DAV UNIVERSITY JALANDHAR

FACULTY OF SCIENCE

Course Scheme & Syllabus

For

Bachelor of Science in Computer Science

(Three Years Degree Course)

(Programme ID-197)

(As per Choice Based Credit System)

1st TO 6th SEMESTER

Syllabi Applicable For 2020 Batch

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	MTH121A	Calculus	Core	4	0	0	4
3	MTH123A	Algebra	Core	5	1	0	6
4	PHY101B	Mechanics	Core	4	0	0	4
5	PHY104A	Physics Laboratory-I	Core	0	0	4	2
6	EVS100	Environmental Studies	AECC	4	0	0	4
7	CSA112	Workshop on Photoshop and Corel Draw	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	MTH127	Theory of Equations	Core	5	1	0	6
4	MTH128	Differential Equations	Core	4	0	0	4
5	PHY111B	Vibrations and Waves	Core	4	0	0	4
6	PHY132	Waves and Analog Electronics Laboratory	Core	0	0	4	2
7	ENG151B	Communication Skills	AECC	3	0	0	3
8	ENG152A	Communication Skills Lab		0	0	2	1
9	SGS107	Human Values and General Studies	AECC	4	0	0	4
	Total						**30**

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	MTH229	Real Analysis	Core	5	1	0	6
4	MTH231	Partial Differential Equations	Core	4	0	0	4
5	PHY221A	Digital Systems and Application	Core	4	0	0	4
6	PHY224	Digital Electronics Laboratory	Core	0	0	4	2
7	CSA207	Database Concepts Laboratory	Core	0	0	4	2
8	CSA221	Workshop on E-Marketing	Core	0	0	4	2
	Total						**28**

Semester 4

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA213	Software Engineering	Core	4	0	0	4
2	CSA218	Computer Networks	Core	4	0	0	4
3	MTH225A	Numerical Methods	Core	4	0	0	4
4	MTH234	Analytical Geometry	Core	5	1	0	6
5	PHY231A	Optics	Core	4	0	0	4
6	PHY234	Thermal and Statistical Physics	Core	4	0	0	4
7	PHY235	Thermal and Statistical Physics Laboratory	Core	0	0	4	2
8	MTH226	Numerical Methods Laboratory	Core	0	0	4	2
	Total						**30**

Semester 5

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA303	Operating Systems	Core	4	0	0	4
2	**Discipline Specific Elective-I**		DSE	4	0	0	4
3	**Discipline Specific Elective-II**		DSE	5	1	0	6
4	MTH324	Number Theory	Core	5	1	0	6
4	PHY303C	Solid State Physics	Core	4	0	0	4
5	PHY322	Quantum Physics	Core	4	0	0	4
6	PHY323	Quantum and Solid State Laboratory	Core	0	0	4	2
	Total						**30**

DSE (Discipline Specific Electives)-I (Choose One)

S.No	Paper Code	Course Title	L	T	P	Cr
1	CSA314	Data Warehousing and Mining	4	0	0	4
2	CSA320	Basics of Artificial Intelligence	4	0	0	4
3	CSA321	Introduction Internet of Things	4	0	0	4

DSE (Discipline Specific Electives)-II (Choose One)

S.No	Paper Code	Course Title	L	T	P	Cr
1	MTH326	Industrial Mathematics	5	1	0	6
2	MTH328	Probability and Statistics	5	1	0	6
3	MTH341	Mechanics I	5	1	0	6

Semester 6

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA302	Core Java	Core	4	0	0	4
2	CSA373	Data Structures Using C	Core	4	0	0	4
3	CSA316	Discrete Mathematics	Core	4	0	0	4
4	**Discipline Specific Elective-III**		Core	4	0	0	4
5	PHY331	Nuclear Physics	Core	4	0	0	4
6	PHY339	Particle Physics	Core	4	0	0	4
7	PHY332	EMT and Nuclear Physics Laboratory	Core	0	0	4	2
8	CSA374	Data Structures Using C Laboratory	Core	0	0	4	2
9	CSA308	Core Java Laboratory	Core	0	0	4	2
	Total						**30**

DSE (Discipline Specific Electives)-III (Choose One)

S.No	Paper Code	Course Title	L	T	P	Cr
1	MTH348	Linear Algebra	5	1	0	6
2	MTH333	Linear Programming	5	1	0	6
3	MTH344	Mechanics II	5	1	0	6

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.
9. O'Leary Timothy, O'Leary Linda and O'Leary Daniel , *Computing Essentials*, McGraw Hill.
10. Sprankle Maureen & Hubbard Jim, *Problem Solving and Programming Concepts*, Pearson.

