DAV UNIVERSITY JALANDHAR

FACULTY OF SCIENCE

Course Scheme & Syllabus

For

B.Sc. Computer Science
(Program ID-197)

1st to 6thSEMESTER

Syllabi Applicable For Admissions in 2018

Scheme of B.Sc. Computer Science

Semester 1

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA171	Computer Fundamentals and Programming using C	Core	4	0	0	4
2	MTH121	Calculus	Core	4	0	0	4
3	MTH123	Algebra	Core	5	1	0	6
4	PHY181	Mechanics and Relativity	Core	4	0	0	4
5	PHY186	Mechanics Laboratory	Core	0	0	4	2
6	EVS100	Environmental Studies	AECC	4	0	0	4
7	CSA104	Office Automation Laboratory	Core	0	0	4	2
8	CSA172	Computer Fundamentals and Programming using C Laboratory	Core	0	0	4	2
	Total						**28**

Semester 2

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA106	Web Designing	Core	4	0	0	4
2	CSA109	Web Designing Laboratory	Core	0	0	4	2
3	MTH124	Real Analysis	Core	5	1	0	6
4	MTH125	Differential Equations	Core	4	0	0	4
5	PHY182	Thermal Physics	Core	4	0	0	4
6	ENG151A	Communication Skills	AECC	3	0	0	3
7	ENG152	Communication Skills Lab		0	0	2	1
8	SGS107	Human Values and General Studies	AECC	4	0	0	4
	Total						**28**

Semester 3

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA203	Database Concepts	Core	4	0	0	4
2	CSA204	Computer System Architecture	Core	4	0	0	4
3	MTH222	Group Theory I	Core	5	1	0	6
4	MTH223	PDE and System of ODE	Core	4	0	0	4
5	PHY281	Electromagnetics	Core	4	0	0	4
6	CSA207	Database Concepts Laboratory	Core	0	0	4	2
7	PHY286	Electromagnetics Laboratory	Core	0	0	4	2
	Total						**26**

Semester 4

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA201	Computer Oriented Numerical and Statistical Techniques	Core	4	0	0	4
2	CSA213	Software Engineering	Core	4	0	0	4
3	CSA218	Computer Networks	Core	4	0	0	4
4	MTH228	Ring Theory and Linear Algebra I	Core	5	1	0	6
5	PHY282	Basic of Quantum Mechanics	Core	4	0	0	4
6	PHY283	Analog Electronics	Core	4	0	0	4
7	PHY288	Electronics Laboratory	Core	0	0	4	2
8	CSA220	Computer Networks Laboratory	Core	0	0	4	2
	Total						**30**

Semester 5

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA373	Data Structures using C	Core	4	0	0	4
2	CSA303	Operating Systems	Core	4	0	0	4
3	MTH322	Group Theory II	Core	5	1	0	6
4	PHY381	Condensed Matter Physics	Core	4	0	0	4
5	PHY382	Digital Electronics	Core	4	0	0	4
6	CSA374	Data Structures using C Laboratory	Core	4	0	0	2
7	PHY386	Condensed Matter Physics and Digital Electronics Laboratory	Core	0	0	4	2
	Total						**26**

Semester 6

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA302	Core Java	Core	4	0	0	4
2	CSA316	Discrete Mathematics	Core	4	0	0	4
3	MTH330	Ring Theory and Linear Algebra II	Core	5	1	0	6
4	PHY346	Wave Optics	Core	4	0	0	4
5	PHY383	Nuclear and Particle Physics	Core	4	0	0	4
6	PHY388	Nuclear Physics Laboratory	Core	0	0	4	2
7	PHY347	Wave Optics Laboratory	Core	0	0	4	2
8	CSA308	Core Java Laboratory	Core	0	0	4	2
	Total						**28**

Course Title: Computer Fundamentals and Programming using C
Course Code: CSA171
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course will enable the student to gain an understanding of the core concepts and technologies which constitute Information Technology. The objective of this course is to help the students in finding solutions to various real life problems and converting the solutions into computer program using C language (structured programming).

UNIT-A **12 Hours**

Computer Fundamentals

- Block Structure of a Computer, Characteristics of Computers
- Computer generations, Applications of Computers.

Number System

- Bit, byte, binary, decimal, hexadecimal, and octal systems, conversion from one system to the other, representation of characters, integers and fractions. Addition, subtraction, multiplication and division of binary numbers.

Memory Types

- RAM, ROM, Cache and Secondary memory.

Input and Output Devices

- Keyboard, Mouse, Monito, Light pen, Joystick, Mouse, Touch screen; OCR, OMR, MICR.
- Impact, nonimpact, working mechanism of Drum printer, Dot Matrix printer, Inkjet printer and Laser printer, plotters.

UNIT-B **13 Hours**

Fundamentals of C

- Character Set, Identifiers and Key Words, Data Types
- Constants, Variables, Expressions, Statements, Symbolic Constants.

Operations and Expressions

- Arithmetic Operators, Unary Operators, Relational Operators,
- Logical Operators, Assignment and Conditional Operators, Library functions.

Data Input and Output

- Single Character Input, Single Character Output, Entering Input Data
- More About Scan Functions, Writing Output Data, More About Print Functions
- Gets and Puts Functions, Interactive Programming.

UNIT-C **13 Hours**

Control Structures

- Introduction, Decision Making with If – Statement, If Else and Nested If,
- While And Do-While, For Loop.
- Jump Statements: Break, Continue, Goto, Switch Statement.

Functions

- Introduction To Functions, Function Declaration, Function Categories
- Standard Functions, Parameters And Parameter Passing, Pass – By Value/Reference
- Recursion, Global and Local Variables, Storage Classes.

Arrays

- Introduction to Arrays, Array Declaration, Single and Multidimensional Array, Memory Representation, Matrices, Strings, String Handling Functions.

UNIT-D **10 Hours**

Structure and Union

- Declaration of Structure, Accessing Structure Members, Structure Initialization, Arrays of Structure, Nested Structures, Unions.

Pointers

- Introduction To Pointers, Address Operator And Pointers, Declaring and Initializing Pointers,
- Assignment through Pointers, Pointers and Arrays.

Files

- Introduction, Creating a Data File, Opening and Closing a Data File, Processing a Data File.

Preprocessor Directives

- Introduction and Use, Macros, Conditional Preprocessors, Header Files

Reference Books

1. Kanetkar Yashvant P, *Let us C*, New Delhi :BPB Publications, Seventh Edition (2007).
2. Balagurusami E, *Programming in ANSI C*, New Delhi: Tata McGraw Hill, Fourth Edition (2010).
3. Gottfried Byron S., *Programming in C*, New Delhi: McGraw Hills, Second Edition 1996.
4. Kernighan & Richie,*The C Programming Language*, New Delhi: PHI Publication, Second Edition(2009) .
5. Gottfriet Bryon, *Schaum Outline Series, Programming in C*, New Delhi: McGraw Hills, 2010
6.Sinha, P.K. and Sinha, P., Foundations of Computing. New Delhi: BPB First Edition, 2002.
7.Norton Peter , Introduction to Computers, McGraw Hill.
8.Rajaraman V, Fundamentals of Computers, New Delhi: Prentice Hall of India, Second Edition, 1996.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Calculus
Paper Code: MTH121
Course Duration: 45-60 Hours

Course Objective: Calculus is one of the major branches of mathematics that finds application in almost all the Fields of science. This course is an introduction to calculus. Students will be introduced to the concepts of limits, derivatives, integrals and infinite series

UNIT-A **15 HOURS**

Hyperbolic functions, higher order derivatives, Leibniz rule and its applications, concavity and inflection points, asymptotes.

UNIT-B **15 HOURS**

Curve tracing in cartesian coordinates, tracing in polar coordinates of standard curves, L'Hospital's rule. Reduction formulae, derivations and illustrations of reduction formulae

UNIT-C **15 HOURS**

Volumes by slicing; disks and washers methods, Volumes by cylindrical shells, parameterizing a curve, arc length, arc length of parametric curves, area of surface of revolution. Techniques of sketching conics, reflection properties of conics, rotation of axes and second degree equations, classification into conics using the discriminant, polar equations of conics.

UNIT-D **15 HOURS**

Triple product, introduction to vector functions, operations with vector-valued functions, limits and continuity of vector functions, differentiation and integration of vector functions, tangent and normal components of acceleration, modeling ballistics and planetary motion, Kepler's second law.

Books Recommended

1. G.B. Thomas and R.L. Finney, *Calculus*, 9th Ed., Pearson Education, Delhi, 2005.
2. M.J. Strauss, G.L. Bradley and K. J. Smith, *Calculus*, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2007.
3. H. Anton, I. Bivens and S. Davis, *Calculus,* 7th Ed., John Wiley and Sons (Asia) P. Ltd., Singapore, 2002.
4. R. Courant and F. John, *Introduction to Calculus and Analysis* (Volumes I & II), Springer-Verlag, New York, Inc., 1989.

Course Title: Algebra
Course Code: MTH123
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
5	1	0	6	100

Course Objective: This course is a prerequisite course for the students to further strengthen their algebra skills. By the end of this course, students will be able to solve different types of linear systems.

UNIT A **15 HOURS**

Polar representation of complex numbers, n^{th} roots of unity, De Moivre's theorem for rational indices and its applications.

UNIT B **13 HOURS**

Equivalence relations, Functions, Composition of functions, Invertible functions, One to one correspondence and cardinality of a set, Well-ordering property of positive integers, Division algorithm, Divisibility and Euclidean algorithm, Congruence relation between integers, Principles of Mathematical Induction, statement of Fundamental Theorem of Arithmetic.

UNIT C **15 HOURS**

Rank of a matrix, echelon form of a matrix, normal form of a matrix, linear dependence and independence of vectors, n-vector space, Subspaces of R^n, dimension of subspaces of R^n, introduction to linear transformations, matrix of a linear transformation, inverse of a matrix, characterizations of invertible matrices.

UNIT D **15 HOURS**

Systems of linear equations (homogeneous and non-homogeneous systems), solution sets of linear systems, applications of linear systems.Eigen values, Eigen Vectors and Characteristic Equation of a matrix.

Books recommended:

1. Grewal B.S. *Higher Engineering Mathematics*. New Delhi: Khanna Publishers, 2012. Print.
2. Jain, R K, and K Iyengar S R.*Advanced Engineering Mathematics*, New Delhi: Narosa Publishing House, 2003.
3. Lipschutz, S., and Marc Lars Lipson. *Linear Algebra, Schaum's outline.* New Delhi: Mc Graw Hill, 2009.Print.
4. Narayan, Shanti, and P.K. Mittal. *A Text Book of Matrices.* New Delhi: S. Chand & Co. Ltd., Reprint 2002.Print.

Course Title: Mechanics and Relativity
Paper Code: PHY181
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

UNIT-I
COORDINATE SYSTEMS AND CENTRAL FORCE MOTION 15 Hours
Coordinate Systems, Cartesian and spherical polar coordinate systems, displacement, velocity, acceleration, area and volume in these systems. Solid angle, Various forces in nature, Centre of mass, Equivalent one body problem, central forces, equation of motion under central force, equation of orbit and turning points, Kepler's laws.

