CREDIT SYSTEM

(CBCS)

Guru Jambheshwar University of Science and Technology, Hisar

Scheme and Syllabi
for
(Third & Fourth Semesters)

Undergraduate Course:

B. SC. PHYSICAL SCIENCES

(PHYSICS/GEOGRAPHY, CHEMISTRY/ ELECTRONICS/ COMPUTER SCIENCE/ COMPUTER APPLICATIONS, MATHEMATICS)

Under
The Faculty of Physical Sciences and Technology

w.e.f. Academic Session 2018-19

SEMESTER III & IV

B. SC. PHYSICAL SCIENCES

LANGUAGE SKILLS COMPULSARY COURSE

(HINDI COMPULSORY)

CXL-301(i)
Language Skills Compulsory Course-III
CXL-401(i)
Language Skills Compulsory Course-IV

FOR SYLLABUS OF HINDI SUBJECT, SEE SEPARATE FILE ON WEBSITE

SEMESTER III & IV

B. SC. PHYSICAL SCIENCES

LANGUAGE SKILLS COMPULSARY COURSE

(SANSKRIT COMPULSORY)

CXL-301(ii)
Language Skills Compulsory Course-III
CXL-401(ii)
Language Skills Compulsory Course-IV

FOR SYLLABUS OF SUNSKRIT SUBJECT, SEE SEPARATE FILE ON WEBSITE

SEMESTER III & IV

B. SC. PHYSICAL SCIENCES

(PHYSICS)

CPL-302
Core Course-V
Heat and Thermodynamics
(Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80
Marks for internal Exam : 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Thermal physics deals with some important laws of thermodynamics, concepts of heart, work, temperature and entropy. Behavior of real gases as thermodynamical systems will be of interest.	The student will be able to understand basic concepts of thermodynamical systems.

Unit- I

Zeroth and First Law of Thermodynamics: Extensive and intensive thermodynamic variables, Thermodynamic equilibrium, Zeroth law and Concept of Temperature, Work and heat, State functions, First law of thermodynamics, Internal energy, Applications of first law, General relation between Cp and C_v, Work done during isothermal and adiabatic Processes .

Second Law of Thermodynamics: Reversible and Irreversible process with examples, Conversion of Work into Heat and Heat into Work, Heat Engines, Carnot's Cycle, Carnot engine & efficiency, Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence, Carnot's Theorem

UNIT-II

Entropy and Third law of Thermodynamics: Concept of entropy, Clausius theorem, Clausius Inequality,Second Law of Thermodynamics in terms of Entropy, Entropy of a Perfect Gas and Universe, Entropy Changes in Reversible and Irreversible Processes, Principle of Increase of Entropy, Third Law of Thermodynamics, T-S Diagrams, Phase Change, Classification of Phase Changes.

UNIT-III

Thermodynamic Potentials :- Extensive and Intensive Thermodynamic Variables, Internal Energy, Enthalpy, Gibbs, Helmholtz function and Their Definitions, Properties and Applications.

Maxwell's Thermodynamic Relations: - Derivations of Maxwell's Relations. Applications of Maxwell's Relations: (1) ClausiusClapeyron equation, (2) Values of CP – CV, (3) Energy equations (4) Change of temperature during adiabatic process.

UNIT-IV

Real gases: - Behaviour of Real Gases, Deviations from the Ideal Gas Equation. The Virial Equation, Critical Constants. Continuity of Liquid and Gaseous State. Vapour and Gas, Boyle Temperature, Van der Waal's Equation of State for Real Gases. Values of Critical Constants. Law of Corresponding States. Comparison with Experimental Curves, p-V Diagrams, Joule's Experiment, Free Adiabatic Expansion of a Perfect Gas.

Reference Books:

- Thermal Physics by Garg, Bansal and Ghosh (Tata McGra-Hill, 1993)
- Concepts in Thermal Physics, S. J. Blundell and K. M. Blundel, Oxford University Press
- Heat and Thermodynamics: An Intermediate Textbook By Mark Waldo Zemansky, Richard Dittman (McGraw-Hill, 1981

CPL-303
Core Course –VI
Semiconductor Devices

(Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 80

Marks for internal Exam : 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit.The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory. The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Semiconductor Devices deals with basic semiconductor properties, band formation, intrinsic and extrinsic semiconductors and formation of junction. After discussing the transistor physics, applications of diodes and transistors in various devices are given.	The student will be able to understand the semiconductor junctions, transistors and various devices based on these basic semiconductor elements.

UNIT-I

Semiconductor Diodes and applications: p and n type semiconductors. Barrier Formation in PN Junction Diode, Drift and Diffusion Currents, Current flow mechanism in Forward and Reverse biased PN Junction Diodes mentioning the roles of drift and diffusion currents, V-I characteristics of PN Junction Diode, Static and Dynamic Resistance, Applications of PN Junction Diode as Half-wave rectifier, Full-wave Rectifier (both center-tapped and bridge FWR),Calculation of ripple factor and rectification efficiency, Zener Diode, Applications of Zener Diode as DC voltage Regulator, Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell.

UNIT-II

Semiconductor Transistors: Bipolar Junction transistors: n-p-n and p-n-p Transistors, Biasing of transistors in Active, Cutoff, and Saturation Modes, Circuit configurations of CB ,CE and CC transistors, characteristics of transistors in CB,CE and CC, Current gains α and β. Relations between α and β, Current gain and power gain, DC Load line and Q- point

UNIT-III

Amplifiers and Their Biasing: Voltage Divider Bias Circuit for CE Amplifier, bias stabilization, Class-A, B&C amplifiers, RC coupled amplifiers and its frequency response, Feedback in amplifiers, positive and negative feedback in amplifiers, Advantages of negative feedback in amplifiers,

Sinusoidal Oscillators: Barkhausen's Criterion for Self-sustained oscillations, Circuit and working of Hartley oscillator, Circuit and working of Colpit's oscillator, Uses of oscillator.

UNIT-IV

Operational Amplifiers (Black Box approach): Qualitative idea of differential amplifier, CMRR, Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop& Closed-loop Gain. concept of Virtual ground, Applications of Op-Amps as Inverting Amplifier, Non-inverting Amplifier, Differentiator, Integrator.

Reference Books:

- Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mcgraw Hill.
- Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar, 2012, Tata McGraw Hill.
- Microelectronic Circuits, M.H. Rashid, 2nd Edn., 2011, Cengage Learning.
- Modern Electronic Instrumentation & Measurement Tech., Helfrick & Cooper, 1990, PHI Learning
- Digital Principles & Applications, A.P. Malvino, D.P. Leach &Saha, 7th Ed.,2011, Tata McGraw Hill
- Fundamentals of Digital Circuits, A. Anand Kumar, 2nd Edition, 2009, PHI Learning Pvt. Ltd.
- OP-AMP and Linear Digital Circuits, R. A. Gayakwad, 2000, PHI Learning Pvt. Ltd.

CPP- 308

Practical -III; Physics Lab--III

Credits: 02, total 60 Hours (4hrs. per week)

Max. Marks: 100

Time: 3 Hours

Note:-

1. Do any Seven experiments.
2. The students are required to calculate the error involved in a particular experiment.
3. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-
   Each student has to perform a minimum number of experiments prescribed in the syllabus. After the completion of a practical the teacher concerned will check the note book and conduct the Viva– voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.
4. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practicals will be entered. This record will be signed by the concerned teacher.
5. The laboratory Record register will be presented to the external practical examiners for Lab.Record marks. These external examiners may verify the record randomly.