11. Thareja Reema, Introduction to C Programming, Oxford University Press.

Course Title: Calculus
Paper Code: MTH121A
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

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 **13 HOURS**

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

UNIT-B **14 HOURS**

Curve tracing in Cartesian coordinates, tracing of standard curves in polar coordinates, Reduction formulae, derivations and illustrations of reduction formulae.

UNIT-C **14 HOURS**

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**

Volumes by slicing; disks and washer's methods, Volumes by cylindrical shells, 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.

Reference Books:

1. Thomas, George B., and Finney Ross L. Calculus. Pearson Education, 9th Ed, 2010.
2. Strauss, M.J., and G.L. Bradley and K. J. Smith. Calculus. Delhi: Dorling Kindersley (India) P. Ltd. (Pearson Education), 3rd Ed, 2007.
3. Anton, H., and I. Bivens, and S. Davis. Calculus. Singapore: John Wiley and Sons (Asia) P. Ltd., 7th Ed. 2002.
4. Courant, R., and F. John. Introduction to Calculus and Analysis. New York: Springer-Verlag (Volumes I & II), 1989.

Course Title: Algebra
Course Code: MTH123A
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
5	1	0	6	100

Course Objective: The concepts and techniques from linear algebra are of fundamental importance in many scientific disciplines. The main objective is to introduce basic notions in linear algebra that are often used in mathematics and other sciences. The emphasis will be to combine the abstract concepts with examples in order to intensify the understanding of the subject.

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 **15 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, 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, Cayley-Hamilton Theorem.

Reference Books:

1. Andreescu, Titu and Dorin Andrica. *Complex Numbers from A to Z*, Birkhauser, 2006.
2. Lay, David C. *Linear Algebra and its Applications, 3rd Ed.* Pearson Education Asia, Indian reprint, 2007.

3. Goodaire, Edgar G. and Michael M. Parmenter. *Discrete Mathematics with Graph Theory, 3rd Ed.* Pearson Education (Singapore) P. Ltd. Indian reprint, 2005.
4. Friedberg, S.H., A.J. Insel and L.E. Spence. *Linear Algebra*. Prentice Hall, 2003.
5. Hoffman, K. and R. Kunze. *Linear Algebra, 2nd Edition*. Prentice-Hall of India, 1989.
6. Lang, S. *Linear Algebra, Undergraduate Texts in Mathematics.* Springer-Verlag, New York, 1989.
7. Lax, P. *Linear Algebra*. John Wiley & Sons, New York. Indian Ed. 1997.

Course Title: Mechanics
Paper Code: PHY101B
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

UNIT-I
Fundamentals of Dynamics **15 Hours**

Fundamentals of Dynamics: Reference frames. Inertial frames; Galilean transformations; Galilean invariance.Centre of mass. Principle of conservation of momentum.
Conservative and nonconservative forces. Potential Energy. Force as gradient of potential energy.
Collisions: Elastic and inelastic collisions between particles. Centre of mass and laboratory frames. Various relations between lab and centre of mass frames.

UNIT-II
Rotational Dynamics and Elasticity **15 Hours**

Rotational Dynamics: 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. Kinetic energy of rotation. Motion involving both translation and rotation. Elasticity: Relation between Elastic constants.

UNIT-III

Central forces and non-inertial systems **15 Hours**

Central forces and Central Force Motion: Motion of a particle under a central force field. Two-body problem and its reduction to one-body problem. Differential equation of orbit. Kepler's laws. Satellite in circular orbit and applications. Basic idea of global positioning system.
Non-Inertial Systems: Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications. Components of velocity and acceleration in cylindrical and spherical Coordinate systems.