UNIT-II
INERTIAL FRAMES AND SPECIAL THEORY OF RELATIVITY 15 Hours
Conservative law of energy and momentum, Inertial frames; Galilean transformations;Galilean invariance, Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations, Lorentz contraction. Time dilation. Relativistic transformation of velocity, Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect,Transformation of Energy and Momentum.

UNIT-III

NON-INERTIAL SYSTEMS AND KINEMATICS OF COLLISIONS 15 Hours

Non inertial frames, Centrifugal force, Coriolis force and its applications, Variation of acceleration due to gravity with latitude, Foucault's pendulum.
Elastic and inelastic collisions: Centre of Mass and Laboratory frames; velocities, angles, and energies inelastic collisions in CM and laboratory frames;

UNIT-IV
ROTATIONAL DYNAMICS 10 Hours
Angular momentum of a particle and system of particles. Torque, Principle of conservation of angular momentum, Rotation about a fixed axis, Moment of Inertia, Calculation of moment of inertia for rectangular, cylindrical, and spherical bodies, Euler's equations.

Reference Books:

1. Kleppner D. and Kolenkow R. J. *An Introduction to Mechanics.* New York: McGrawHill Publishing, 1973.
2. Hans H.S. and Puri S.P. *Mechanics*. New Delhi: Tata McGraw Hill Education, 2003.
3. Mathur D.S. *Mechanics*. New Delhi: S.Chand and Company Limited, 2000.
4. Tayal D.C. *Mechanics*. Mumbai: Himalaya Publishing House, 2013.
5. Fowles G.R. and Cassiday G.L. *Analytical Mechanics.* New Delhi*:* Cengage Learning, 2005.
6. Kittel C., Knight W., et.al. *Mechanics Berkeley Physics course, Vol.1*. New Delhi: Tata McGraw Hill Education, 2007.

7. Feynman R. P., Leighton R.B., Sands M. *Feynman Lectures, Vol. I*. New Delhi: Pearson Education, 2008.

Course Title: Mechanics Laboratory
Paper Code: PHY186

L	T	P	Credits	Marks
0	0	4	2	50

1. To analyse the given experimental Data by using the least squares curve fitting and the knowledge of straight line fitting of the experimental data. Also determine the standard deviation and their use in expressing the experimental results. (Note: To achieve these objectives on a sample data of some experiment to be decided by the teacher concerned.)
2. To study the variation of time period with distance between centre of suspension and centre of gravity for a bar pendulum and to determine :(i) Radius of gyration of bar about an axis through its C.G. and perpendicular length. (ii) The value of g in the laboratory.
3. Determination of acceleration due to gravity ‘g’ by Kater's pendulum method.
4. To study moment of inertia of a flywheel.
5. Determination of moment of inertia of a symmetrical body using torsional pendulum method
6. Use of Vernier callipers, Screw gauge, Spherometer, Barometer, Sphygmomanometer, Light meter, dry and wet thermometer, TDS/conductivity meter and other measuring instruments based on applications of the experiments.
7. Determination of height (of inaccessible structure) using sextant.
8. To determine the Young's modulus by (i) bending of beam using traveling microscope/laser.
9. To determine the Young's modulus by Flexural vibrations of a bar.
10. To determine the coefficient of viscosity of glycerine or castor oil by Stoke’s method.

Course Title: Environmental studies
Course Code: EVS100
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course aims at understanding the students in aspects of environmental problems, its potential impacts on global ecosystem and its inhabitants, solutions for these problems as well as environmental ethics which they should adopt to attain sustainable development.

Unit I

The multidisciplinary nature of environmental studies **2 Hours**

Definition, scope and importance, Need for public awareness

Natural Resources: Renewable and non-renewable resources: **8 Hours**

Natural resources and associated problems.

(a) **Forest resources:** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
(b) **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) **Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
(d) **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
(e) **Energy resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
(f) **Land resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Ecosystem: **4 Hours**

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit II

Biodiversity and its conservation **4 Hours**

- Introduction – Definition: Genetic, Species and Ecosystem Diversity
- Bio-geographical classification of India
- Value of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, global and national efforts.

Environmental Pollution **8 Hours**

- Definition, causes, effects and control measures of:
  a. Air pollution
  b. Water pollution
  c. Soil pollution
  d. Marine pollution
  e. Noise pollution
  f. Thermal pollution
  g. Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

Unit III

Social Issues and the Environment **7 Hours**

- Population growth, variation among nations, Population explosion – Family Welfare Programmes.
- Environment and human health,
- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environmental Laws: The Environment Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981; The Water (Prevention and control of Pollution) Act 1974; The Wildlife Protection Act, 1972; Forest Conservation Act, 1980.
- Issues involved in enforcement of environmental legislation

- Public Awareness

Unit IV

Human Population and Environment **5 Hours**

- Population Growth and Variations among Nations
- Population Explosion
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

Field Work **5 Hours**

- Visit to a local area to document environmental assets river/ forest/ grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-Pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

Suggested Readings:

1. Odum, EP. *Basic Ecology*. Japan: Halt Saundurs, 1983.
2. Botkin, DB, and Kodler EA. *Environmental Studies: The Earth as a living planet.* New York: John Wiley and Sons Inc., 2000.
3. Singh, JS, Singh, SP, and Gupta SR. Ecology, *Environment and Resource Conservation.* New Delhi: Anamaya Publishers, 2006.
4. De, AK. *Environmental Chemistry*. New Delhi: Wiley Eastern Ltd., 1990.
5. Sharma, PD. *Ecology and Environment*. Meerut Rastogi Publications, 2004

Course Title: Computer Fundamentals and Programming using C Laboratory
Course Code: CSA172

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of C programming concepts:

- Control Structures, Loops, Arrays, Strings
- Functions, Structures, Union, Files, etc.

Course Title: Office Automation Laboratory
Course Code: CSA104

L	T	P	Credits	Marks
0	0	4	2	50

- Working of DOS internal & external commands.
- Learning to use MS WORD, MS EXCEL.
- Using MS PowerPoint to make slides and presentations.
- Introduction to the Database Window, Database Objects, Database Terminology
- Creating a Database, Basic Tables
- Using Queries, Using the Auto Form Feature Form Design
- Using the Auto Report Feature, Report Design
- Copying Data, Freezing Columns
- Printing Tables, Printing Reports
- Sorting Records, Using the Filter Sorts, Renaming Columns
- Using the Chart Wizard

Course Title: Web Designing
Course Code: CSA106
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course will enable the student to build and publish web sites using Dreamweaver, a popular visual web site production and management program, using HTML, DHTML, CSS and PHP. This course will enable the student to build and publish web sites using Dreamweaver, a popular visual web site production and management program.

UNIT-A **15 Hours**

Introduction to Web Development

- Website, Webpage, Static Website, Dynamic Website.

Introduction to HTML/DHTML:

- HTML Basics, HTML Elements (Tags), Structure of HTML Program, Attributes, Headings, Paragraphs
- Formatting, Links, Images, Tables, Lists, Forms, Frames, Where to put Tables, Lists, Images, Forms
- CSS in DHTML, Implementation of Web Pages using CSS

UNIT-B **12 Hours**

Dreamweaver

- Understanding Workspace Layout, Managing Websites, Creating a Website, Using Dreamweaver Templates
- Adding New WebPages, Text and Page Format, Inserting Tables, Lists, Images, Adding Links.

UNIT-C **10 Hours**

Introduction to PHP

- PHP Environment, Syntax Overview, Variable Types, Constants, Operator Types, Decision Making
- Arrays, Strings, Web Concepts, GET & POST
- File Inclusion, Files & I/O, Functions, Cookies, Sessions, Sending Emails, Uploading, Coding Standards.

UNIT-D **8 Hours**

Purchasing a Domain Name & Web Space

- Domain Name & Web Space, Getting a Domain Name & Web Space (Purchase or Free), Uploading the Website to Remote Server

Reference Books

1. Powell Thomas, *HTML & CSS: The Complete Reference*, New Delhi: McGraw-Hill, Fifth Edition (2010).
2. Andy Harris, *HTML, XHTML and CSS All in One For Dummies*, Delhi: Willey ,Second Edition (2010).
3. Lerdorf Rasmus, Tatroe Kevin, MacIntyre Peter, *Programming PHP*, Delhi: O'Reilly Media, 2013.

4. Ullman Larry, *PHP for the World Wide Web,Visual QuickStart Guide*. New Delhi: Peachpit Press, fourth edition (2011)

Course Title: Web Designing Laboratory
Course Code: CSA109

L	T	P	Credits	Marks
0	**0**	**4**	**2**	**50**

- Web designing using HTML, DHTML, CSS, and PHP.

Course Title: Real Analysis
Course Code: MTH124
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
5	1	0	6	100

Course Objective: The aim of this course is to introduce students to the fundamentals of mathematical analysis and to reading and writing mathematical proofs.

UNIT A **15 HOURS**

Review of Algebraic and Order Properties of *R*, -neighborhood of a point in *R*, Idea of countable sets, uncountable sets and uncountability of *R*. Bounded above sets, Bounded below sets, Bounded Sets, Unbounded sets, Suprema and Infima, The Completeness Property of *R*, The Archimedean Property

UNIT B **15 HOURS**

Sets in IR (Intervals): Neighborhood of a point. Interior point. Open set. Union, Intersection of open sets. Point and isolated point of a set. Criteria for L.U.B. and G.L.B. of a bounded set to be limit point of the set. Illustrations of Bolzano-Weierstrass theorem for sets. Definition of derived set. Closed set. Complement of open set and closed set. Union and intersection of closed sets as a consequence. No nonempty proper subset of *R* is both open & closed. Dense set in *R* as a set having non-empty intersection with every open interval. Q and *R* - Q are dense in *R*.

UNIT C **15 HOURS**

Sequences: Sequences, Bounded sequence, Convergent sequence, Limit of a sequence. Limit Theorems, Monotone Sequences, Monotone Convergence Theorem. Subsequences, Divergence Criteria, Monotone Subsequence Theorem (statement only), Bolzano Weierstrass Theorem for Sequences. Cauchy sequence, Cauchy's Convergence Criterion.

UNIT D **15 HOURS**

Infinite series, convergence and divergence of infinite series, Cauchy Criterion, Tests for convergence: Comparison test, Limit Comparison test, Ratio Test, Cauchy's n^{th} root test, Integral test, Alternating series, Leibniz test, Absolute and Conditional convergence.

Books recommended:

1. Bartle, R.G. and D.R. Sherbert.*Introduction to Real Analysis,* 3rd Ed. Singapore: John Wiley and Sons (Asia) Pvt. Ltd., 2002.
2. Rudin, W. *Principles of Mathematical Analysis, 3rd Edition*. New Delhi: McGraw-Hill Inc., 1976.
3. Berberian, S.K. *A First Course in Real Analysis*. New York: Springer Verlag, 1994.
4. Thomson, B.S., A.M. Bruckner and J.B. Bruckner. *Elementary Real Analysis.* Prentice Hall, 2001.
5. Apostol, T. M., *Calculus-I &II* (2nd edition). New Delhi: Wiley, 1969.