List of Experiments

1. To measure the (a) area of a window (b) height of an inaccessible object by Sextent.
2. Refractive index and dispersive power of a prism material by spectrometer.
3. To draw a graph between wave length and minimum deviation for various lines from a Mercury discharge source.
4. Determination of wave length of Na light and the number of lines per centimeter using a diffraction grating.
5. To draw common base and common emitter characteristics of a transistor and calculate transistor characteristics parameters.
6. To study the ripple factor in a d.c. power supply.
7. Study of Hartley oscillator (calibration of gang condenser).
8. To measure (a) Voltage, and (b) Frequency of a periodic waveform using a CRO
9. To verify and design AND, OR, NOT and XOR gates using NAND gates

Extended list of experiments that may be added in above list (Experiments based on Computer programming in FORTRAN language.)

1. To print out all natural (even/odd) numbers between given limits using computer.
2. To find maximum, minimum and range of a given set of numbers using computer.
3. To evaluate sum of finite series.
4. Find the roots of a quadratic equation.

References:

1 Worshnop and Flint, Advanced Practical Physics
2 Nelkon M and Ogborn, Advanced Level Practical Physics, Heinemann Education Bookd Ltd, New Delhi
3 Srivastava S S and Gupta M K, Experiments in Electronics, Atma Ran & Sons, Delhi 4 Gupta S L and Kumar V, Practical Physics, Pragati Prakashan, Meerut.

CXL-401

Semester IV

CPL-402
Core Course-VII
Statistical Mechanics
(Credits – 02, 30 Hrs (2 Hrs/week))
Marks for Major test (External): 80
Marks for internal Exam : 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, *The paper will include at least 20% of total marks as numerical problems.*

Course Objective	Course Outcome
The course on statistical mechanics deals with statistical description of macro system, density of states, concept of ensemble, partition function and kinetic theory of gases. The Maxwell-Boltzmann Distributions, Fermi-Dirac Distribution and Bose-Einstein distributions and their applications are given.	The student will be able to understand some basic notion of statistical mechanics including interpretation of second law of thermodynamics. Concept of negative temperature. Gibbs paradox.

UNIT-I

Statistical Basis of Thermodynamics: - Statistical Basis, Probability and Frequency, Permutations and Combinations, Distribution of n distinguishable and indistinguishable particles in two boxes, Macrostate and Microstate, Thermodynamic Probability, Fluctuations and their Dependence on n : (narrowing of probability distribution with increasing n), Constraints on a System, Static and dynamics system, most probable state, Concept of cell in a compartment, Concept of Ensembles and type of Ensembles (Qualitative Idea only)

Universal Law in Statistics: - Fundamental Postulates of Statistical Mechanics, Density of Quantum states of energy of a particle, Entropy and thermodynamics Probability, Statistical Interpretation of 2nd law of thermodynamics, Partition function and Relation with Thermodynamics Quantities

UNIT-II

Kinetic Theory of Gases: - Maxwell-Boltzmann Law of Distribution of Particle speed in an Ideal Gas and its Experimental Verification, Mean, RMS and Most Probable Speeds.

Molecular Collisions: - Mean Free Path. Collision Probability, Estimates of Mean Free Path, Transport Phenomenon in Ideal Gases: (1) Viscosity, (2) Thermal Conductivity (3) Diffusion. Brownian Motion and its Significance.

Equipartition Law: Degrees of Freedom, Law of Equipartition of Energy (No proof required) and its application to the specific heat of monoatomic and diatomic gases and its limitations.

UNIT-III

Classical Statistics: - Phase space and Application to One Dimension Harmonic Oscillator and Free particle, Division of phase space into cells, Basic approach in three statistics, Maxwell-Boltzmann Distribution Law, Thermodynamic Functions of Finite Number of Energy Levels, Negative Temperature, Thermodynamic Functions of an Ideal Gas, Classical Entropy Expression, Gibbs Paradox.

UNIT-IV

Bose-Einstein Statistics: - B.E. distribution law, Thermodynamic functions of a Completely Degenerate Bose Gas, Bose-Einstein condensation, properties of liquid He (qualitative description), Radiation as photon gas, Bose's derivation of Planck's law.

Fermi-Dirac Statistics: - Fermi-Dirac Distribution Law, Thermodynamic functions of an ideal Completely Degenerate, Fermi Gas, Fermi Energy, Electron gas in a Metal, Specific Heat of Metals, Comparison of three statistics M-B, B-E and F-D.

Suggested Books:

- Concepts in Thermal Physics, S. J. Blundell and K. M. Blundel, Oxford University Press
- Statistical Physics, Berkeley Physics Course Volume 5 by F Reif (Tata McGraw-Hill Company Ltd, 2008)
- Statistical and Thermal Physics: an introduction by S. Lokanathan and R.S. Gambhir. (P.H.I., 1991).
- Statistical Mechanics by R. K. Patharia. (Oxford: Butterworth, 1996).

CPL-403
Core Course-VIII
Waves and Optics
((Credits – 02, 30 Hrs (2 Hrs/week))
Marks for Major test (External): 80
Marks for internal Exam : 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit.The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory, The paper will include at least 20% of total marks as numerical problems.

Course Objective	Course Outcome
The course on Waves and Optics deals with the wave equation, Interference, diffraction and polarization.	The student will be able to understand concepts of transverse and longitudinal waves, Young have double slit experiment. Concept of refractive index, Zone plate, various types of diffraction. Basic idea of the light propagation through optical fibers.

UNIT 1

Wave Motion: Wave Equation, Solution of wave equation, Particle and Wave Velocities, Intensity of Wave, Superposition Principle, Group velocity, Phase velocity

Transverse Waves: The string as a force oscillator, Velocity of Transverse Vibrations of Stretched Strings, Reflections and transmission of waves on a string at a boundary, Transverse waves on a string, Travelling and standing waves on a string, Normal Modes of a string, Reflections and transmission of Energy.

Longitudinal Waves: Velocity of Longitudinal Waves in a Fluid in a Pipe, Newton's Formula for Velocity of Sound, Laplace's Correction (qualitative), Reflections and transmission of sound waves at a boundary, Energy distribution in sound waves.

UNIT II

Interference: Division of amplitude and division of wave front, Young's Double Slit experiment, Lloyd's Mirror and Fresnel's Biprism, Phase change on reflection: Stokes' treatment, Interference in Thin Films: parallel and wedge-shaped films, Newton's Rings: measurement of wavelength and refractive index.

UNIT III

Diffraction: Fresnel Diffraction: Fresnel's Assumptions, Fresnel's Half-Period Zones for Plane Wave, Rectilinear Propagation of Light, Theory of a Zone Plate and its application, Multiple Foci of a Zone Plate, Qualitative description for Fresnel diffraction pattern of a straight edge, a slit and a wire.

Fraunhofer diffraction: Single slit, Double slit multiple slits and 'n' multiple slits, Diffraction grating and it's resolving power, Rayleigh Criteria of the limit of resolution and Resolving Power of a telescope.