UNIT-IV
Special Theory of Relativity **10 Hours**

Special Theory of Relativity: Michelson-Morley experiment and its outcome. Postulates of special theory of relativity. Lorentz transformations. Simultaneity and order of events. Lorentz contraction. Time dilation and its experimental verification. Relativistic transformation of velocity, Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy equivalence. Relativistic Doppler effect. Relativistic kinematics. Transformation of energy and momentum

Reference Books:

1. D. Kleppner, R.J. Kolenkow, An introduction to mechanics, New Delhi: McGraw- Hill, 1973.
2. C.Kittel, W.Knight, et.al. Mechanics, Berkeley Physics, vol.1, New Delhi: Tata McGraw-Hill, 2007.
3. Resnick, Halliday and Walker, Physics, 8/e. Wiley, 2008.
4. G.R. Fowles and G.L. Cassiday, Analytical Mechanics, New Delhi: Cengage Learning, 2005.
5. R. P. Feynman, R. B. Leighton, M. Sands, Feynman Lectures, Vol. I, Pearson Education, 2008.
6. R. Resnick, Introduction to Special Relativity, John Wiley and Sons, 2005.
7. R. L. Reese University Physics, Thomson Brooks/Cole, 2003.
8. D.S. Mathur, Mechanics, New Delhi: S. Chand and Company Limited, 2000.
9. F.W Sears, M.W Zemansky, H.D Young, University Physics. 13/e, Addison Wesley, 1986.
10.

Course Title: Physics-I Laboratory
Paper Code: PHY104A

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.

List of Experiments:

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To study the random error in observations.
3. To determine the height of a building using a Sextant.
4. To study the Motion of Spring and calculate (a) Spring constant, (b) **g** and (c) Modulus of rigidity
5. To determine the Moment of Inertia of a Flywheel.
6. To determine **g** and velocity for a freely falling body using Digital Timing Technique
7. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
8. To determine the Young's Modulus of a Wire by Optical Lever Method.
9. To determine the Modulus of Rigidity of a Wire by Maxwell's needle
10. To determine the elastic Constants of a wire by Searle's method.
11. To determine the value of g using Bar Pendulum.
12. To determine the value of g using Kater's Pendulum.
13. To study the characteristics of a series RC Circuit.
14. To determine an unknown Low Resistance using Potentiometer.
15. To determine an unknown Low Resistance using Carey Foster's Bridge.
16. To compare capacitances using De'Sauty's bridge.
17. Measurement of field strength B and its variation in a solenoid (determine dB/dx).
18. To verify the Thevenin and Norton theorems.
19. To verify the Superposition, and Maximum power transfer theorems.
20. To determine self inductance of a coil by Anderson's bridge.
21. To study response curve of a Series LCR circuit and determine its (a) Resonant

frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.

22. Determine a high resistance by leakage method using Ballistic Galvanometer.
23. To determine self-inductance of a coil by Rayleigh'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)

Reference Books:

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. Dietel and Dietel, *Internet and World Wide web: How to Program*, Pearson(2008)
5. Ullman Larry, *PHP for the World Wide Web,Visual QuickStart Guide*. New Delhi: Peachpit Press, fourth edition (2011)
6. Uttam K. Roy, ***Web Technologies*** , Oxford HigherEducation.
7. Chris Bates, *Web Programming Building Internet Applications*, 2 ed, John Wiley & Sons, 2002

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: Theory of Equations
Course Code: MTH127
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
5	1	0	6	100

Course Objective: The aim of this course is to study general properties of polynomials and to find the roots of different types of polynomials.

UNIT-A **15 Hours**

General properties of polynomials, Graphical representation of a polynomial, maximum and minimum values of a polynomials, General properties of equations, Fundamental theorem of algebra, Product form of an algebraic equation, Repeated factors, equal roots, Descarte's rule of signs positive and negative rule, Complex root, Relation between the roots and the coefficients of equations.

UNIT-B **15 Hours**

Symmetric functions, Applications of symmetric function of the roots, Transformation of equations, Reciprocal equations, Binomial equations, Solutions of reciprocal equations, Euclidean construction of the regular polygon, Algebraic solutions of the cubic and biquadratic. Properties of the derived functions.