Course Title: Differential Equations
Course Code: MTH125
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The objective of this course is to equip the students with knowledge of some advanced concepts related to differential equations and to understand some basic approach to mathematical oriented differential equations.

UNIT A **13 HOURS**

Differential equations and mathematical models, General, particular, explicit, implicit and singular solutions of a differential equation, Exact differential equations and integrating factors, separable equations and equations reducible to this form, linear equation and Bernoulli equations, special integrating factors and transformations.

UNIT B **12 HOURS**

Introduction to compartmental model, exponential decay model, lake pollution model (case study of Lake Burley Griffin), drug assimilation into the blood (case of a single cold pill, case of a course of cold pills), exponential growth of population, limited growth of population, limited growth with harvesting.

UNIT C **13 HOURS**

General solution of homogeneous equation of second order, principle of super position for homogeneous equation, Wronskian: its properties and applications, Linear homogeneous and non-homogeneous equations of higher order with constant coefficients, Euler's equation, method of undetermined coefficients, method of variation of parameters.

UNIT D **12 HOURS**

Equilibrium points, Interpretation of the phase plane, predator-prey model and its analysis, epidemic model of influenza and its analysis, battle model and its analysis.

Books Recommended

1. Singhania R.*Ordinary and Partial Differential Equations*. New Delhi: S. Chand and Company, 2006.

2. Ross S.L. *Differential Equations,* 3rd edition. India: John Wiley and Sons, 2004.

3. Abell Martha L., and James P Braselton. *Differential Equations with Mathematica,* 3rd edition. Elsevier Academic Press, 2004.

4. Siddiqi A.H., and P. Manchanda. *A First Course in Differential Equation with Applications*. New Delhi: Macmillan India Ltd., 2006.

5. Codington E.A. *An Introduction to Ordinary Differential Equation*. New York: Dover Publications, 1989.

Kapur, J.N, *Mathematical Modelling,* New Age International (P) limited, New Delhi: 2005

Course Title: Thermal Physics
Paper Code: PHY182
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The aim and objective of the course on Thermal and Statistical Physics for the student of B.Sc. (Hons.) Physics is to equip them with the knowledge of Basic thermodynamic laws and Kinetic theory of gases.

UNIT-I

Zeroth and First Law of Thermodynamics: 15 Hours

Extensive and intensive Thermodynamic Variables, Thermodynamic Equilibrium, Zeroth Law of Thermodynamics & Concept of Temperature, Concept of Work & Heat, State Functions, First Law of Thermodynamics and its differential form, Internal Energy, First Law & various processes, Applications of First Law: General Relation between CPand CV, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Co-efficient.

UNIT-II

Second Law of Thermodynamics: 15 Hours

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, 2ndLaw ofThermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale.

UNIT-III

Entropy: 15 Hours

Concept of Entropy, Clausius Theorem. Clausius Inequality, Second Law of Thermodynamics in terms of Entropy.Entropy of a perfect gas. Principle of Increase of Entropy. Entropy Changes in Reversible and Irreversible processes with examples. Entropy of the Universe.Entropy Changes in Reversible and Irreversible Processes.Principle of Increase of Entropy. Temperature–Entropy diagrams for Carnot's Cycle. Third Law of Thermodynamics.Unattainability of Absolute Zero.

UNIT IV

Kinetic Theory of Gases Distribution of Velocities: 15 Hours

Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification. Doppler Broadening of Spectral Lines and Stern's Experiment.Mean, RMS and Most Probable Speeds. Degrees of Freedom.Law of Equipartition of Energy (No proof required). Specific heats of Gases.

Suggested Books:

1. Zemansky M.W., Dittman R., *Heat and Thermodynamics,* McGraw-Hill, 1981.
2. Saha M., Srivastava B.N., *A Treatise on Heat,* Indian Press S.P. 1958.
3. Garg S., Bansal R.., Ghosh H.J., *Thermal Physics*, Tata McGraw-Hill, 2nd Edition, 1993,

4. Sears & Salinger. *Thermodynamics, Kinetic Theory & Statistical Thermodynamics,* Narosa. 1988,
5. Blundell S.J.,Blundell K.M., *Concepts in Thermal Physics*, Oxford University Press, 2ndEd. 2012.
6. A.Kumar, S.P. Taneja, *Thermal Physics,* R. Chand Publications, 2014.

Course Title: Communication Skills
Course Code: ENG151A
No. of Lectures: 35-45 hours

L	T	P	Credits	Marks
3	0	0	3	75

Course Objective:

- To enhance students' vocabulary and comprehensive skills through prescribed texts.
- To hone students' writing skills.

Learning Outcomes: Students will be able to improve their writing skills as well as will enrich their word power.

Unit – A Applied Grammar (Socio-Cultural Context)

- Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection **5 hours**
- Tenses (Rules and Usages in Socio-cultural contexts) **6 hours**
- Modals: Can, Could, May, Might, Will, Would, Shall, Should, Must, Ought to **5 hours**
- Passives **5 hours**
- Reported/Reporting Speech **5 hours**

Unit – B Reading (Communicative Approach to be Followed)

- J M Synge: Riders to the Sea (One Act Play) **7 hours**
- Anton Chekhov : Joy (Short Story) **5 hours**
- Swami Vivekanand : The Secret of Work (Prose) **7 hours**

Unit – C Writing

- Paragraph and Essay Writing **5 hours**
- Letter Writing: Formal and Informal **5 hours**
- Notice and Email **5 hours**

References:

a. Books

1. Kumar, Sanjay and PushpLata. *Communication Skills*. India: OUP, 2012.
2. Vandana, Singh R. *The Written Word* by. New Delhi: Oxford University Press, 2008.

b. Websites

1. www.youtube.com (to download videos for panel discussions)
2. www.letterwritingguide.com
3. www.teach-nology.com
4. www.englishforeveryone.org
5. www.dailywritingtips.com
6. www.englishwsheets.com
7. www.mindtools.com

Course Title: Communication Skills Lab
Course Code: ENG152
Course Duration: 30 Hours

L	T	P	Credits	Marks
0	**0**	**2**	**1**	25

Course Objective:

- To improve fluency in speaking English.
- To promote interactive skills through Group Discussions and role plays.

Learning Outcomes:

Students will get exposure to speaking through the above mentioned interactive exercises. In addition, they will develop a technical understanding of language learning software, which will further improve their communicative skills

Unit – A Speaking/Listening	**30 Hours**
• Movie-Clippings	10 hours
• Role Plays	10 hours
• Group Discussions	10 hours

Instructions:

1. Each student will prepare a scrap file on any of the topics given by class teacher. Student should be able to justify the contents of his/her Scrap file, which carries the weightage of 10 marks.Marks will be given for originality, creativity and presentation of thoughts.
2. In the end of semester, viva exam will be conducted. Viva will be for 10 marks. Spoken English will be the focus of exam. Examiner will ask questions related to scrap file and other general (non-technical) topics.
3. In the End-term exam, lab activity will carry the weightage of 10 marks.

Acknowledge all the sources of information in your scrap file

References:

Books

1. Gangal, J. K. *A Practical Course In Spoken English.* India: Phi Private Limited, 2012.
2. Kumar, Sanjay and PushpLata. *Communication Skills*. India: OUP, 2012.

Websites

1. www.youtube.com (to download videos for panel discussions)
2. www.englishforeveryone.org
3. www.talkenglish.com
4. www.mindtools.com

Course Title: Human Values and General Studies
Course Code: SGS107
Course Duration: 35 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:

- To sensitize students about the role and importance of human values and ethics in personal, social and professional life.
- To encourage students to read and realize the values of enlightened human beings.
- To enable students to understand and appreciate ethical concerns relevant to modern lives.

Learning Outcomes:

Students will become responsible citizens and better professionals who practice Values and Ethics in every sphere of life.

UNIT-A

Human Values **8 Hours**

Concept of Human Values: Meaning, Types and Importance of Values
Human Values : Lessons from the lives and teachings of
Value Education : The content of value education
Value crisis and its redressal

UNIT-B **10 Hours**

Being Good and Responsible

- Self-Exploration and Self Evaluation
- Acquiring Core Values for Self Development
- Living in Harmony with Self, Family, Society and Nature
- Values enshrined in the Constitution : Liberty, Equality Fraternity and Fundamental Duties

UNIT-C **8 Hours**

Value – based living

- Vedic values of life
- Karma Yoga and Jnana Yoga
- Ashta Marga and Tri-Ratna
- Truth, Contentment and Wisdom

UNIT-D **9 Hours**

Ethical Living:

Ethics: Difference between Ethics and Values

- Personal Ethics
- Professional Ethics

- Ethics in Governance
- Ethics in Education

Suggested Readings:

1. Restoring Values (ed.) E. Sreedharan and Bharat Wakhlu, Sage Publications Ltd., New Delhi 2010.
2. Indian Ethos and Values by Nagarajan K, Tata McGraw Hill, 2011
3. Human Values, A N Tripathi, New Age International Publishers, New Delhi, Third Edition, 2009
4. Indian Ethos and Values in Management, 1st Edition by Sankar, Tata McGraw Hill Education Pvt. Ltd.
5. Values and Ethics, Osula, Asian Books, 2001.
6. Professional Ethics, R. Surbiramanian, Oxford University Press, New Delhi, 2013.
7. Human Values and Professional Ethics, Rishabh Anand, Satya Prakashan, New Delhi, 2012
8. Human Values and Professional Ethics, Sanjeev Bhalla, Satya Prakashan, New Delhi, 2012.
9. Human Values and Professional Ethics, Ritu Soryan Dhanpat Rai & Co. Pvt. Ltd., First Edition, 2010.
10. Human Values and Professional Ethics by Suresh Jayshree, Raghavan B S, S Chand & Co. Ltd. , 2007.
11. Human Values and Professional Ethics, Dr. R K Shukla, Anuranjan Misra, A B Publication 2010.
12. Human Values and Professional Ethics, Sharma, Vayu Education of India Language publishers, 2012.
13. Human Values and Professional Ethics, S. Kannan, K. Srilakshmi, Taxmann Publication, Pvt. Ltd., 2009
14. Human Values and Professional Ethics, Smriti Srivastava, S K Kataria & Sons, 2001
15. Human Values and Professional Ethics, Yogendra Singh, Ankur Garg, Aitbs publishers, 2011.
16. Human Values and Professional Ethics, Vrinder Kumar, Kalyani Publishers, Ludhiana, 2013.
17. Human Values and Professional Ethics, R R Gaur, R. Sangal, GP Bagaria, Excel Books, New Delhi 2010.
18. Values and Ethics, Dr. Bramwell Osula, Dr. Saroj Upadhyay, Asian Books Pvt. Ltd., 2011.
19. Complete works of Swami Vivekanand, Advaita Ashram, Calcutta – 1931.
20. Indian Philosophy, S. Radhakrishnan, George Allen & Unwin Ltd., New York: Humanities Press INC, 1929.
21. Essentials of Hinduism, Jainism and Buddhism, A N Dwivedi, Books Today, New Delhi – 1979
22. Light of Truth : Satyarth Parkash, Maharishi Dayanand Saraswati, Arya Swadhyay Kendra, New Delhi, 1975.
23. Dayanand : His life and work, Suraj Bhan, DAVCMC, New Delhi – 2001.
24. Moral and Political Thoughts of Mahatma Gandhi, V. Raghavan, N Iyer, Oxford University Press India, New Delhi, 2000.
25. Guru Nanak Dev's view of life, Amplified by Narain Singh, Published by Bhagat Puran Singh All India Pingalwara Society, Amritsar 2010.