UNIT IV

Polarization: Plane polarized light – production and analysis, Circular and elliptical polarization, Optical activity, Specific Rotation

Fibre Optics: Optical Fibres - Construction and working, Critical angle of propagation, Modes of propagation, Acceptance angle, Attenuation. Advantages and applications of Optical Fibre

Reference Books

- Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill.
- Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill
- Principles of Optics, Max Born and Emil Wolf, 7thEdn., 1999, Pergamon Press.
- Optics, Ajoy Ghatak, 2008, Tata McGraw Hill
- The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.
- The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.
- Fundamental of Optics, A. Kumar, H.R. Gulati and D.R. Khanna, 2011, R. Chand Publications

CPP- 408

Practical -IV; Physics Lab--IV

Credits: 02, total 60 Hours (4hrs. per week)

Max. Marks: 100

Time: 3 Hours

Note:-

1. Do any Seven experiments.
2. The students are required to calculate the error involved in a particular experiment.
3. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-
   Each student has to perform a minimum number of experiments prescribed in the syllabus. After the completion of a practical the teacher concerned will check the note book and conduct the Viva– voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.
4. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practicals will be entered. This record will be signed by the concerned teacher.
5. The laboratory Record register will be presented to the external practical examiners for Lab.Record marks. These external examiners may verify the record randomly.

List of Experiments

1. Wave length by Newton's Rings
2. Resolving power of a telescope.
3. Comparison of Illuminating Powers by a Photometer.
4. To find the equivalent focal length of a lens system by nodal slide assembly
5. Study of series and parallel resonance circuits.
6. Electronic Voltmeter measurement of peak, average & R.M.S. value of signal.
7. Study of voltage doubler and trippler circuits.
8. To determine value of Boltzmann constant using V-I characteristic of PN diode.
9. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify λ2 – T Law.

Extended list of experiments that may be added in above list (Experiments based on Computer programming in FORTRAN language.)

1. To find integration of a definite integral by trapezoidal rule.
2. To find the area of a triangle, sphere and cylinder.
3. Given values for a, b, c and d and a set of values for the variable x evaluate the function defined by. f(x) = ax2 + bx + c if x < d f(x) = 0 if x = d f(x) = ax2 + bx - c if x> d For each value of x and print the value of x and f(x). Write a program for an arbitrary number of x values.

References:

1 Worsnop and Flint, Advanced Practical Physics

2 Nelkon M and Ogborn, Advanced Level Practical Physics, Heinemann Education Bookd Ltd, New Delhi

3 Srivastava S S and Gupta M K, Experiments in Electronics, Atma Ran & Sons, Delhi 4 Gupta S L and Kumar V, Practical Physics, Pragati Prakashan, Meerut.

CPS-409

Skill Enhancement Course-I (Physics)

Electrical Circuits and Network Skills

((Credits – 02, 30 Hrs (2 Hrs/week))

Marks for Major test (External): 50

Time: 2 Hours

Note:-

1. *There are two UNITs and the paper is a mix of theory and practical/demonstration/project to understand the concepts of use of components and design of small circuits.*
2. *The students are required to design the circuits using bread boards and elementary electronic components.*
3. *Each student has to perform/ evolve a small project/device.*
   The teacher concerned will see the performance and conduct the Theory/Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the project, he/ she has understood. According to his/her performance marks will be recorded, in internal.

Course Objective	Course Outcome
The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and applications through hands-on mode.	The student will be able to design the electrical and electronic circuits. This will enable the student to evolve small projects.

UNIT -I

Basic Electrical Components: Electronic components. Passive components. Resistors and their types. Color coding of resistors. Troubles in resistors. Capacitors and their types. Troubles in capacitors. Inductors and their types. Troubles in inductors. Internal resistance and impedance.Types of Electrical switches. “Single-pole Single-throw” (SPST) switch. “Single-pole Double-throw” (SPDT) switch. “Double-pole Double-throw” (DPDT) switch. Application of SPST , SPDT and DPDT switches.

Electrical Protection and Electrical Wiring: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Construction and working of MCB & MCCB and their uses. Different types of conductors and cables. Basics of wiring - Star and delta connection. Voltage drop and losses across cables and conductors.. Insulation. Solid and stranded cable. Preparationofextensionboard.

UNIT-II

Electrical Energy Sources and Measurements: Real (practical) and ideal voltage source. Real (practical)current source. Conversion of voltage source into current source or vice-versa Maximum power transfer theorem. Thevenin theorem and norton’s theorem. Familiarization with multimeter. Voltmeter and ammeter. AC source -single phase and three phase alternating current sources. Measurement of energy consumption in AC circuits.

Digital Circuits: Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates, Realization of AND, OR and NOT Gates using Diodes, resistances and Transistor, NAND and NOR Gates as Universal Gates, Realization of AND, OR and NOT Gates using NAND Gates only and NOR Gates only, XOR gates, XNOR Gates,De Morgan's Theorems, Boolean Laws.

Reference Books:

- A text book in Electrical Technology- B L Theraja – S Chand & Co.
- A text book of Electrical Technology - A K Theraja.

SEMESTER III & IV

B. SC. PHYSICAL SCIENCES

(GEOGRAPHY)

CGL - 302

Core Course – V

GEOGRAPHY OF INDIA

Credits: 02 Hrs (2 Hrs / week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-1

1. India: Location, Relief Structure and Drainage Systems.
2. Climate: Seasons of India, Theory of Indian Monsoon.
3. Classification and Distribution of Indian soils and Natural Vegetation.

Unit-II

4. Population: Distribution, Density, Growth, Composition and Migration.
5. Human Settlements: Classification of Urban and Rural Settlements.

Unit-III

6. Land use, Green Revolution and Problems of Indian Agriculture.
7. Regional Variation in Cropping Pattern: Rice, Wheat, Sugarcane, and Cotton.

Unit-IV

8. Energy and mineral resources: coal, petroleum, and Hydroelectricity, iron-ore and mica.
9. Industries – iron and steel and cotton textile and industrial regions.
10. Modes of transport and communication.

Reading List

1. Hussain M., 1992: G*eography of India*, Tata McGraw Hill Education.
2. Mamoria C. B., 1980: *Economic and Commercial* G*eography of India*, Shiva Lal Agarwala.
3. Miller F. P., Vandome A. F. and McBrewster J., 2009: *Geography of India: Indo- Gangetic Plain, Thar Desert, Major Rivers of India, Climate of India, Geology of India*, Alphascript Publishing.
4. Nag P. and Sengupta S., 1992: G*eography of India*, Concept Publishing.
5. Pichamuthu C. S., 1967: *Physical Geography of India*, National Book Trust.
6. Sharma T. C. and Coutinho O., 1997: *Economic and Commercial* G*eography of India*, Vikas Publishing.
7. Singh Gopal, 1976: *A* G*eography of India*, Atma Ram.
8. Spate O. H. K. and Learmonth A. T. A., 1967: *India and Pakistan: A General and Regional Geography*, Methuen.
9. Rana, Tejbir Singh, 2015, Diversity of India , R.K. Books, Delhi.

CGL - 303

Core Course – VI

REGIONAL PLANNING WITH SPECIAL REFERENCE TO HARYANA

Credits: 02 Hrs (2 Hrs / week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-1

1. Concept, Need and Types of regional planning.
2. Characteristics and Delineation of regional planning.
3. Regionalization of India for planning: Agro – ecological zones.

Unit-II

4. Models for Regional Planning: Growth Pole Theory, Core Periphery Model and Growth Foci Concept in Indian Context.
5. Success Story and failures of Regional Plans: Damodar Valley Corporation (DVC), Integrated Tribal Development programme (ITDP).

Unit-III

6. Physical and economic diversities in Haryana:

i). Relief, Climate, Drainage, Groundwater, Soils and Natural Vegetation.
ii). Cropping Pattern in Haryana.
iii). Industrial regions and means of transportation.

Unit-IV

7. Distribution, density and growth of population in Haryana.
8. Educational development, health facilities and gender issues (sex ratio) in Haryana.