UNIT-C **15 Hours**

Symmetric functions of the roots, Newton's theorem on the sums of powers of roots, homogeneous products, limits of the roots of equations.

UNIT-D **15 Hours**

Separation of the roots of equations, Strums theorem, Applications of Strum's theorem, Conditions for reality of the roots of an equation and biquadratic. Solution of numerical equations. Newton's method and Horner's method for solving an equation.

Reference Books:

1. Burnside, W. S. and A. W. Panton. The Theory of Equations. Dublin & London: Dublin University Press, 1954. Print
2. MacDuffee, C. C. Theory of Equations. John Wiley & Sons Inc., 1954. Print
3. Turnbull, H.W. Theory of equations. London & New York, Interscience Publishers, Inc., 1947 Print

Course Title: Differential Equations
Course Code: MTH128
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 **15 Hours**

Basic definitions: order and degree of differential equation, formulation of differential equations. General, particular, explicit, implicit and singular solutions of a differential equation, integral curves, isoclines.

First order differential equations: Linear differential equation, variables separable and equations reducible to this form, homogeneous equations and equations reducible to homogeneous form. Exact differential equations and integration factors. Bernoulli equations and Geometrical interpretation of first order differential equation, applications.

UNIT-B **12 Hours**

Non-linear differential equation of first order- Equations solvable for p, equations solvable for x, equations solvable for y, equations in Clairaut's form and equations reducible to Clairaut's form.

Extraneous Loci: Definition, Tac locus, the Node locus, Cusp locus.

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**

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.

Reference Books:

1. Ross S.L. *Differential Equations*, 3rd edition. India: John Wiley and Sons, 2004.
2. Rai B., Choudhury D. P. and Freedman H. I. *A Course in Ordinary Differential Equations.* Alpha Science International Ltd. 2012.

3. Codington E.A. *An Introduction to Ordinary Differential Equation*. New York: Dover Publications, 1989.
4. Barnes, Belinda and Glenn R. Fulford. *Mathematical Modeling with Case Studies: A Differential Equation Approach using Maple and MATLAB, 2nd Ed.* London and New York: Taylor and Francis group, 2009.

Course Title: Vibrations and Waves
Paper Code: PHY111B
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Unit I **15 Hours**

Hooke's law,Simple harmonic motion, Equation of Simple harmonic motion, Frequency, Amplitude, Displacement, Velocity, Acceleration, and phase difference of SHM, Energy of a simple harmonic oscillator, Compound pendulum, Torsional pendulum, Kater's pendulum, Simple harmonic oscillations in electrical system, Principle of Superposition Harmonic Oscillations, Superposition of Two Harmonic Motions of Same Frequency and Lissajous Figures and its applications, Anharmonic Oscillations.

Unit II **15 Hours**

Damped simple harmonic motions in mechanical and electrical system, Decay of free vibrations due to damping, Differential equation of damped harmonic motion and its solution, Types of damping, Determination of damping coefficient of a damped vibrating system – Logarithmic decrement, Relaxation time, and Quality Factor, Forced Vibrations – Mechanical and Electrical Forced Oscillator, Differential equations for forced mechanical and electrical oscillators, Transient and steady state oscillations.

Unit III **15 Hours**

Forced Mechanical Oscillators - Displacement, Velocity and Acceleration, Variation of Displacement, Velocity and Acceleration with driving force frequency, Power supplied to Forced Oscillator by the driving force, Power dissipated against frictional force, Variation of power with driving force frequency, Quality factor, Amplification factor of forced oscillator Coupled Oscillations - Mechanical and Electrical Coupled Oscillators, Stiffness Coupled Oscillators, Potential energy of coupled pendulums, Equation of motion of two coupled pendulums, Normal coordinates and Normal modes of vibrations, Degrees of freedom,Inductive coupling of electrical oscillators.