26. Esence of Vedas, Kapil Dev Dwivedi, Katyayan Vedic Sahitya Prakashan, Hoshiarpur, 1990.
27. Vedic Concepts, Prof. B B Chaubey, Katyayan Vedic Sahitya Prakashan, Hoshiarpur, 1990.
28. Mahatma Gandhi : Essays and Reflections on his life and work by Saravapalli Radhakrishnan, Zaico Publication, Mumbai, 1977.
29. Lala Har Dayal, Hints for Self Culture, Jaico Publishing House, Mumbai, 1961.
30. Maharishi Swami Dayanand Saraswati, The Light of Truth (The Satyartha Prakashan), available at URL :
www. aryasamajjamnagar.org/download/satyarth_prakash_eng.pdf
31. Krishnamurti J, The First and Last Freedom, available at URL :
http://www.jiddu-krishanmurti.net/en/th-first-and-last-freedom/
32. Sri Raman Maharishi, Who Am I, available at URL :
http://www.sriramanamaharshi.org/resource_centre/publicatins/who-am-i-books/
33. Ramesh S Balsekar, Peace and Harmony in Daily Living, Yogi Impressions; 1st edition

Course Title: Database Concepts
Course Code: CSA203
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course covers fundamentals of database architecture, database management systems, and database systems, Principles and methodologies of database design, and techniques for database application development.

UNIT – A **10 Hours**

An Overview of DBMS

- Concept of File Processing Systems and Database Systems
- Database Administrator and his Responsibilities
- Physical and Logical Data Independence

Three level Architecture of Database System

- The External Level
- Conceptual Level
- The Internal Level

UNIT-B **12 Hours**

Introduction to Data Models

- Entity Relationship Model, Hierarchical
- Network and Relational Model
- Comparison of Network, Hierarchical and Relational Model
- E–R Diagram
- Different Keys Used In a Relational System, Sql

UNIT – C **10 Hours**

Database Protection

- Recovery
- Concurrency Management
- Database Security
- Integrity and Control
- Disaster Management

Normal Forms

INF, 2NF, 3NF, BCNF, 4th NF, 5th NF, and DBTG

UNIT – D **13 Hours**

Distributed databases

- Structure of a Distributed Database, Design of Distributed Databases

SQL *PLUS

- Introduction to SQL–DDL, DML, DCL, Join Methods & Sub Query
- Union Intersection, Minus, Tree Walking, Built in Functions
- Views, Security Amongst Users, Sequences, Indexing,

Reference Books:

1. Desai Bipin C, *An Introduction to Database System,* New Delhi: Galgotia Publications, 2010
2. Date C.J, *An Introduction to Data Base Systems*, New Delhi: Narosa Publications, Eighth Edition,2012
3. Korth Henry F, *Database System Concepts*, New Delhi: McGraw Hill, 2010
4. Ullman, *Principles of Database Systems*, New Delhi: Galgotia Publications , 2010.
5. Coronel, Moris, Rob, *Database Systems: Design, Implementation, and Management*, New Delhi South-Western, Ninth Edition (2009)

Course Title: Computer System Architecture
Course Code: CSA204
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The objective of the course is to provide students with a solid foundation in computer design. Examine the operation of the major building blocks of a computer system Syllabus includes instruction set architecture, control design, memory hierarchy, input/output and communication.

UNIT – A **15 Hours**

Introduction to Computer Organization

- Introduction to Computer and CPU
- (Computer Organization, Computer Design and Computer Architecture), Stored Program Concept- Von Neumann Architecture.

Register Transfer and Micro operations

- Introduction to Registers, Register Transfer Language
- Data movement among Registers and Memory

Micro operations

- Introduction to micro operations, Types of micro operations—Logic Operations, Shift operations, Arithmetic and Shift operations

Common Bus System

- Introduction to Common Bus System, Types of Buses(Data Bus, Control Bus, Address Bus),
- 16 bit Common Bus System--Data Movement among registers using Bus

UNIT– B **11 Hours**

Basic Computer Instructions

- Introduction To Instruction, Types Of Instructions (Memory Reference, I/O Reference And Register Reference), Instruction Cycle,
- Instruction Formats (Direct and Indirect Address Instructions, Zero Address, One Address, Two Address and Three Address Instructions)
- Interrupt
    - Introduction to Interrupt and Interrupt Cycle

Design of Control UNIT:

- Introduction to Control UNIT, Types of Control UNIT

(Hardwired & Micro programmed Control UNIT).

Addressing Modes

- Introduction & different types of Addressing Modes

UNIT– C **12 Hours**

Computer Organization

- Microcomputer Organization; Microprocessor Organization, Instruction codes
- Memory Reference, Register Reference and Input-Output Reference Instructions
- Instruction cycle, Instruction formats
- Processing UNIT Design: one, two and three bus Organization.
- Addressing Mode, CISC, RISC

Memory Organization

- Memory Hierarchy, Types of Memory: RAM and ROM Chips,
- Associative Memory, Cache Memory, Auxiliary Memory, Virtual Memory
- Memory Address Map, Memory Connection to CPU.

UNIT– D **7 Hours**

Input Output Organization

- Input output Interface, Memory Mapped I/O; Interrupt
- Asynchronous Data Transfer: Strobe Control, Handshaking
- Priority Interrupts: Daisy-Chaining, Parallel Interrupt, Priority Encoder
- Interrupt Cycle, Types of Interrupt: Program interrupt
- Priority Interrupts, Direct Memory Access (DMA).
- Introduction to Assembly Language.

Reference Books:

1. Mano M.M.,*Computer System Architecture*, Delhi: Prentice Hall of India, 1993
2. Mano M.M., *Digital Logic and Computer Design*, Delhi: Prentice Hall of India 1993.
3. Hayes,*Computer Architecture and Organization*,New Delhi : McGrawHill International Edition,2010.
4. Tannenbaum A.S., *Structured Computer Organization*, Delhi: Prentice Hall of India, 2010
5. Brey B, *The Intel Microprocessors*, New Delhi: Pearson Education, 2008.
6. Sloan M.E, *Computer Hardware and Organization*, 2nd Edition,New Delhi: Galgotia, Pvt. Ltd, 2010

Course Title: Group Theory I
Course Code: MTH222
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
5	1	0	6	100

Course Objective: The aim of this course is to make the students learn fundamental concepts of Groups.

UNIT A **15 Hours**

Symmetries of a square, dihedral groups, definition and examples of groups including permutation groups and quaternion groups (illustration through matrices), elementary properties of groups, Subgroups and examples of subgroups.

UNIT B **15 Hours**

Centralizer, normalizer, center of a group, product of two subgroups, properties of cyclic groups, classification of subgroups of cyclic groups. Cycle notation for permutations, properties of permutations, even and odd permutations, alternating group.

UNIT C **15 Hours**

Properties of cosets, Lagrange's theorem and consequences including Fermat's Little theorem, External direct product of a finite number of groups, normal subgroups, factor groups, Cauchy's theorem for finite abelian groups.

UNIT D **15 Hours**

Group homomorphisms, properties of homomorphisms, Cayley's theorem, properties of isomorphisms, First, Second and Third isomorphism theorems.

Books Recommended

1. Bhattacharya, P.B., S.K. Jain, and S.R. Nagpal.*Basic Abstract Algebra*. New Delhi: Foundation Books. Print.
2. Herstein, I.N. *Topics in Algebra,* Wiley Eastern Limited, India, 1975. Print.
3. Fraleigh J.B.*A First Course in Abstract Algebra,* 7th Ed. Pearson, 2002**.**Print.
4. Gallian J.A.*Contemporary Abstract Algebra,* 4th Ed. New Delhi: Narosa Publishing House, 1999. Print.
5. Rotman J.J.*An Introduction to the Theory of Groups,* 4th Ed. Springer Verlag, 1995. Print.

Course Title: PDE and System of ODE
Course Code: MTH223
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective:
The objective of this course is to equip the students with knowledge of some advanced concepts related to differential equations and partial differential equations.

UNITA **14 HOURS**
Partial Differential Equations– Basic concepts and definitions, Mathematical problems. First-Order Equations: Classification, Construction and Geometrical Interpretation. Method of Characteristics for obtaining General Solution of Quasi Linear Equations. Canonical Forms of First-order Linear Equations. Method of Separation of Variables for solving first order partial differential equations.

UNIT B **12 HOURS**
Derivation of Heat equation, Wave equation and Laplace equation, Classification of second order linear equations as hyperbolic, parabolic or elliptic, Reduction of second order Linear Equations to canonical forms.

UNIT C **12 HOURS**
The Cauchy problem, the Cauchy-Kowaleewskaya theorem, Cauchy problem of an infinite string, Initial Boundary Value Problems, Semi-Infinite String with a fixed end, Semi-Infinite String with a Free end, Equations with non-homogeneous boundary conditions, Non-Homogeneous Wave Equation. Method of separation of variables, solving the vibrating string problem, solving the heat conduction problem.

UNIT D **13 HOURS**
Systems of linear differential equations, types of linear systems, differential operators, an operator method for linear systems with constant coefficients, Basic Theory of linear systems in normal form, homogeneous linear systems with constant coefficients: Two Equations in two unknown functions, The method of successive approximations, the Euler method, the modified Euler method, The Runge-Kutta method.

Books Recommended

1. Tyn Myint-U and Lokenath Debnath, *Linear Partial Differential Equations for Scientists andEngineers,* 4th edition, Springer, Indian reprint, 2006.
2. Ross S.L., *Differential equations,* 3rd Ed., John Wiley and Sons, India, 2004.
3. Abell Martha L., and James P. Braselton, *Differential Equations with Mathematica,* 3rd edition. Elsevier Academic Press, 2004.
4. Singhania R., *Ordinary and Partial Differential Equations*. New Delhi: S. Chand and Company, 2006.
Kreyszig, Erwin, *Advanced Engineering Mathematics*. New Delhi: John Wiley & Sons, 1999.