Reading List

1. Blij H. J. De, 1971: *Geography: Regions and Concepts*, John Wiley and Sons.
2. Claval P.l, 1998: *An Introduction to Regional Geography*, Blackwell Publishers, Oxford and Massachusetts.
3. Friedmann J. and Alonso W. (1975): *Regional Policy - Readings in Theory and Applications*, MIT Press, Massachusetts.
4. Gore C. G., 1984: *Regions in Question: Space, Development Theory and Regional Policy*, Methuen, London.
5. Gore C. G., Köhler G., Reich U-P. and Ziesemer T., 1996: *Questioning Development; Essays on the Theory, Policies and Practice of Development Intervention*, Metropolis- Verlag, Marburg.
6. Haynes J., 2008: *Development Studies*, Polity Short Introduction Series.
7. Johnson E. A. J., 1970: *The Organization of Space in Developing Countries*, MIT Press, Massachusetts.
8. Peet R., 1999: *Theories of Development*, The Guilford Press, New York.
9. UNDP 2001-04: *Human Development Report,* Oxford University Press.
10. World Bank 2001-05: *World Development Report,* Oxford University Press, New

CGP – 308*

Practical – III; Geography Lab – III

(Credits: 02, 60 Hours (4 hrs. per week)

Maximum Marks:100

Time: 4 Hours

Note: Distribution of Marks is as under;

Exercise - 60

Record File - 20

Viva – voce - 20

1. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-

   Each student has to perform a minimum number of exercises/experiments prescribed in the syllabus. After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.

2. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.
3. The laboratory Record register will be presented to the external practical examiners for Lab. Record marks. These external examiners may verify the record randomly.

Projection

1. Introduction to Map Projection: Meaning, Classification and importance; Characteristics of latitudes and longitudes lines.
2. Cylindrical projections: Characteristics, applications and drawing; (3 exercises)
   (i) Simple cylindrical projection
   (ii) Cylindrical equal area projection.
   (iii) True shape or orthomorphic or Mercator's Projection.

3. Conical Projections: Characteristics, applications and drawing. (5 exercises)
   (i) Simple conical projections with one standard parallel
   (ii) Simple conical projection with two standard parallel

(iii) Bonne's Projection

(iv) Polyconic Projection.

(v) International Map Projection.

4. Zenithal Projections: Characteristics, applications and drawing. (5 exercises)

(i) Polar Zenithal Equidistant Projection.

(ii) Polar Zenithal Equal Area Projection

(iii) Polar Zenithal Gnomonic Projection

(iv) Polar Zenithal Stereographic Projection.

(v) Polar Zenithal Orthographic Projection

5. Characteristics, applications and drawings. (2 exercises)

(i) Sinusoidal

(ii) Mollweide Projections.

6. Prismatic Compass Survey. (2 exercises)

Suggested Readings:-

1. Goyal K.K.1981.. Practical Geography, Manthan Publication, Rohtak.

2. Gregory S. 1963. Statistical Methods and the Geography, Longman, London.

3. Khan, A.A. 1996. Text Book of Practical Geography, Concept, New Delhi,.

4. Lawarence, GRP1968. Cartographic Methods, Methuen, London,.

5. Monkhouse, F.J. and Wilkinson, H.R1994. Maps and Diagrams, Methuen, London,

6. Pal. S.K. 1998: Statistics for Geoscientist- Techniques and Applications, Concept Publication, New Delhi,.

7. Sarkar, A.K 1997: Practical Geography-A Systematic Approach, Orient Longman, Calcutta,.

8. Singh, R.L. 1972. Elements of Practical Geography, Kalyani Pub., New Delhi

9. Steers, J.B. Map Projections; University of London Press, London.

CGL - 402

Core Course – VII

ENVIRONMENTAL GEOGRAPHY

Credits: 02 Hrs (2 Hrs / week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit-I

1. Environmental Geography: Definition, Concepts and Scope.
2. Approaches to the study of environmental geography.

Unit- II

3. Ecosystem: Concept, Structure and functions.
4. Flow of energy; food chain and food web; trophic level.

Unit- III

5. Biomes and Habitat: Tropical rainforest biome, Grassland biomes and Desert biome.
6. Environmental Problems and Management: Climate change and Global warming.

Unit – IV

7. Environmental Programmes and Policies – Developed countries and Developing countries.
8. Global Environmental concerns: Stockholm conference, Earth summit and Kyoto protocol and after.

Reading List

1. Casper J.K. (2010) Changing Ecosystems: Effects of Global Warming. Infobase Pub. New York.
2. Hudson, T. (2011) Living with Earth: An Introduction to Environmental Geology, PHI Learning Private Limited, New Delhi.
3. Miller, G.T. (2007) Living in the Environment: Principles, Connections, and Solutions, Brooks/ Cole Cengage Learning, Belmont.
4. Singh, R.B. (1993) Environmental Geography, Heritage Publishers, New Delhi.
5. UNEP (2007) Global Environment Outlook: GEO4: Environment For Development, United Nations Environment Programme. University Press, Cambridge.
6. Wright R. T. and Boorse, D. F. (2010) Toward a Sustainable Future, PHI Learning Pvt Ltd, New Delhi.
7. Singh, R.B. and Hietala, R. (Eds.) (2014) Livelihood security in Northwestern Himalaya: Case studies from changing socio-economic environments in Himachal Pradesh, India. Advances in Geographical and Environmental Studies, Springer
8. Singh, Savindra 2001. *Paryavaran Bhugol*, Prayag Pustak Bhawan, Allahabad. (in Hindi)

CGL - 403

Core Course – VIII

GEOGRAPHY OF DISASTER

Credits: 02 Hrs (2 Hrs / week)

Marks for Major Test (External): 80

Marks for Internal Exam: 20

Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of two marks. The remaining eight questions are to be set uniformly having two questions from each unit. The students is required to attempt five questions in all selecting one question from each unit and Question No. 1 is compulsory.

Unit - I

1. Hazards, Risk, Vulnerability and Disasters: Definition and Concepts.
2. Tectonic disasters: Earthquakes, Tsunamis and Volcanic eruption in India.

Unit – II

3. Hydrological disasters: Occurrence and impact of floods and droughts in India.
4. Climatic disasters: Tropical cyclones, Heavy Precipitation Events-Cloud Burst, Heat and cold waves.

Unit - III

5. Human induced disasters: Forest Fire, Road Accidents, Agricultural residual burning.
6. Mitigation and Preparedness for disasters, NDMA and NIDM: Indigenous Knowledge and Community – based disaster management. Do's and Don'ts During disaster.

Unit – IV

7. Post disaster Rehabilitation: Policies and Programmes.
8. Major Disaster in India: Bhopal Gas Tragedy, Bhuj Eartquake, Kashmir flood.

Reading List

1. Government of India. (1997) Vulnerability Atlas of India. New Delhi, Building Materials & Technology Promotion Council, Ministry of Urban Development, Government of India.

2. Kapur, A. (2010) Vulnerable India: A Geographical Study of Disasters, Sage Publication, New Delhi.

3. Modh, S. (2010) Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi.

4. Singh, R.B. (2005) Risk Assessment and Vulnerability Analysis, IGNOU, New Delhi. Chapter 1, 2 and 3

5. Singh, R. B. (ed.), (2006) Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi.

6. Sinha, A. (2001). Disaster Management: Lessons Drawn and Strategies for Future, New United Press, New Delhi.

7. Stoltman, J.P. et al. (2004) International Perspectives on Natural Disasters, Kluwer Academic Publications. Dordrecht.