Unit IV **15 Hours**

What is wave?, Types of Waves - Longitudinal and Transverse Waves, Characteristics of Wave Motion, Differential Equation of Wave Motion, Equation of a Progressive Simple Harmonic Waves, Energy in Progressive waves, Velocities of Wave motion – Particle, Wave, Group Velocities, Relation between Particle Velocity and Wave Velocity, Velocity of Transverse Waves, Characteristics impedance of string, Reflection and Transmission of Waves on a string at a Boundary, Reflection and Transmission Coefficients – Amplitude and Energy, Stationary Waves and Waves on a string of fixed length, Nodes and Anti-nodes, Energy of a Vibrating String.

Reference Books:

1.S P Puri, Vibrations and Waves, Macmillan India Ltd.,2004.
2.H. J. Pain, Physics of Vibrations and Waves, John Wiley and Sons, 2013.
3.N.K. Bajaj, Physics of Waves and Oscillations, Tata McGraw Hill, 1998

Course Name: Waves And Nalog Electronics Laboratory
Course Code: PHY132

L	T	P	Credits	Marks
0	0	4	2	100

List of experiments:

1. To determine the frequency of a tuning fork using a sonometer.
2. To verify the laws of transverse vibrations of stretched strings using a sonometer.
3. To determine the frequency of an electrically maintained tuning fork by Melde's experiment.
4. To determine the frequency of AC mains using a sonometer and an electromagnet.
5. To find the velocity of sound in the material of the given rod with a Knudt's tube.
   22. To determine the velocity of ultrasonic waves in a given liquid.
6. To measure the logarithmic decrement, coefficient of damping, relaxation time and quality factor of a simple damped pendulum.
7. To find the resistivity of a semiconductor crystal by using the Four Probe technique and hence, determine the band gap of the material.
8. To determine the carrier concentration and mobility of the semiconductor crystal by using the Hall effect measurement technique.
9. To study V-I characteristics of PN junction diode, and Light emitting diode.
10. To study the V-I characteristics of a Zener diode and its use as voltage regulator.
11. To study (a) Half-wave Rectifier and (b) Full-wave Bridge Rectifier and investigate the effect of C, L and π filters.
12. To study the current voltage characteristics of the Tunnel diode.
13. Study of V-I & power curves of solar cells, and find maximum power point & efficiency.
14. To study the characteristics of a Bipolar Junction Transistor in CE, CB and CC configurations.
15. To study the various biasing configurations of BJT.
16. To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias.
17. To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
18. To design a phase shift oscillator of given specifications using BJT.
19. To study the characteristics of Junction Field Effect Transistor (JFET).
20. To study the characteristic of Metal Oxide Semiconductor Field Effect Transistor (MOSFET).
21. To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
22. To design a Wien bridge oscillator for given frequency using an op-amp.
23. To design a phase shift oscillator of given specifications using BJT.
24. To study the Colpitt`s oscillator.
25. To design a digital to analog converter (DAC) of given specifications.
26. To study the analog to digital convertor (ADC) IC.

27. To design an inverting amplifier using Op-amp (741, 351) for dc voltage of given gain
28. To design inverting amplifier using Op-amp (741, 351) and study its frequency response
29. To design non-inverting amplifier using Op-amp (741,351) & study its frequency response
30. To study the zero-crossing detector and comparator
31. To add two dc voltages using Op-amp in inverting and non-inverting mode
32. To design a precision Differential amplifier of given I/O specification using Op-amp.
33. To investigate the use of an op-amp as an Integrator.

L	T	P	Credits	Marks
3	0	0	3	75

Course Title: Communication Skills
Course Code: ENG151B
No. of Lectures: 35-45 hours

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: ENG152A
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

L	T	P	Credits	Marks
4	0	0	4	100

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

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

L	T	P	Credits	Marks
4	0	0	4	100

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

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).
6. Elmasri, Navathe, Fundamentals of Database System, 7e, Pearson India.

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: Real Analysis
Course Code: MTH229
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 the basic properties of the field of real numbers, concepts of limit and convergence (of real sequences, series) and to indicate how these are treated rigorously, and then show how these ideas are used in the development of real analysis.