Course Title: Electromagnetics
Paper Code: PHY281
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

UNIT-I **20 Hours**
Calculus of Vectors

Introduction to gradient, divergence and curl; their physical significance, Rules for vector derivatives, Useful relations involving gradient, divergence and curl, Fundamental theorem for gradients, Gauss's and Stoke's theorems (Statements only)

Electrostatics

Coulomb's law, Electric Field and potentials, Gauss's law and its application to calculate electric field due to spherical, cylindrical and planar symmetry charge distributions , Poisson's and Laplace equation, Conservative nature of Electrostatic Field, Field due to a uniform charged sphere, The Field of a conductor. Electric dipole, Field and potential due to an electric dipole, Method of electrical images

Unit-II **15 Hours**
Magnetostatics

Definition of magnetic field, Magnetic force on a current carrying wire, Torque acting on a current loop placed in a uniform magnetic field, Biot-Savart's law and its applications, Ampere's Circuital law and its applications, Curl and Divergence of magnetic field, Comparison of magnetostatics and electrostatics, Earth's magnetism, Tangent galvanometer, Magnetic materials and their classification, Field due to magnetised matter, B-H curve and hysteresis.

Unit-III **15 Hours**
Electromagnetic Induction

Faraday's experiment, Lenz's law, Conducting rod moving through a uniform magnetic field, Laws of electromagnetic induction, Eddy currents, Mutual inductance, Mutual inductance of solenoid, Maxwell's Equation, Basic concept of electromagnetic waves and its solution in free space. EM propagation through free space, Poynting's theorem

Unit-IV **10 Hours**
Varying currents

Currents through CR and LR circuits, High resistance by leakage, Alternating and Direct current, Analysis of LC and LCR circuits using complex number representation, Resonance, Q factor, Kirchoff's law and its application to AC circuits, Anderson's, Owen's and De-Dauty's bridges, Transformer and choke coil.

Reference Books:

1. Purcell, E.M. Electricity and Magnetism. New York: McGraw Hill Education, 1986.
2. Kip, A. Fundamentals of Electricity and Magnetism. New York: McGraw Hill, 1968
3. Mahajan, A.S. and Rangwala, A.A. Electricity and Magnetism. New Delhi: Tata McGraw Hill, 1988.
4. Tayal, D. C. Electricity and Magnetism. New Delhi: Himalaya Publishing House.
5. Fewkes, J.H. and Yarwood, J. Electricity and Magnetism. UK: Oxford University Press, 1991.
6. Griffiths, D.J. Introduction to Electrodynamics. Benjamin Cummings, 3rd Edn, 1998.

Course Title: Database Concepts Laboratory
Course Code: CSA207

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of SQL

- DDL, DML, DCL, TCL
- Practice of PL/SQL.

Course Title: Eectromagnetics Laboratory
Paper Code: PHY286

L	T	P	Credits	Marks
0	0	4	2	50

List of experiments:

1. To calibrate the moving coil ballistic galvanometer and determine its charge sensitivity using a known capacitor.
2. To study the induced electromotive force (emf) as a function of velocity of magnet.
3. To find the angle of dip in the laboratory using an earth inductor.
4. To study the variation of magnetic field with distance along the axis of a circular coil carrying current by plotting a graph.
5. To study an R.L. and R.C. circuit
6. To find the impedance of an A.C. circuit containing R, L, and C in series. To draw the voltage vector triangle and to find the phase angle between the voltage and current.
7. To plot a graph between current and frequency in a series LCR circuit and to find the resonant frequency.
8. To find the coefficient of self induction of a coil by Anderson's method using
    a. A head phone
    b. A CRO
9. To study the growth and decay of current in an RL circuit using magnetic core inductor.
10. To study working of household energy meter or watt –hour meter and determine the power consumption of some electric appliance.

Course Title: Computer Oriented Numerical and Statistical Techniques
Course Code: CSA201
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The course aims at discussing various significant and fundamental concepts to inculcate in the students an adequate understanding of the application of Numerical Algorithms and Statistical Methods.

UNIT – A **12Hours**

Errors and Sources of Propagation fDor Errors

- Floating Point Representation of Numbers
- Arithmetic Operations with Normalized Floating Point Numbers and Their Consequences
- Error in Number Representation Pitfalls in Computing

Iterative Methods

- Zeros of aSingle Transcendental Equation and Zeros of Polynomial Using Bisection Method
- False Position Method
- Newton Raphson Method
- Convergence of Solution

12 Hours

UNIT – B
Solution of Simultaneous Linear Equation

- Gauss Elimination Method
- Pivoting
- ILL Conditioned Equations And Refinement Of Solutions
- Gauss Siedel Iterative Methods

Numeric Differentiation and Integration

- Numerical Differentiation Using Interpolation Method
- Numerical Integration, Trapezoidal Rule
- Simpson's 1/8 Rule, Simpson 3/8 Rule.

UNIT – C **12 Hours**

Numerical Solution of Ordinary Differential equations

- Euler Method
- RungaKuttaMethod
- Predictor Corrector Method.

Introduction to Statistics

- Meaning, Scope, Collection and Classification of Data.
- Methods to Measures Central Tendency

UNIT-D **12 Hours**

Dispersion

- Meaning
- Measurement of Dispersion (Mean Deviation, Standard Deviation and Variance)

Bivariate Data

- Correlation, Meaning, Type of Correlation, Correlation and Causation, Methods of Studying Correlation,
- Algorithm to Compute Karl Pearson's Correlation and Rank Correlation. Applications Based On Correlation.

Reference Books

1. Rajaraman V, *Computer Oriented Numerical Methods*, Prentice Hall, India, 1993
2. Gupta S.C, *Fundamental of Statistics*,Himalayas Publication House,2007
3. Gupta &Kapoor,*AppliedStatistics*,Sultan Chand & Sons, 2007
4. Gupta S.P, *Statistical Method*, Sultan Chand & Sons, 2009

Course Title: CSA213
Course Code: Software Engineering
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The course should provide an introduction to the fundamentals principles of software engineering. The present course should seek to equip the student with a repertoire of principles, tools and techniques and make him/her appreciate that software engineering is, after all, an exercise in making compromises.

UNIT—A **8 Hours**

Software engineering principles:

- How is software engineering an engineering discipline
- Information system characteristics, software development process models,
- Life Cycle Concepts, Software Phases and Deliverables, Software Development Strategies

UNIT—B **8 Hours**

Technical development:

- Structured systems analysis and design requirements
- Collection And Specification, Data Flow and Logical Data Modeling, Cost Benefit Analysis,
- Feasibility study, architectural and detailed design, process, data, network, control
- User Interface Designs, Physical Data Design, Dynamic Modeling for Real-Time Systems

UNIT—C **14 Hours**

Software project management:

- Principles of software project management organizational and team structure
- Project Planning, Project Initiation and Project Termination; Technical
- Quality And Management Plans, Project Controls, Cost Estimation Methods-Function Points and COCOMO, Tools
- Software quality management: quality control, quality assurance, quality standards

UNIT—D **15 Hours**

Software Development Method & CASE:

- Software metrics, verification and validation, testing, quality plans, tools configuration management.
- Formal, semi-formal and informal methods; data function, and event-based modeling, some of the popular methodologies such as yourdon's sad, ssadm etc.
- CASE Tools, CASE Standards
- Documentation, Software Maintenance

Reference Books

1. Pressman R. S., *Software Engineering: A practitioner's Approach*, New York: McGraw Hill, Seventh Edition 2010.
2. Jalote Pankaj, *An Integrated Approach to Software Engineering*, New Delhi:Pearson 2010.
3. Sommerville I., *Software Engineering*, Addison –Pearson, Eighth Edition 2009.

Course Title: Computer Networks
Course Code: CSA218
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: Fundamental principles as well as the critical role of performance in driving protocol and network design; it explores in detail all the critical technical areas in data communications, and protocol design.

UNIT – A **15 Hours**

Introduction to Data Communication

- Components of Data Communication, Data Representation
- Transmission Impairments, Switching, Modulation, Multiplexing

Review of Network Hardware

- LAN, MAN, WAN
- Wireless networks, Internetworks

Review of Network Software

- Layer, Protocols, Interfaces and Services

Review of Reference Models

- OSI, TCP/IP and their comparison

Physical Layer

- Transmission Media**:** Twisted pair, Coaxial cable, Fibre optics
- Wireless transmission (Radio, Microwave, Infrared)

UNIT – B **15 Hours**

Data Link Layer

- Error Correction and Detection
- Framing, Noiseless Channels and Noisy Channels
- Multiple Access Protocol
  (ALOHA, CSMA, CSMA/CD, CSMA/CA)
- Wired LANs

UNIT – C **15 Hours**

Network Layer

- Logical Addressing, Internet Protocol IPv4 and IPv6
- Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast)
- Internetworking, IP Protocol, ARP, RARP.

UNIT – D **15 Hours**

Transport Layer

- Flow Control, Buffering
- Internet Transport Protocol (TCP and UDP)
- Congestion Control Algorithms (Leaky bucket, Token bucket, Load shedding)

Application Layer

- Domain name system, Email, File transfer protocol
- HTTP, HTTPS, World Wide Web.

Reference Books

1. Tanenbaum. Andrew S. , *Computer Networks*, 4th Edition, New Delhi: PHI, 2013.
2. Forouzan B. A., *Data Communications and Networking*, Fourth Edition, New Delhi: Tata McGraw Hill, 2003.
3. Stalling W, *Data & Computer Communications*, New Delhi: PHI, Ninth Edition 2010.

Course Title: Ring Theory and Linear Algebra I
Course Code: MTH228
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
5	1	0	6	100

Course Objective: The main objective is to introduce basic notions in linear algebra and ring theory that are often used in mathematics, importantly in abstract algebra.

UNIT A **15 Hours**

Definition and examples of rings, properties of rings, subrings, integral domains and fields, characteristic of a ring. Ideal, ideal generated by a subset of a ring, factor rings, operations on ideals, prime and maximal ideals.

UNIT B **15 Hours**

Ring homomorphisms, properties of ring homomorphisms. Isomorphism theorems I, II and III. Field of quotients.

UNIT C **15 Hours**

Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces.

UNIT D **15 Hours**

Linear transformations, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation, algebra of linear transformations. Isomorphism, Isomorphism theorems, invertibility and change of coordinate matrix.

Books Recommended

1. Bhattacharya, P.B., S.K.Jain, and S.R.Nagpal. *Basic Abstract Algebra, 2nd edition.*U.K: Cambridge University Press, 2004.
2. Hoffman,Kenneth, and Ray Alden Kunze.*Linear Algebra, 2nd edition.* Prentice-Hall of India Pvt.
Ltd., 1971.

3. Fraleigh, John B. *A First Course in Abstract Algebra*, 7th *edition*. Pearson, 2002.
4. Artin, M. *Abstract Algebra*, *2nd Ed.,* Pearson, 2011.
5. Gallian, Joseph A. *Contemporary Abstract Algebra*, *4th Ed.*, Narosa Publishing House, 1999.
6. Lang,S. I*ntroduction to Linear Algebra,2nd Ed.*, Springer, 2005.
7. Strang, Gilbert.*Linear Algebra and its Applications*, Thomson, 2007.