8. Singh Jagbir (2007) "Disaster Management Future Challenges and Oppurtunities", 2007. Publisher- I.K. International Pvt. Ltd. S-25, Green Park Extension, Uphaar Cinema Market, New Delhi, India (www.ikbooks.com).

CGP – 408*

Practical – IV; Geography Lab – IV
(Credits: 02, 60 Hours (4 hrs. per week)

Maximum Marks: 100
Time: 4 Hours

Note: Distribution of Marks is as under;
Exercise - 60
Record File - 20
Viva – voce - 20

1. For giving marks under Lab. Record each college will maintain practical assessment record by using the following procedure:-
   Each student has to perform a minimum number of exercises/experiments prescribed in the syllabus. After the completion of a practical the teacher concerned will check the note book and conduct the Viva – voce of each student to find out how much concepts related to the theoretical and experimental part of the experiment he/ she has understood. According to his/her performance marks will be recorded on their practical note-book. These marks will constitute the lab. Record.
2. To compute the final marks for lab. Record, a separate register will be maintained. Each student will be assigned separate page on this register. On this page the marks obtained by the student in different practical's will be entered. This record will be signed by the concerned teacher.
3. The laboratory Record register will be presented to the external practical examiners for Lab. Record marks. These external examiners may verify the record randomly.

Remote Sensing and GPS based Project Report

1. Remote Sensing: Definition, Development, Platforms and Types.
2. Aerial Photography: Principles, Types and Geometry.
3. Satellite Remote Sensing: Principles, EMR Interaction with Atmosphere and Earth surface; Satellites (Land sat & IRS) and Sensors.
4. Interpretation and Application of Remote Sensing: Land use / Land Cover
5. Global Positioning System (GPS): Principles and Uses.

Practical Record: A Project file consisting of following exercises;

1. Demarcation of Principal Point, Conjugate Principal point and Flight line on Aerial Photographs – 3 Exercises.
2. Determination of Scale of Aerial Photographs – 3 Exercises.
3. Interpretation of Single Vertical Photographs – 1 Exercise.
4. Use of Stereoscope and Identification of Features – 1 Exercise.
5. Identification of Features (Different Topography) on IRSID, LISS III imagery (Mark copy of FCC) -3

Suggested Readings:-

1. John R. Jensen, Remote Sensing of the Environment; An Earth Resource Perspective, Pearson Education, (India Edition) New Delhi, 2009.
2. Lillesand and R.W. Kiefer, Remote Sensing and Image Interpretation, John Wiley and Sons, 1994.

SEMESTER III&IV

B. SC. PHYSICAL SCIENCES

(CHEMISTRY)

Semester III

CCL-304
CORE COURSE-V
PHYSICAL CHEMISTRY-II:
(SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE & ELECTROCHEMISTRY)
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3Hrs

Note: *The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.*

UNIT-I

Solutions

Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions. Vapour pressure-composition and temperature composition curves of ideal and non-ideal solutions. Distillation of solutions.Azeotropes.Colligative properties of solutions.Thermodynamic derivations of relation between amount of solute and elevation in boiling point and depression in freezing point.

Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids. Immiscibility of liquids- Principle of steam distillation.

(8 Hours)

UNIT-II

Phase Equilibrium

Phases, components and degrees of freedom of a system, criteria of phase equilibrium.Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria. Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, congruent and incongruent melting points (lead-silver, and Na-K only).

(7 Hours)

UNIT-III

Conductance

Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes.Kohlrausch law of independent migration of ions.

Transference number, ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid-base).Concept of pH and pK_a, buffer solution, buffer action, Handerson Hazel Blac equation.

(7 Hours)

UNIT-IV

Electrochemistry

Reversible and irreversible cells.Concept of EMF of a cell.Measurement of EMF of a cell.Nernst equation and its importance.Types of electrodes.Standard electrode potential.Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: ΔG, ΔH and ΔS from EMF data.

Calculation of equilibrium constant from EMF data. Concentration cells with transference and without transference. Liquid junction potential and salt bridge.pH determination using hydrogen electrode and quinhydrone electrode.
Potentiometric titrations -qualitative treatment (acid-base and oxidation-reduction only).

(8 Hours)

Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry*, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
- Mahan, B.H. *University Chemistry*, 3rd Ed. Narosa (1998).
- Petrucci, R.H. *General Chemistry*, 5th Ed., Macmillan Publishing Co.: New York (1985).

CCL-305
CORE COURSE-VI
ORGANIC CHEMISTRY-III*:*
(FUNCTIONAL GROUP ORGANIC CHEMISTRY-II)
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3Hrs

Note: *The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.*

UNIT-I

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure for Units I-IV.

Carboxylic acids and their derivatives

Carboxylic acids (aliphatic and aromatic)

Preparation: Acidic and Alkaline hydrolysis of esters.

Reactions: Hell-Vohlard-Zelinsky Reaction.

Carboxylic acid derivatives (aliphatic): (Upto 5 carbons)

Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their interconversion.

Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation.

(7 Hours)

UNIT-II

Amines and Diazonium Salts

Amines (Aliphatic and Aromatic): (Upto 5 carbons)

Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, HofmannBromamide reaction.

Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO_2, Schotten-Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation.

Diazonium salts: *Preparation:* from aromatic amines. *Reactions:* conversion to benzene, phenol, dyes.

(8 Hours)

UNIT-III

Amino Acids, Peptides and Proteins:

Preparation of Amino Acids: Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis.

Reactions of Amino acids: ester of –COOH group, acetylation of $–NH_2$ group, complexation with Cu^{2+} ions, ninhydrin test.

Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins.

Determination of Primary structure of Peptides by degradation Edmann degradation (N-terminal) and C–terminal (thiohydantoin and with carboxypeptidase enzyme).Synthesis of simple peptides (upto dipeptides) by N-protection (t-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid-phase synthesis.

(8 Hours)

UNIT-IV

Carbohydrates:

Classification, and General Properties, Glucose and Fructose (open chain and cyclic structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation, ascending and descending in monosaccharides. Structure of disacharrides (sucrose, cellobiose, maltose, lactose) and polysacharrides (starch and cellulose) excluding their structure elucidation.

(7 Hours)

Reference Books:

- Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. *Organic Chemistry* (*Volume 1*), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. *Organic Chemistry* (*Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Bioch*emistry *7th Ed.,* W. H. Freeman.
- Berg, J.M., Tymoczko, J.L. &Stryer, L. *Biochemistry*, W.H. Freeman, 2002. Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry*, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
- Petrucci, R.H. *General Chemistry*, 5th Ed., Macmillan Publishing Co.: New York (1985).

CCP-309
PRACTICAL-III
CHEMISTRY LAB-III:
(SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE, ELECTROCHEMISTRY & FUNCTIONAL GROUP ORGANIC CHEMISTRY)
Credits: 02; 60 Hrs (4Hrs /week)

Marks (External): 100
Time: 6Hrs

Section A: Physical Chemistry

Solutions: Determination of molecular weight of non volatile solute by Rast Method.

Phase equilibria: i.Construction of the phase diagram of a binary system (simple eutectic) using cooling curves.

ii.Determination of the critical solution temperature and composition of the phenol water system and study of the effect of impurities on it.

iii.Study of the variation of mutual solubility temperature with concentration for the phenol water system and determination of the critical solubility temperature.

Conductance: i.Determination of cell constant

ii.Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.

iii.Perform the following conductometric titrations:

a. Strong acid vs. strong base

b. Weak acid vs. strong base

Potentiometry: Perform the following potentiometric titrations:

i. Strong acid vs. strong base

ii. Weak acid vs. strong base

iii. Potassium dichromate vs. Mohr's salt

Section B: Organic Chemistry

I. Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.