UNIT-A **16 Hours**

Review of Algebraic and Order Properties of $\mathbb{R}$, neighborhood of a point in $\mathbb{R}$, Idea of countable sets, uncountable sets and uncountability of $\mathbb{R}$.

Bounded above sets, Bounded below sets, Bounded Sets, Unbounded sets, Suprema and Infima, The Completeness Property of $\mathbb{R}$, The Archimedean Property, Density of Rational (and Irrational) numbers in $\mathbb{R}$. Characterization of intervals, Cantor Nested Interval Theorem.

UNIT-B **14 Hours**

Sets in IR (Intervals): Neighborhood of a point. Properties of Neighbourhoods. Interior point. Open set. Union and Intersection of open sets. Limit point and isolated point of a set. Definition of derived set. Illustrations of Bolzano-Weierstrass theorem for sets. Closed set. Complement of open set and closed set. Union and intersection of closed sets as a consequence. No nonempty proper subset of $\mathbb{R}$ is both open & closed. Dense set in $\mathbb{R}$ as a set having non-empty intersection with every open interval. Q and $\mathbb{R}$ - Q are dense in $\mathbb{R}$.

UNIT-C **13 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: Infinite series, convergence and divergence of infinite series, Cauchy Criterion, Tests for convergence: Comparison test, Limit Comparison test, Ratio Test, Cauchy's nth root test, Integral test, Alternating series, Leibniz test, Absolute and Conditional convergence.

Reference Books

1. Bartle, R.G. and D.R. Sherbert. *Introduction to Real Analysis*, 4th 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.

Course Title: Partial Differential Equations
Course Code: MTH231
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.

UNIT-A **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.

UNIT-B **12 Hours**

Nonlinear equations of first order (four standard forms). Charpit method for finding complete integral of a non-linear PDE. Homogeneous linear equations with constant coefficients. Canonical Forms of First-order Linear Equations. Method of Separation of Variables for solving first order partial differential equations.

UNIT-C **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-D **13 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.

Reference Books:

1. Tyn Myint-U and Lokenath Debnath, *Linear Partial Differential Equations for Scientists and Engineers*, 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.
5. Kreyszig, Erwin, *Advanced Engineering Mathematics*. New Delhi: John Wiley & Sons, 1999.

Course Title: Digital Systems and Application
Paper Code: PHY221A
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Unit I **10 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 **20 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 Logic Circuit 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)**

Arithmetic and Sequential Circuits: Binary Addition. Binary Subtraction using 2'sComplement;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 Parallelin-Parallel-out, Shift Registers (only up to 4 bits).**Counters (4 bits):** Ring Counter, Asynchronous counters, Decade Counter. Synchronous, Counter.

Unit IV **(10)**

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.

Reference Books:

1. A. P. Malvino, and D. P. Leach, Digital Principles and Applications. New Delhi: Tata
2. McGraw Hill, 1986.
3. A. P. Malvino, Digital Computer Electronics. New Delhi: Tata McGraw Hill, 1986.
4. W. H. Gothmann, Digital Electronics. New Delhi: Prentice Hall, 1980.
5. J. Millman, and H. Taub, Pulse, Digital and Switching Waveforms. New Delhi: Tata

6. McGraw Hill, 1992.
7. A. Mottershead, Electronic Devices and Circuits. New Delhi: Prentice Hall, 1977.

Course Title: Digital Electronics Laboratory

Course Code: PHY224

L	T	P	Credits	Marks
0	0	4	2	50

1. To measure (a) Voltage, and (b) Time period of a periodic waveform using CRO.
2. To test a Diode and Transistor using a Multimeter.
3. To design a switch (NOT gate) using a transistor.
4. To verify and design AND, OR, NOT and XOR gates using NAND gates.
5. To design a combinational logic system for a specified Truth Table.
6. To convert a Boolean expression into logic circuit and design it using logic gate ICs.
7. To minimize a given logic circuit.
8. Half Adder, Full Adder and 4-bit binary Adder.
9. Half Subtractor, Full Subtractor, Adder-Subtractor using Full Adder I.C.
10. Parity generator and checker.
11. To study D/A and A/D convertors
12. To build Flip-flop Circuits using elementary gates (RS, Clocked RS, D type, and JK Flip- Flop).
13. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
14. To build JK Master-slave flip-flop using Flip-Flop ICs
15. To build a 4-bit Counter using D-type/JK Flip-Flop ICs and study timing diagram.
16. To make a 4-bit Shift Register (serial and parallel) using D-type/JK Flip-Flop ICs.
17. Write the following programs using 8085 Microprocessor