Course Title: Basic of Quantum Mechanics
Paper Code: PHY282
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Unit I **20 Hours**

Drawbacks of classical mechanics, foundations of quantum mechanics: Planck's quantum, Blackbody Radiation, Quantum theory of Light; Photo-electric effect and Compton scattering; de - Broglie wavelength and matter waves; Davisson-Germer experiment; Wave description of particles by wave packets. Group and Phase velocities and relation between them; Two-Slit experiment with electrons; Probability; Wave amplitude and wave functions.

Wave-particle duality, Heisenberg uncertainty principle (Uncertainty relations involving Canonical pair of variables): Derivation from Wave Packets impossibility of a particle following a trajectory; Energy-time uncertainty principle

Unit II **15 Hours**

Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles - time dependent and independent, Operators and wavefunction : Momentum, Energy, Hamiltonian operators; stationary states; physical interpretation of a wave function, probabilities and normalization; Eigen values and eigen functions, Postulates of quantum mechanics, Probability and probability current densities in one dimension. One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; Quantum mechanical scattering and tunnelling in one dimension-across a step potential & rectangular potential barrier.

Unit III **10 Hours**

Atoms in Electric & Magnetic Fields: Electron angular momentum; Space quantization. Electron Spin and Spin Angular Momentum.Larmor's Theorem; Spin Magnetic Moment.Stern-Gerlach Experiment. Zeeman Effect: Electron Magnetic Moment and Magnetic Energy, Gyromagnetic Ratio and Bohr Magnetron

Unit IV **15 Hours**

Atoms in External Magnetic Fields: Normal and Anomalous Zeeman Effect. Paschen Back and Stark Effect (Qualitative Discussion only).

Many electron atoms: Pauli's Exclusion Principle; Symmetric & Antisymmetric Wave Functions;Fine structure; Spin orbit coupling; Spectral Notations for Atomic States; Total angular momentum; Spin-orbit coupling in atoms- L-S and J-J couplings; Hund's Rule; Spectra of Hydrogen

Reference Books:

1. White, H.E. Introduction to Atomic Spectra. London: McGraw Hill, 1934.
2. Banwell, C.B. Fundamentals of molecular spectroscopy, New Delhi: Tata McGraw Hill, 1986.
3. Barrow, G.M. Introduction to Molecular spectroscopy. New York: McGraw Hill, 1962.
4. Herzberg, G.Spectra of diatomic molecules.New York: Van Nostr and Reinhold, 1950.
5. McHale,J. L.Molecular spectroscopy. New Jersey: Prentice Hall, 1999.
6. Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill.

Course Title: Analog Electronics
Paper Code: PHY283
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Unit 1. Semiconductor Materials 15 Hours

Semiconductor materials, Energy band diagram, Fermi level, Intrinsic Semiconductor, charge carrier concentration, doping, Extrinsic semiconductors, Carrier transport in semiconductors, Mobility and conductivity, Direct and indirect band gap, Measurement from the optical transmission, Four probe experiment, Hall effect and Hall coefficient measurements, Applications of semiconducting materials.

Unit 2. P-N Junctions 15 Hours

Diode theory, depletion region, current components in pn junction, forward and reverse-biased junctions, reverse-bias breakdown, load line analysis, diode applications - Limiters, clippers, clampers, voltage multipliers, half wave & full wave rectification, Special purpose diodes - Zener diode, Varactor diode, light emitting diodes, Photodiode, Laser diodes.

Unit 3. Bipolar Junction Transistors (BJT) 15 Hours

Transistor fundamentals, transistor biasing, current components in the transistor, DC operating point, BJT characteristics & parameters, CB, CE, CC configurations, transistor as an amplifier, fixed bias, emitter stabilised biasing, voltage divider biasing, Stability of I_{CO}, V_{BE} and beta, characteristics and applications.

Unit 4. Semiconductor devices 15 Hours

Construction and operation of JFET, MOSFET and MESFET, current-voltage characteristics and their applications, other semiconducting devices: Unijunction transistor (UJT), Four Layer (PNPN) device (PNPN), Semiconductor Controlled Rectifier, Gun diode, Charge coupled Devices (CCD), Regulated Power supplies.

Suggested Books:

1. Millman, J. and Halkias, C.C. Electronic Devices and Circuits. New Delhi: Tata McGraw Hill, 1983
2. Ryder, J.D. Electronic Fundamentals and Applications. New Delhi: Prentice Hall, 2004.
3. Tyagi, M. S. Introduction to Semiconductor Materials and Devices, Singapore: John Wiley & Sons Inc., 1991
4. Shur M. S. Introduction to Electronic Devices, Singapore: John Wiley & Sons Inc., 2000
5. Streetman B.G. and Banerjee S. Solid State Electronic Devices, New Delhi: Prentice Hall India, 5th Edn, 2001.

Course Title: Electronics Laboratory
Paper Code: PHY288

L	T	P	Credits	Marks
0	0	4	2	50

List of Experiments

1. To find the resistivity of a semiconductor crystal by using the Four Probe technique and hence, determine the band gap of the material.
2. To determine the carrier concentration and mobility of the semiconductor crystal by using the Hall effect measurement technique.
3. To study V-I characteristics of PN junction diode, and Light emitting diode.
4. To study the V-I characteristics of a Zener diode and its use as voltage regulator.
5. To study (a) Half-wave Rectifier and (b) Full-wave Bridge Rectifier and investigate the effect of C, L and π filters.
6. To study V-I characteristics of Uni Junction transistor (UJT).
7. To study V-I characteristics of Silicon Controlled Rectifier (SCR).
8. To study V-I characteristics of DIAC / TRIAC devices.
9. To study the current voltage characteristics of the Tunnel diode.
10. Study of V-I & power curves of solar cells, and find maximum power point & efficiency.
11. To study the characteristics of a Bipolar Junction Transistor in CE, CB and CC configurations.
12. To study the various biasing configurations of BJT.
13. To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias.
14. To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
15. To design a phase shift oscillator of given specifications using BJT.
16. To study the characteristics of Junction Field Effect Transistor (JFET).
17. To study the characteristic of Metal Oxide Semiconductor Field Effect Transistor (MOSFET).

Course Title: Computer Networks Laboratory
Course Code: CSA220

L	T	P	Credits	Marks
0	0	4	2	50

- Specifications of latest desktops and laptops.
- Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.
- Familiarization with Transmission media and Tools: Co-axial cable, UTP Cable, Crimping Tool, Connectors etc.
- Preparing straight and cross cables.

- Study of various LAN topologies and their creation using network devices, cables and computers.
- Configuration of TCP/IP Protocols in Windows and Linux.
- Implementation of file and printer sharing.
- Designing and implementing Class A, B, C Networks
- Subnet planning and its implementation
- Installation of ftp server and client

Course Title: Data Structures using C
Course Code: CSA373
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The emphasis of this course is on the organization of information, the implementation of common data structures such as lists, stacks, queues, trees, and graphs.

UNIT - A **10 Hours**

Preliminaries

- Introduction to Data Structures: Primitive and Composite, Various Data Structures
- Common Operations on Data Structures, Algorithm Complexity
- Big O Notation, Time, Space Tradeoff Between Algorithms
- Complexity of Algorithms, Records and Pointers.

Arrays

- Arrays Defined, Representing Arrays in Memory, Various Operations on Linear Arrays
- Multi Dimensional Arrays, Records, Matrices, Sparse Matrices
- Linear Search, Binary Search
- Insertion Sort, Selection Sort, Bubble Sort, Merge Sort
- String, Representation and Manipulation

UNIT– B **12 Hours**

Linked Lists

- Types of Linked Lists, Representing Linked Lists in Memory
- Advantage of Using Linked Lists Over Arrays
- Various Operation on Linked Lists

Stacks

- Description of Stack Structure, Implementation of Stack Using Arrays and Linked Lists
- QuickSort Technique to Sort an Array, Parenthesis Checker.

Queues

- Implementation of Queue Using Arrays and Linked Lists
- De-Queues, Priority Queues and Their Implementation, Aapplications of Queues.

UNIT– C **12 Hours**

Trees

- Description of Tree Structure and Its Terminology, Binary Search Tree
- Implementing Binary Search Tree Using Linked Lists
- Various Operations on Binary Search Trees

Heaps

- Description of Heap Structure, Implementing Heaps Using Arrays
- Various Operations on Heaps, Applications of Heaps
- Heap Sort Technique to Sort an Array

UNIT– D **11 Hours**

Graphs

- Representation of Graphs And Applications: Adjacency Matrix, Path Matrix
- Warshall's Algorithm, Linked Representation of A Graph
- Traversing aGraph, DFS and BFS.

Files

- Operations on Files, Types of Files
- File Organizations: Sequential Files, Indexed Sequential File, Directed Files and Multikey Files
- File Performance Criteria and Terms.

Reference Books:

1. Lipschutz Seymour, *Theory and Problems of Data Structures*, Schaum Outline Series, New Delhi: Tata McGrawHill Book Company, 2001.
2. Mark Allen Weiss, *Data Structures and Algorithm Analysis In C* , Mexico City:Addison Wesley, (An Imprint of Pearson Education),.New Delhi: Prentice Hall of India Pvt. Ltd, 1993.
3. Esakov Jeffery, Weiss Tom, *Data Structures: An Advanced Approach Using C*, New Delhi: Prentice Hall International, Inc, 2007.
4. Trembley and Sorenson,*An Introduction to Data Structures with Application*, New York : McGraw Hill Company, 1984.
5. Tanenbaum, *Data Structures using C*, New Delhi: Pearson Education, *2009*.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Operating Systems
Course Code: CSA303
Course Duration: 45-60 Hours

Course Objective: Understand the overall architecture of the operating system and its main components, Functions of Kernel, file system architecture and implementation, concurrent programming and concurrency.

UNIT—A **9 Hours**

Introduction To Operating System

- Computer System Structure
- Operating System Structure
- Process Management

UNIT—B **12 Hours**

CPU Scheduling

- Process Synchronization
- Deadlocks

UNIT—C **12 Hours**

Memory management

- Paging and Segmentation Virtual Memories
- I./O System and Secondary Storage Structure

UNIT—D **12 Hours**

Protection and Security

- Introduction to multiprocessor and distributed operating systems

Case Studies:

- LINUX
- UNIX Operating System with SOLARIS
- SCO-UNIX

Reference Books

1. Galvin and Silberschatz A., *Operating System Concepts*, Eigth Addition, New York: J. Wiley & Sons, 2009.
2. Crowley, *Operating Systems: A Design Oriented Approach*, New Delhi: Tata McGraw Hill, 2008.
3. Donovan J.J, *Systems Programming*, New York: McGraw Hill, 1972.
4. Dhamdhere. D.M, *System Programming and Operating Systems*, New Delhi: Tata McGraw Hill, 1999.
5. Madnick and Donovan, *Operating System*, New York: McGraw Hill, 1978.
6. Beck Leland L., *System Software*, Delhi: Pearson Education, 2000.
7. Henson P.B., *Operating System Principles*, Delhi: Prentice Hall
8. Tenenbaum A.S., *Operating System: Design and Implementation*, New Delhi: PHI, 2013.