II. 1.Separation of amino acids by paper/thin layer chromatography.

2. Determination of the concentration of glycine solution by formylation method.

3. Titration curve of glycine

4. Action of salivary amylase on starch

5. Effect of temperature on the action of salivary amylase on starch.

6. Differentiation between a reducing and a nonreducing sugar.

Reference Books:

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.
- Khosla, B. D.; Garg, V. C. &Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
- Ahluwalia, V.K. &Aggarwal, R. *Comprehensive Practical Organic Chemistry*, Universities Press.

Semester IV

CCL-404
CORE COURSE-VII
INORGANIC CHEMISTRY-II:
TRANSITION METALS & COORDINATION CHEMISTRY
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Transition Elements (3d series)

General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.

(8 Hours)

UNIT-II

Lanthanoids and actinoids

Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion exchange method only).

(7 Hours)

UNIT-III

Coordination Chemistry

Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Drawbacks of VBT.IUPAC system of nomenclature.

(7 Hours)

UNIT-IV

Crystal Field Theory

Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry.Factors affecting the magnitude of d-orbital splittings.Spectrochemical series. Comparison of CFSE for O_h and T_d complexes, Tetragonal distortion of octahedral geometry.Jahn-Teller distortion, Square planar coordination.

(8 Hours)

Reference Books:

- Cotton, F.A. & Wilkinson, G. *Basic Inorganic Chemistry,* Wiley.
- Shriver, D.F. & Atkins, P.W. *Inorganic Chemistry*, Oxford University Press.
- Wulfsberg, G. *Inorganic Chemistry,* Viva Books Pvt. Ltd.
- Rodgers, G.E. *Inorganic & Solid State Chemistry,* Cengage Learning India Ltd., 2008.

CCL-405
CORE COURSE-VIII
PHYSICAL CHEMISTRY-III:
STATES OF MATTER & CHEMICAL KINETICS
Credits: 02; 30 Hrs (2Hrs /week)

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3Hrs

Note: The examiner is requested to set nine questions in all, selecting two questions from each UNIT and one compulsory question (Question No.1 based on entire syllabus will consist of eight short answer type questions each of two marks). The candidate is required to attempt five questions in all selecting one from each UNIT and the compulsory Question No.1.

UNIT-I

Kinetic Theory of Gases

Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation.

Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation.Andrews isotherms of CO_2.

Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance.

Temperature dependence of these distributions.Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules.

(8 Hours)

UNIT-II

Liquids: Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer.Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

(7 Hours)

UNIT-III

Solids: Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices. Miller indices.X–Ray diffraction by crystals, Bragg's law.Structures of NaCl, KCl and CsCl (qualitative treatment only).Defects in crystals.

(7 Hours)

UNIT-IV

Chemical Kinetics: The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates.Order and molecularity of a reaction.Derivation of integrated rate

equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants).Half–life of a reaction.General methods for determination of order of a reaction.Concept of activation energy and its calculation from Arrhenius equation.
Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).

(8 Hours)

Reference Books:

- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry* Cengage Learning India Pvt. Ltd., New Delhi (2009).
- Mahan, B.H. *University Chemistry* 3rd Ed. Narosa (1998).
- Petrucci, R.H. *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).

CCP-409
PRACTICAL-IV
CHEMISTRY LAB IV:
(TRANSITION METAL & COORDINATION CHEMISTRY, STATES OF MATTER & CHEMICAL KINETICS)
Credits: 02; 60 Hrs (4 Hrs /week)

Marks (External): 100
Time: 6Hrs

Section A: Inorganic Chemistry

Semi-micro qualitative analysis (using H_2S or other methods) of mixtures - not more than four ionic species (two anions and two cations, excluding insoluble and interfering salts) out of the following:
Cations : NH_4^+, Pb^{2+}, Bi^{3+}, Cu^{2+}, Cd^{2+}, Fe^{3+}, Al^{3+}, Co^{2+}, Ni^{2+}, Mn^{2+}, Zn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, K^+
Anions : CO_3^{2-} , S^{2-}, SO_3^{2-}, $S_2O_3^{2-}$, NO_2^-, CH_3COO^-, Cl^-, Br^-, I^-, NO_3^-, SO_4^{2-}, PO_4^{3-}, BO_3^{3-}, $C_2O_4^{2-}$,
(Spot tests should be carried out wherever feasible)

1. Estimate the amount of nickel present in a given solution as bis(dimethylglyoximato)nickel (II) in a given solution gravimetrically.
2. Estimation of (i) Mg^{2+} or (ii) Zn^{2+} by complexometric titrations using EDTA.
3. Estimation of total hardness of a given sample of water by complexometric titration.

Section B: Physical Chemistry

I. Surface tension measurement (use of organic solvents excluded).
a. Determination of the surface tension of a liquid or a dilute solution using a stalagmometer.
b. Study of the variation of surface tension of a detergent solution with concentration.
II. Viscosity measurement (use of organic solvents excluded).
a. Determination of the viscosity of a liquid or dilute solution using an Ostwald's viscometer.
b. Study of the variation of viscosity of an aqueous solution with concentration of solute.
III. Chemical Kinetics
Study the kinetics of the following reactions by integrated rate method:
a. Acid hydrolysis of methyl acetate with hydrochloric acid.
b. Saponification of ethyl acetate.
c. Compare the strengths of HCl and H_2SO_4 by studying kinetics of hydrolysis of methyl acetate

Reference Books:

- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
- Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
- Khosla, B. D.; Garg, V. C. &Gulati, A. *Senior Practical Physical Chemistry,* R. Chand & Co.: New Delhi (2011).

SEMESTER III & IV

B. SC. PHYSICAL SCIENCES

(ELECTRONICS)

Semester III

CEL 304
Core Course V (Electronics)
Communication Electronics - I

(Credits: 02; 30 Hrs (2Hrs /week)))
Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I (8 Hours)

Electronic communication:
Introduction to communication – means and modes. Need for modulation. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in India (TRAI). Electromagnetic communication spectrum, band designations and usage. Channels and base-band signals. Concept of Noise, signal-to-noise (S/N) ratio.

UNIT-II (8 Hours)

Analog Modulation:
Amplitude Modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector), Concept of Single side band generation and detection.

UNIT-III (7 Hours)

Analog Modulation:
Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector), Qualitative idea of Super heterodyne receiver.

UNIT-IV (7 Hours)

Analog Pulse Modulation:

Channel capacity, Sampling theorem, Basic Principles- PAM, PWM, PPM modulation and detection technique for PAM only, Multiplexing.

Reference Books:

- Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011,Oxford University Press.
- Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
- Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
- Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill
- Communication Systems, S. Haykin, 2006, Wiley India
- Electronic Communication system, Blake, Cengage, 5th edition.
- Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press

CEL 305
Core Course VI (Electronics)
Microprocessor
(Credits: 02; 30 Hrs (2Hrs /week)))

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I **(8 Hours)**

Microcomputer Organization:
Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map.

UNIT-II **(6 Hours)**

8085 Microprocessor Architecture:

Main features of 8085. Block diagram. Pin-out diagram of 8085. Data and address buses. Registers. ALU. Stack memory. Program counter. Hardware and software interrupts.

UNIT-III **(8 Hours)**

8085 Programming :

Instruction classification, Instructions set (Data transfer including stacks. Arithmetic, logical, branch, and control instructions). Subroutines, delay loops. Timing & Control circuitry. Timing states. Instruction cycle, Timing diagram of MOV and MVI.