a) Addition and subtraction of numbers using direct addressing mode
b) Addition and subtraction of numbers using indirect addressing mode
c) Multiplication by repeated addition.
d) Division by repeated subtraction.
e) Handling of 16-bit Numbers.
f) Use of CALL and RETURN Instruction.
g) Block data handling.
h) Other programs (e.g. Parity Check, using interrupts, etc.).

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: Workshop on E-Marketing
Course Code: CSA221

L	T	P	Credits	Marks
0	0	4	2	50

- Introduction to digital marketing
- Digital Strategy and Planning
- Website marketing tools
- Digital content – website, blogs, email, webinars, videos, podcasts, e-zines, PPC advertising
- Social Media and Social Bookmarking – Facebook, Twitter, Pinterest, Instagram, YouTube and YouTube channels and emerging social medias
- Search Engine Marketing – What it is, how it works and how to make it work
- Search Engine Optimisation -What it is, how it works and how to make it work
- Measuring Digital media performance • Ecommerce, Tcommerce and Mcommerce
- Implementing the digital marketing plan • Website design /development for digital marketing
- Mastering Google - AdWords Advertising, Analytics & Applications

Reference Books:

1. Blanchard O. (2014) Social Media ROI: Managing and Measuring Social Media Efforts in Your Organization
2. Pulizzi, J. (2013) Epic Content Marketing Marketing on Facebook – Best practice guide (2015) Facebook Marketing Press
3. Chaffey, D., & Ellis-Chadwick, F. (2012) Digital Marketing: Strategy, Implementation and Practice, 5/E, Pearson
4. Tapp, A., & Whitten, I., & Housden, M. (2014) Principles of Direct, Database and Digital Marketing, 5/E, Pearson
5. Tasner, M. (2015) Marketing in the Moment: The Digital Marketing Guide to Generating More Sales and Reaching Your Customers First, 2/E, Pearson

Websites

www.smartinsights.com, www.hubspot.com
www.mashable.com ,www.emarketer.com
www.socialmediaexaminer.com , www.brandrepublic.com
www.allfacebook.com , www.insidefacebook.com
www.ipassexam.com,www.wordstream.com
www.seomoz.org, www.searchengineland.com , www.searchenginewatch.com

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.
4. K.K.Aggarwal, Y.Singh, *Software Engineering*, New Age International Publishers, 3rd ed., 2007.

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: Numerical Methods
Course Code: MTH225A
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: The aim of this course is to teach the applications of various numerical techniques for a variety of problems occurring in daily life. At the end of the course, the students will be able to understand the basic concepts in Numerical Analysis of differential equations.

UNIT-A **15 HOURS**

Approximate numbers, Significant figures, rounding off numbers, Inherent errors, Rounding errors, Truncation errors, Absolute, Relative and Percentage error.
Non-Linear Equations: Transcendental and Polynomial equations. Bisection method, Secant method, Regula-Falsi method, Newton's method, Order of convergence of these methods

UNIT-B **14 HOURS**

System of linear algebraic equations: Matrix inversion method, Gauss Elimination method, Gauss Jordan method and its application to find A^{-1} , Jacobi method, Gauss Seidel method.

UNIT-C **13 HOURS**

Operators: Forward, Backward and Shift (Definitions and relations among them).
Interpolation: Divided difference operators. Newton's forward and backward difference interpolation. Newton's divided difference formula, Lagrange's interpolation, Inverse Interpolation

UNIT-D **14 HOURS**

Numerical Integration: General integration formula and its particular cases for n=1, 2 and 3. (Order of Error in each case)
Numerical solutions to first order ordinary differential equations: Picard method of successive approximations, Taylor series method**,** Euler's method, Modified-Euler's method, Runge-Kutta methods.