Course Title: Group Theory II
Course Code: MTH322
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
5	1	0	6	100

Course Objective: The objective of this course is to understand he structure of finite groups and some properties of finite groups.

UNIT-A **15 Hours**

Automorphism, inner automorphism, automorphism groups, automorphism groups of finite and infinite cyclic groups, applications of factor groups to automorphism groups, Characteristic subgroups, Commutator subgroup and its properties.

UNIT-B **15 Hours**

Properties of external direct products, the group of units modulo n as an external direct product, internal direct products, Fundamental Theorem of finite abelian groups.

UNIT-C **15 Hours**

Group actions, stabilizers and kernels, permutation representation associated with a given group action, Applications of group actions: Generalized Cayley's theorem, Index theorem.

UNIT-D **15 Hours**

Groups acting on themselves by conjugation, class equation and consequences, conjugacy in Sn, *p*-groups, Sylow's theorems and consequences, Cauchy's theorem, Simplicity of Anfor n≥5,non-simplicity tests.

Books Recommended

1. Bhattacharya, P.B., S.K. Jain, and S.R. Nagpal.*Basic Abstract Algebra*. UK: Cambridge University Press, 2006, Print.
2. Fraleigh, John B. *A First Course in Abstract Algebra*. 7th Ed., India: Pearson, 2002**.** Print.
3. Gallian, Joseph A. *Contemporary Abstract Algebra.* 4th Ed., Delhi: Narosa Publishing House, 1999. Print.

4.Dummit, David S.,and Richard M. Foote.*Abstract Algebra*. 3rd Ed.,Singapore: John Wiley and Sons (Asia) Pvt. Ltd., 2004. Print.
5.Rotman Joseph J., *An Introduction to the Theory of Groups*, 4th Ed. Springer Verlag, 1995. Print.

Course Title: Condensed Matter Physics
Paper Code: PHY381
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

UNIT-I **15 Hours**

Crystal Structure

Solids-Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis, Central and Non-Central Elements, Unit Cell, Miller Indices, Two dimensional and three dimensional Bravais lattices, crystal planes, NaCl structure and diamond structure

UNIT-II

Crystal diffraction: **15 Hours**

Diffraction of X-rays by Crystals. Bragg's Law. Atomic and Geometrical Factor. Reciprocal Lattice, Types of Lattices. Brillouin Zones. Reciprocal lattice to SC, BCC and FCC lattice, Free Electron Theory: Free Electron Theory, Drude Lorentz theory, Sommerfeld model, the Fermi Dirac distribution

UNIT-III

Elementary Lattice Dynamics:: **15 Hours**

Concept of Entropy, Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T3 law, the thermal conductivity of metals. WiedemannFrenz law, Free electron gas and Fermi energy

UNIT IV

Elementary band theory and superconductivity **15 Hours**

Kronig Penny model. Band Gaps, Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect, Hall coefficient.

Superconductivity: Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect.

Suggested Books:

1. Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley India Pvt. Ltd.
2. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India 95
3. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
4. Solid State Physics, N.W. Ashcroft and N.D. Mermin, 1976, Cengage Learning
5. Solid State Physics, Rita John, 2014, McGraw Hill
6. Solid-state Physics, H. Ibach and H. Luth, 2009, Springer
7. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India
8. Solid State Physics, M.A. Wahab, 2011, Narosa Publications

Course Name: Digital Electronics
Course Code: PHY382
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Unit I **12 Hours**

Introduction to CRO: Block Diagram of CRO. Electron Gun, Deflection System and Time Base. Deflection Sensitivity. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.

Integrated Circuits (Qualitative treatment only): Active & 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 lCs.

Unit II **15 Hours**

Digital Circuits and Boolean algebra: Difference between Analog and Digital Circuits. Binary Numbers, Decimal to Binary and Binary to Decimal Conversion. 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. De Morgan's Theorems. Boolean Laws. Simplification of LogicCircuit using Boolean Algebra. Fundamental Products, Conversion of a Truth table into Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.

Data processing circuits: Basic idea of Multiplexers, De-multiplexers, Decoders, Encoders.

Unit III **20 Hours**

Arithmetic and Sequential Circuits: Binary Addition. Binary Subtraction using 2's Complement. Half and Full Adders. Half & Full Subtractors, 4-bit binary Adder/Subtractor. SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. M/S JK Flip-Flop.

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.

Unit IV **13 Hours**

Computer Organization: Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map.
Intel 8085 Microprocessor Architecture: Main features of 8085. Block diagram. Components. Pin-out diagram. Buses. Registers. ALU. Memory. Stack memory. Timing & Control circuitry. Timing states. Instruction cycle, Timing diagram of MOV and MVI.
Introduction to Assembly Language: 1 byte, 2 byte & 3 byte instructions.

Reference Books:

1. A. P. Malvino,and D. P. Leach, Digital Principles and Applications. New Delhi: Tata McGraw Hill, 1986.
2. A. P. Malvino, Digital Computer Electronics. New Delhi: Tata McGraw Hill, 1986.
3. W. H. Gothmann, Digital Electronics. New Delhi: Prentice Hall, 1980.
4. J. Millman,and H. Taub, Pulse, Digital and Switching Waveforms. New Delhi: Tata McGraw Hill, 1992.
5. A. Mottershead, Electronic Devices and Circuits. New Delhi: Prentice Hall, 1977.
6. R. S. Gaonkar, Microprocessor Architecture, Programming and Applications with 8085. New Delhi: Prentice Hall, 2002.

Course Title: Data Structure using C Laboratory
Course Code: CSA374

L	T	P	Credits	Marks
0	0	4	2	50

Implementation of Data Structures using C

- Implementation of various searching and sorting algorithms.
- Implementation of Arrays, Linked Lists, Stacks, Queues, etc.

Course Title: Condensed Matter Physics Laboratory and Digital Electronics Laboratory
Paper Code: PHY386

L	T	P	Credits	Marks
0	0	4	2	50

List of experiments:

1. To draw the V-I characteristic of a p-n junction diode and to draw the load line.
2. To study Zener diode voltage regulating characteristics.
3. To study the common base and common emitter characteristics of p-n-p junction transistor.
4. To study output and transfer characteristic of a field effect transistor.
5. To find the value of Stefan's constant.
6. To find the ionization potential of mercury using the gas filled diode.
7. To trace the B-H curve for ferromagnetic material using CRO and to find the magnetic parameters from the B-H hysteresis loop.
8. To draw the anode current, anode voltage characteristic curve of a thermionic valve diode and hence to find the internal resistance of the valve.
9. To plot a graph between grid potential and plate current for a triode valve and hence to determine the mutual conductance of the valve.
10. To study the voltage regulation and ripple factor of a half wave rectifier and full wave rectifier with L type filter circuits.
11. To verify and design AND, OR, NOT and XOR gates using NAND gates.
12. To design a combinational logic system for a specified Truth Table.
13. To convert a Boolean Expression into Logic Gate Circuit and assemble it using logic gate ICs.
14. To minimize a given Logic Circuit.
15. Half Adder, Full Adder and 4 bit Binary Adder.
16. Half Subtractor, Full Subtractor, Adder Subtractor using Full Adder I.C.

17. Parity generator and checker.
18. To study D/A and A/D convertors.
19. To build Flip-flop Circuits using elementary gates (RS, Clocked RS, D type, and JK Flip Flop).
20. To build a 4bit Counter using D type/JK Flip Flop.
21. To make a Shift Register from D type/JK Flip Flop.
22. Serial and parallel shifting of data.
23. Write the following programs using 8085 Microprocessor
    a) Addition and subtraction of numbers using direct addressing mode 24
    b) Addition and subtraction of numbers using indirect addressing mode
    c) Multiplication by repeated addition.
    d) Division by repeated subtraction.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Discrete Mathematics
Course Code: CSA316
Course Duration: 45-60 Hours

Course Objective: The objective of this course is to acquaint the students with the basic concepts in Discrete Mathematics viz .sets, functions, relations, groups, graphs etc required for the implementation of various computer science courses.

UNIT—A **12 Hours**

Introduction

- Introduction to Sets
- Finite and Infinite Sets, Unaccountably Infinite Sets.
- Introduction to Functions and relations, Properties of Binary relations, Closure, Partial Ordering Relations.

UNIT—B **10 Hours**

- Pigeonhole Principle
- Permutation and Combinations, Mathematical Induction, Principle of Inclusion and Exclusion
- Asymptotic Notations

UNIT—C **15 Hours**

Recurrence Relations

- Introduction, Generating Functions, Linear Recurrence Relations with constant coefficients and their solution

Graphs Theory

- Basic Terminology of Graphs, Models and Types, Multigraphs, Weighted Graphs, Graph Representation. Graph Isomorphism Graph Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Basic Terminology of Trees, Properties of Trees, Spanning Trees.

UNIT—D **8 Hours**

Inference Theory

- Introduction, Logical Connectives, Well Formed Formulas, Tautologies, Equivalence

Reference Books

1. C. L. Liu and D.P. Mohapatra, *Elements of Discrete Mathematics*, Third Edition, Tata McGraw Hill, 2008.
2. K. Rosen, *Discrete Mathematics and Its Applications*, Sixth Edition, Tata McGraw Hill,2007.
3. T.H. Cormen, C.E. Leiserson, R.L. Rivest, *Introduction to Algorithms*, Third Edition,Prentice Hall of India,2010.
4. J.P. Trembley, R. Manohar, *Discrete Mathematical Structures with Application to Computer Science*, First Edition, Tata McGraw Hill, 2001.
5. David Gries, Fred B. Schneider, *A Logical Approach to Discrete Math*, Springer; 2010.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Core JAVA
Course Code: CSA302
Course Duration: 45-60 Hours

Course Objective: To provide the advanced Knowledge about OOPS

UNIT—A **15 Hours**

An overview of Java

- Object Oriented Programming, Two Paradigms
- Abstraction, The, OOP Principles, Java Class Libraries
- Date Types, Variables And Arrays:-Integers, Floating-Point Types, Characters, Boolean, Iterates, Variable, Data Types And Casting
- Automatic Type Promotion in Expressions Arrays.
- Operators: Arithmetic Operators, Bit Wise Operators, Relational Operators
- Boolean Logical Assignment Operators, The? Operator, Operator Precedence Control Statements
- Java's Selection Statements, Iteration Statements, Jump Statements
- Introduction to Classes: Class Fundamentals, Declaring Object Reference Variable

UNIT—B **10 Hours**

Introducing Methods

- Constructors, The Key Word, Garbage Collection, The Finalize () Method
- Methods And Classes :-Overloading Methods, Using Objects As Parameters, Recursion

Inheritance:

- Inheritance Basics, Using Super, Method Overriding, Dynamic Method Dispatch

- Using Abstract Classes, Using Final With Inheritance, Package and Interfaces
- Package Asses Protection, Importing Packages

UNIT—C **10 Hours**

Exception Handling:

- Exception Handling Fundamentals., Exception Types
- Uncaught Exceptions Using Try and Catch, Multiple Catch Clauses, Nested Try Statements Throw
- Finally Java Built in Exception Creating Your own Exception Sub Classes, Using Exceptions

Multithreaded Programming:

- The Java Thread Model, The Main Thread, Creating Thread, Creating Multiple Thread, Using Is Alive () and Join ()

UNIT—D **10 Hours**

String Handling:

- The String Constructor, String Length, Special String Operator Character
- Extraction, String Comparison, Searching String, Modifying String, Data Conversion

The Applet Class:

- Its Architecture Displays Methods. The HTML APPLET.
- Passing Parameters to Applet. The Get Documentation Base () and Get Code Base () Methods
- Applet Context And Show Document ()

Reference Books

1. Eckel Bruce ,*Thinking in Java*, Pearson Education, Fourth Edition, 2006.
2. Schildt Herbert, *The Complete Reference Java 2*, New Delhi: TMH, 2005.
3. Balagurusami E, *Programming In Java*, New Delhi: Tata McGraw Hill Fourth Edition.
4. Bayross Ivan, *Advance Java*, New Delhi:BPB Publications.
5. *Mastering Java*, New Delhi:BPB Publications, Second Edition.