UNIT-IV **(7 Hours)**

Introduction to embedded system:
Embedded systems and general purpose computer systems. Architecture of embedded system. Classifications, applications and purpose of embedded systems.

Reference Books:

- Microprocessor Architecture Programming & applications with 8085, 2002, R.S.Goankar, Prentice Hall.
- Microprocessor and Microcontrollers, N. Senthil Kumar, 2010, Oxford University Press
- Advanced Microprocessors and Interfacing : Badri Ram; TMH
- Introduction to embedded system, K.V. Shibu, 1st edition, 2009, McGraw Hill
- Embedded Systems: Architecture, Programming & Design, Raj Kamal, 2008, Tata McGraw Hill
- The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.

CEP 309
Practical III (Electronics)
Communication Electronics LAB
(Credits: 02; 60 Hrs (4Hrs /week)

Marks: 100
Time: 4 Hours

At least 8 experiments are to be performed including at least 6 experiments from following:

1. To design an Amplitude Modulator using Transistor.
2. To study envelope detector for demodulation of AM signal
3. To study FM Generator and Detector circuit
4. To study AM Transmitter and Receiver
5. To study FM Transmitter and Receiver
6. To study Time Division Multiplexing (TDM)
7. To study Pulse Amplitude Modulation (PAM)
8. To study Pulse Width Modulation (PWM)
9. To study Pulse Position Modulation (PPM)
10. To study Pulse Code Modulation (PCM)

Semester IV

CEL 404
Core Course-VII (Electronics)
Communication Electronics - II
(Credits: 02; 30 Hrs (2Hrs /week))

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I (8 Hours)

Digital Pulse Modulation:
Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), and Binary Phase Shift Keying (BPSK).

UNIT-II (8 Hours)

Introduction to Communication and Navigation systems:
Satellite Communication– Introduction, need, Geosynchronous satellite orbits, geostationary satellite, advantages of geostationary satellites. Satellite visibility, transponders (C - Band), path loss, ground station, simplified block diagram of earth station. Uplink and downlink. GPS navigation system (qualitative idea only)

UNIT-III (7 Hours)

Mobile Telephony System:
Basic concept of mobile communication, frequency bands used in mobile communication, concept of cell sectoring and cell splitting, SIM number, IMEI number, need for data encryption

UNIT-IV (7 Hours)

Mobile Telephony System:
Architecture (block diagram) of mobile communication network, idea of GSM, CDMA, TDMA and FDMA technologies, simplified block diagram of mobile phone handset, 2G, 3G and 4G concepts (qualitative only).

Reference Books:

- Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011,Oxford University Press.
- Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
- Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
- Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill
- Communication Systems, S. Haykin, 2006, Wiley India
- Electronic Communication system, Blake, Cengage, 5th edition.
- Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press

CEL 405
Core Course-VIII (Electronics)
Microcontroller
(Credits: 02; 30 Hrs (2Hrs /week)))

Marks for Major Test (External): 80
Marks for Internal Exam: 20
Time: 3 Hours

Paper setter is required to set nine questions in all. Question no. 1 is Compulsory and is based on the entire syllabus consisting of eight to ten short answer type questions each of 2 marks. The remaining eight questions is to be set uniformly having two questions from each unit. The student is required to attempt five questions in all selecting one question from each unit and Question no. 1 is Compulsory wherein student is required to attempt 8 parts.

UNIT-I (8 Hours)

8051 microcontroller:
Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and Program Status Word (PSW) register, Jump, loop and call instructions.

UNIT-II (7 Hours)

8051 I/O port programming:
Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description & their functions, I/O port programming in 8051 (using assembly language), I/O programming: Bit manipulation.

UNIT-III (8 Hours)

8051 Programming:
8051 addressing modes and accessing memory locations using various addressing modes, assembly language instructions using each addressing mode, arithmetic and logic instructions

UNIT-IV (7 Hours)

8051 Programming:
8051 programming in C: for time delay & I/O operations and manipulation, for arithmetic and logic operations, for ASCII and BCD conversions.

Reference Books:

- The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
- Microprocessor and Microcontrollers, N. Senthil Kumar, 2010, Oxford University Press
- 8051 microcontrollers, Satish Shah, 2010, Oxford University Press.
- Introduction to embedded system, K.V. Shibu, 1st edition, 2009, McGraw Hill
- Embedded Systems: Architecture, Programming & Design, Raj Kamal, 2008, Tata McGraw Hill
- Embedded Systems: Design & applications, S.F. Barrett, 2008, Pearson Education India
- Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011, Cengage Learning

CEP 409

Practical -IV (Electronics)

Microprocessor and Microcontroller Lab

(Credits: 02; 60 Hrs (4Hrs /week)

Marks: 100

Time: 4 Hours

At least 8 experiments are to be performed including at least 6 experiments from following:

Section-A: Programs using 8085 Microprocessor

1. Addition and subtraction of numbers using direct addressing mode
2. Addition and subtraction of numbers using indirect addressing mode
3. Multiplication by repeated addition.
4. Division by repeated subtraction.
5. Handling of 16-bit Numbers.
6. Use of CALL and RETURN Instruction.
7. Block data handling.
8. Other programs (e.g. Parity Check, using interrupts, etc.).

Section-B: Experiments using 8051 microcontroller:

1. To find that the given numbers is prime or not.
2. To find the factorial of a number.
3. Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.
4. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's .
5. Program to glow the first four LEDs then next four using TIMER application.
6. Program to rotate the contents of the accumulator first right and then left.
7. Program to run a countdown from 9-0 in the seven segment LED display.
8. To interface seven segment LED display with 8051 microcontroller and display 'HELP' in the seven segment LED display.
9. To toggle '1234' as '1324' in the seven segment LED display.
10. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clockwise direction.
11. Application of embedded systems: Temperature measurement & display on LCD

SEMESTER III & IV

B. SC. PHYSICAL SCIENCES

(MATHEMATICS)

CML 306: Advanced Calculus

Marks (Theory): 80 **Marks(Total) : 100**
Marks (Internal Assessment) : 20 **Time : 3 Hrs**

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.** Each of the four sections (**I-IV**) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity, chain rule of differentiability. Mean value theorems; Rolle's Theorem and Lagrange's mean value theorem and their geometrical interpretations. Taylor's Theorem with various forms of remainders, Darboux intermediate value theorem for derivatives, Indeterminate forms.

Section – II

Limit and continuity of real valued functions of two variables. Partial differentiation. Total Differentials; Composite functions & implicit functions. Change of variables. Homogenous functions & Euler's theorem on homogeneous functions. Taylor's theorem for functions of two variables.

Section – III

Differentiability of real valued functions of two variables. Schwarz and Young's theorems. Implicit function theorem. Maxima, Minima and saddle points of two variables. Lagrange's method of multipliers.

Section – IV

Jacobians, Beta and Gama functions, Double and Triple integrals, Dirichlets integrals, change of order of integration in double integrals.

Books Recommended:

1. Gabriel Klaumber, Mathematical analysis, Marcel Dekkar, Inc., New York, 1975
2. R.R. Goldberg , Real Analysis, Oxford & I.B.H. Publishing Co., New Delhi, 1970
3. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad
4. S.C. Malik , Mathematical Analysis, Wiley Eastern Ltd., Allahabad.
5. Shanti Narayan, A Course in Mathemtical Analysis, S.Chand and company, New Delhi
6. Murray, R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing co., New York

CML 307: Numerical Analysis

Marks (Theory): 80 **Marks (Total): 100**
Marks (Internal Assessment): 20 **Time: 3 Hrs**

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.** Each of the four sections (**I-IV**) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Finite Difference operators and their relations, difference table, finding the missing terms and effect of error in a difference tabular values, Interpolation with equal intervals: derivations of Newton's forward and Newton's backward interpolation formulae and their applications, Interpolation with unequal intervals: derivations of Newton's divided difference & Lagrange's Interpolation formulae and their applications.

Section – II

Central Difference interpolation formulae: derivations of Gauss's forward and Gauss's backward interpolation formulae, Sterling,Bessel formulae and their applications. Numerical Differentiation: Relation between difference operator and derivative operator, Derivative of a function using interpolation formulae (as studied in Sections – I & II). Numerical Integration: Newton-Cote's Quadrature formula, Trapezoidal rule, Simpson's one- third rule and Simpson's three-eighth rule, Chebychev formula, Gauss Quadrature formula.

Section – III

Solution of Algebraic and Transcendental equations: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson's method, Newton's iterative method for finding pth root of a number. Simultaneous linear algebraic equations: Gauss-elimination method, Gauss-Jordan method, Triangularization method (LU decomposition method). Iterative method, Jacobi's method, Gauss-Seidal's method, Relaxation method.

Section – IV

Eigen Value Problems: Power method, Jacobi's method, Given's method, House-Holder's method. Numerical solution of ordinary differential equations: Single step methods-Picard's method. Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta Methods. Multiple step methods; Predictor-corrector method, Milne-Simpson's method

Books Recommended:

1. Babu Ram, Numerical Methods: Pearson Publication.
2. R.S. Gupta, Elements of Numerical Analysis, Macmillan's India 2010.

3. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Method, Problems and Solutions, New Age International (P) Ltd., 1996.
4. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Method for Scientific and Engineering Computation, New Age International (P) Ltd., 1999
5. C. E. Froberg, Introduction to Numerical Analysis (2nd Edition).
6. Melvin J. Maaron, Numerical Analysis-A Practical Approach, Macmillan Publishing Co., Inc., New York
7. R.Y. Rubnistein, Simulation and the Monte Carlo Methods, John Wiley, 1981

CMP 310: Mathematics Lab-III

Marks (Total): 100
Time: 3 Hrs

Write down and execute the following programs using C-Programming Language

1. To interpolate the data using Newton's forward interpolation formula
2. To interpolate the data using Newton's backward interpolation formula
3. To interpolate the data using Gauss's forward interpolation formula
4. To interpolate the data using Gauss's backward interpolation formula
5. To interpolate the data using Lagrange's interpolation formula
6. To find the roots of algebraic and transcendental equations using Bisection method.
7. To find the roots of algebraic and transcendental equations using Regula-Falsi method.
8. To find the roots of algebraic and transcendental equations using Secant method.
9. To find the roots of algebraic and transcendental equations using Newton-Raphson's method.
10. To solve the system of linear equations using Gauss -elimination method.
11. To solve the system of linear equations using Gauss -Seidal iteration method.
12. To solve the system of linear equation using Gauss –jordan method.
13. To find the largest eigen value of a matrix by Power -method.
14. To integrate numerically using Trapezoidal rule.
15. To integrate numerically using Simpson's one- third rule.
16. To integrate numerically using Simpson's three-eighth rule.
17. To find numerical solution of ordinary differential equations by Euler's method/ Modified Euler's method.
18. To find numerical solution of ordinary differential equations by Runge -Kutta method.

BOOKS SUGGESTED:

1. Applied Numerical Analysis by Curtis F. Gerald and Patrick G. Wheatley – Pearson Education Ltd.
2. Numerical Methods: E. Balagurusamy, T.M.H.

CML 406: Partial Differential Equations & Special Functions

Marks (Theory): 80 **Marks(Total) : 100**
Marks (Internal Assessment) : 20 **Time : 3Hrs**

Note: Attempt five questions in all. The question paper will consist of **four** sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be **compulsory.** Each of the four sections (**I-IV**) will contain two questions and the students are required to attempt **one** question from each section. **All questions carry equal marks.**

Section – I

Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.

Section – II

Linear partial differential equations of second and higher orders, Linear and non-linear homogeneous and non-homogeneous equations with constant coefficients, Partial differential equation with variable coefficients reducible to equations with constant coefficients, their complimentary functions and particular integrals, Equations reducible to linear equations with constant coefficients. Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Co-ordinate system.

Section – III

Classification of linear partial differential equations of second order, hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order, Cauchy's problem for second order partial differential equations, Characteristic equations and characteristic curves of second order partial differential equation.

Section – IV

Series solution of differential equations – Power series method. Bessel equation and its solution: Bessel functions and their properties-Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions. Legendre differential equation and its solution: Legendre function and its properties-Recurrence Relations and generating functions. Orthogonality of Legendre polynomial. Rodrigues' Formula for Legendre Polynomial.

Books Recommended:

1. D.A. Murray, Introductory Course on Differential Equations, Orient Longman, (India), 1967
2. Erwin Kreyszing, Advanced Engineering Mathematics, John Wiley & Sons, Inc., New York, 1999
3. A.R. Forsyth, A Treatise on Differential Equations, Macmillan and Co. Ltd.

4. Ian N. Sneddon, Elements of Partial Differential Equations, McGraw Hill Book Company, 1988
5. Frank Ayres, Theory and Problems of Differential Equations, McGraw Hill Book Company, 1972
6. J.N. Sharma and Kehar Singh, Partial Differential Equations
7. W.W. Bell, Special Functions for Scientists and Engineers.

CML-407 Mechanics-I

Theory: 80 **Marks (Total): 100**
Marks (Internal Assessment): 20 **Time: 3 Hrs**

Note:Attempt five questions in all. The question paper will consist of four sections. **Question No. 1** will contain **seven** short answer type questions without any internal choice covering the entire syllabus and shall be compulsory. Each of the four sections **(I-IV)** will contain two questions and the students are required to attempt one question from each section. All questions carry equal marks.

Section -I

Forces in two dimension (co-planner), triangle law and polygon law of forces, Lami's theorem, resultant of concurrent and coplanar forces, conditions of equilibrium of concurrent forces. Parallel forces: like parallel and unequal unlike parallel forces, resultant and centre of parallel forces; Moments and Couples.

Section -II

Forces in three dimensions, Poinsot'scentral axis, conditions for the reduction of a general system of forces in space to a single force, equations of central axis, Wrenches: Definition and basic laws, resultant wrench of two wrenches, locus of the central axis of two wrenches; Null lines and null planes.

Section –III

Velocity and acceleration along a plane curve, component of velocity and acceleration in radial, transverse, tangential and normal directions, Relative velocity and acceleration.Simple harmonic motion (SHM).

Section- IV

Newton's laws of motion, Central Orbits, differential equations of Central Orbits in polar form and in pedal form, areal velocity, elliptic, hyperbolic and parabolic orbit, velocity in a circle, apse and apsidal distances: definition and laws, velocity from infinity, Kepler's laws of planetary motion, equivalence of Kepler's laws of planetary motion and Newton's law of gravitation, motion under the inverse square law.

Books Recommended:

1. S.L. Loney : Statics, Macmillan Company, London.
2. R.S. Verma: A Text Book on Statics, Pothishala Pvt. Ltd., Allahabad.
3. S.L. Loney, An Elementary Treatise on the Dynamics of a Particle and a Rigid Bodies, Cambridge University Press, 1956
4. F. Chorlton, Dynamics, CBS Publishers, New Delhi.
5. A.S. Ramsey, Dynamics Part-1&2, CBS Publisher & Distributors.