Course Title: Ring Theory and Linear Algebra II
Course Code: MTH330
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
5	1	0	6	100

Course Objective: Here some advanced topics of ring theory and linear algebra are included. The emphasis will be to combine the abstract concepts with examples in order to intensify the understanding of the subject.

UNIT-A **15 Hours**

Polynomial rings over commutative rings, division algorithm and consequences, principal ideal domains, factorization of polynomials, reducibility tests, irreducibility tests, Eisenstein criterion.

UNIT-B **15 Hours**

Unique factorization in Z[x]**.**Divisibility in integral domains, irreducibles, primes, unique factorization domains, Euclidean domains.

UNIT-C **15 Hours**

Dual spaces, dual basis, double dual, transpose of a linear transformation and its matrix in the dual basis, annihilators, Eigen spaces of a linear operator, diagonalizability, invariant subspaces and Cayley-Hamilton theorem, the minimal polynomial for a linear operator.

UNIT-D **15 Hours**

Inner product spaces and norms, Gram-Schmidt orthogonalisation process, orthogonal complements, Bessel's inequality, the adjoint of a linear operator, Least Squares Approximation, minimal solutions to systems of linear equations, Normal and self-adjoint operators, Orthogonal projections and Spectral theorem.

Books Recommended

1. Bhattacharya, P.B., S.K.Jain, and S.R.Nagpaul. Basic Abstract Algebra, 2nd Edition.U.K: Cambridge University Press, 2004.
2. Hoffman,Kenneth, and Ray Alden Kunze.Linear Algebra, 2nd Ed., Prentice-Hall of India Pvt. Ltd., 1971.
3. Fraleigh, John B. A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
4. Artin, M. Abstract Algebra, 2nd Ed., Pearson, 2011.
5. Gallian, Joseph A. Contemporary Abstract Algebra, 4th Ed., Narosa Publishing House, 1999.
6. Lang,S. Introduction to Linear Algebra, 2nd Ed., Springer, 2005.
7. Strang, Gilbert.Linear Algebra and its Applications, Thomson, 2007.
8. Kumaresan S. Linear Algebra- A Geometric Approach, Prentice Hall of India, 1999.

Course Title: Wave Optics
Paper Code: PHY346
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

UNIT-I
INTERFERENCE **15 Hours**

Young's double slit experiment, Fresnel's Biprism, displacement of fringes, fringes with white light, Stoke's law, Interference in parallel film, Newton's rings and applications, Michelson's interferometer principle, theory and applications, Intensity distribution in multiple beam interference, applications.

UNIT-II
DIFFRACTION **15 Hours**

Huygen's principle, Huygen's Fresnel theory, Fresnel and Fraunhaufer diffraction, Fresnel diffraction at a single slit and circular aperture, Fresnel's half period zones, zone plate, Fraunhoffer diffraction at single slit, circular aperture, diffraction grating, Rayleigh's criterion for resolution, dispersive power of diffraction grating, resolving power of a diffraction grating, telescope and microscope.

UNIT-III
POLARIZATION **15 Hours**

Polarised and unpolarised light, production of polarized light, Malus' law, polarization by reflection and refraction, Brewster's law, double refraction, anisotropic crystals, Nicol prism, Phase retardation plates, theory of circularly and elliptically polarized light, Rotation of plane of polarization, origin of optical rotation in liquids and in crystals, Polarimeter.

UNITIV
FIBRE OPTICS **15 Hours**

Principle and structure of optical fibers, acceptance angle and acceptance cone, numerical aperture, types of optical fibers, loses in optical fibres, fiber optical communication, light sources for fibre optics, photodetectors, fiber optical sensors, and classification of optical sensors, applications of optical fibers.

Suggested Books:

1. Subrahmanyam N., Lal B., Avadhanulu M. N., *A Textbook of Optics*. New Delhi: S Chand, 2004.
2. Puri S.P. *Text Book of Vibrations and Waves*. New Delhi: Macmillan India, 2004.
3. Pain H.J. *The Physics of Vibrations and Waves.* West Sussex, England: John Wiley and Sons, 2005.
4. Ghatak A.K. *Optics*. New Delhi: TataMcGraw Hill Publishing, 1992.
5. Jenkins F.A. and White H.E. *Fundamentals of Optics.* New York: McGraw Hill Publishing, 1981.
6. Ghatak A. and Thyagarajan K. *An Introduction to Fiber Optics.* London: Cambridge University Press, 1998.

Course Title: Nuclear and Particle Physics
Paper Code: PHY383
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Unit I **15 Hours**

Nuclear Properties: Historical overview of nuclear physics, Nuclear charge and mass, nuclear radius, spin, parity, angular momentum, magnetic moment, electric quadrupole moment, binding energy, binding energy per nucleon and explanation of the binding energy curve.

Radioactive decays: Radioactive decay law, Natural radioactivity, radioactive dating, Beta decays : β-, β+ and electron capture decays, neutrino and antineutrino, Alpha decay: Stability of heavy nuclei against break up, Gamow's explanation, angular momentum and parity in a decay, Gamma transitions : multipole moments, selection rules.

Unit II **15 Hours**

Nuclear reactions: Rutherford's experiment of nuclear transmutation, Types of nuclear reactions, reactions cross section, Kinematics of nuclear reaction, Q-value and its physical significance. Nuclear fission, Nuclear reactor.

Nuclear Models: Liquid drop model, semi-empirical mass formula, condition of stability, evidence for nuclear magic numbers.

Unit III **15 Hours**

Interaction and Detection of radiation: Energy loss of electrons and positrons, Positron annihilation in condensed media, Stopping power and range of heavier charged particles, interaction of gamma rays with matter: Basis of detection of nuclear radiations, Gas-filled detectors, proportional and Geiger-Muller counters, Scintillation detectors, solid-state detectors.

Unit IV **15 Hours**

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, concept of quark model, color quantum number and gluons.

Reference Books:

1. Burcham, W. E. and Jobes, M. *Nuclear and Particle Physics.* New Delhi Pearson 1995.
2. Mittal, V. K., Verma, R. C. and Gupta S.C. *Introduction to Nuclear and Particle Physics.* New Delhi Prentice Hall of India 2013.
3. Krane, K.S. *Introductory Nuclear Physics.* New Delhi John Wiley & Sons 1988.
4. Hyde, K. *Basic ideas and Concepts in Nuclear Physics* IoP 2004.
5. Dunlap, R. A. *Introduction to the physics of nuclei & particles* Thomson Asia 2004.
6. 6.Griffith, G. *Introduction to Elementary Particles* New Delhi John Wiley & Sons.

Course Title: Nuclear Physics Laboratory
Paper Code: PHY388

L	T	P	Credits	Marks
0	0	4	2	50

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note:

• Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.

• The examination for both the courses will be of 3 hours duration

1. To draw the plateau curve for Geiger Muller counter
2. To find the dead time of GM counter
3. To find the absorption coefficient of beta particles in aluminium using GM counter.
4. To find the half life time of radioactive substance using GM Counter.
5. Verification of Rutherford Soddy nuclear decay formula mechanical analogue.
6. To study Poisson and Gaussian distributions using a GM Counter.
7. To study the alpha spectrum from natural sources Th and U.
8. To determine the gamma-ray absorption coefficient for different elements.
9. To verify the inverse square law using gamma rays.
10. To estimate the efficiency of GM detector for (a) gamma source (b) beta source
11. To find the Linear & mass attenuation coefficient using gamma source.
12. To determine the operating voltage of a photomultiplier tube.

13. To study Compton Scattering.
14. To study the Rutherford scattering.

Course Title: Wave Optics Laboratory
Paper Code: PHY347

L	T	P	Credits	Marks
0	0	4	2	50

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipments.

Note: Students are expected to perform at least eight-ten experiments out of following list. The examination will be of 3 hours duration

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

List of Experiments: Students are expected to perform at least eight experiments out of following list.

1. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
2. To determine the Dispersive Power of the Material of a given Prism using Mercury Light.
3. To determine the Resolving Power of a Prism.
4. To determine wavelength of sodium light using Fresnel Biprism.
5. To determine wavelength of sodium light using Newton's Rings.
6. To determination Wavelength of Sodium Light using Michelson's Interferometer.
7. To determine the wavelength of Laser light using Diffraction of Single Slit.
8. To determine the wavelength of (1) Sodium and (2) Mercury Light using Plane Diffraction Grating.
9. To determine the Dispersive Power of a Plane Diffraction Grating.
10. To determine the Resloving Power of a Plane Diffraction Grating.
11. To determine the (1) Wavelength and (2) Angular Spread of HeNe Laser using Plane Diffraction Grating.
12. To study the wavelength of spectral lines of sodium light using plane transmission grating.
13. To study the specific rotation of sugar solution Laurent's half shade polarimeter method
14. To study the numerical aperture and propagation losses using He-Ne laser Optical fiber set up

15. To compare the focal length of two lenses by Nodal slide method.
16. To determine Mechanical Equivalent of Heat, J, by Callender and Barne'sconstant flow method.
17. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.
18. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
19. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and
    a. Charlton's disc method.
20. To determine the Temperature Coefficient of Resistance by Platinum Resistance
    a. Thermometer (PRT).
21. To study the variation of Thermo-Emf of a Thermocouple with Difference of
    i. Temperature of its Two Junctions.
22. To calibrate a thermocouple to measure temperature in a specified Range using (1) Null
    i. Method, (2) Direct measurement using Op-Amp difference amplifier and to determine (3) Neutral Temperature.
23. To measure the thermal conductivity and thermal diffusivity of a conductor.
24. To determine the value of Stefan's Constant of radiation.
25. To find the thermal conductivity of copper

Course Title: Core Java Programming Laboratory
Course Code: CSA308

L	T	P	Credits	Marks
0	0	4	2	50

- Implementation of OOP concepts using JAVA
- Packages and Interfaces
- Exception Handling
- Applets
- AWT classes