Reference Books:

1. Shastry, S. S. *Introductory Methods of Numerical Analysis*. New Delhi: PHI Learning Private Limited, 2005.
2. Jain, M.K., Iyenger, S. R. K. and R. K. Jain. *Numerical Methods for Scientific and Engineering Computation.* Delhi: New Age International Publishers, 2012.
3. Gerald C. F., and P. O. Wheatley. *Applied Numerical Analysis.* India: Pearson Education, 2008.
4. Mathews, John H., and D. Fink Kurtis. *Numerical Methods using Matlab 4th Edition.* New Delhi: PHI Learning Private Limited, 2012.
5. Grewal B. S. *Numerical Methods in Engineering and Science.* New Delhi: Khanna Publishers, 2014

Course Title: Analytical Geometry
Course Code: MTH234
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
5	1	0	6	100

Course Objective: The course is an introductory course on Analytical Geometry so as to provide basic understanding of the geometry of two and three dimensions.

UNIT-A **14 Hours**

Preliminary- Cartesian co-ordinates, polar co-ordinates and their transformations, straight line in $2-D$, positive and negative side of a line, bisectors of angles; Change of Axes- Translation and rotation of axes, general transformation, invariants; Pair of Straight lines- Homogeneous equation of second degree, angle between pair of straight lines, joint equation of the angle bisectors, joint equation of lines joining origin to the intersection of a line and a curve; Circle: General equation of circle, tangents and normal, pair of tangents from a given point, chord of contact, pole and polar, equation of chord in terms of mid-point, angle of intersection and orthogonality of two circles, radical axis, coaxial family of circles.

UNIT-B **14 Hours**

Conics- Standard equations of conics (parabola, ellipse, hyperbola), tangent and normal, tangents from a point, chord of contact, pole and polar, equation of chord in terms of midpoint, diameter, conjugate diameters of ellipse and hyperbola, special properties of parabola, ellipse and hyperbola, asymptotes of a hyperbola, conjugate hyperbola, , rectangular hyperbola; Tracing of conics- The second degree equation $S = ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$, reduction of the second degree equation into standard form, principal axes and eccentricity of a conic, identification of curves represented by $S = 0$ (including pair of lines); Polar equation of a conic- Polar equations of straight lines, circles and conics, polar equation of chords, tangents and normal, director circle.

UNIT-C **14 Hours**

The plane- Equation of a plane and its different forms, system, two sides of a plane, bisector of angles between two planes, joint equation of two planes, distance of a point from a plane; The line- Equation of line in $3-D$ and its symmetrical & unsymmetrical forms, angle between line and a plane, conditions for a line to lie in a plane, co-planarity of lines, shortest distance between two lines, length of perpendicular from a point to a line; Sphere- Equation of a sphere and its properties, the tangent plane, plane of contact, the polar plane, angle of intersection of two spheres,

UNIT-D **14 Hours**

Cone and Cylinder- Equation of a cone, enveloping cone of sphere, intersection of cone with a line, right circular cone, equation of cylinder, enveloping cylinder, right circular cylinder; Conicoids- General equation of the second degree in three variables, equations of central

conicoids (the ellipsoid, hyperboloid of one and two sheets), intersection of line with a conicoid, directorsphere, normals from a given point, elliptic and hyperbolic paraboloid.

Reference Books:

1. Jain, P.K., and A. Khalil, *A textbook of Analytical Geometry*. New Age International Publishers, Edition 3rd, New Delhi, 2014.
2. Narayan, S. and P.K. Mittal, *Analytical Solid Geometry*. S. Chand & Company Pvt. Ltd., New Delhi, 2008.

L	T	P	Credits	Marks
4	0	0	4	100

Course Title: Optics
Paper Code: PHY231A
Course Duration: 45-60 Hours

UNIT-I **15 HOURS**

Wave Optics: Electromagnetic nature of light, Definition and Properties of wave front, Huygens Principle.

Interference: Interference: Division of amplitude and division of wave-front, Young's Double Slit experiment, Lloyd's Mirror and Fresnel's Biprism, Phase change on reflection: Stokes' treatment, Interference in Thin Films, parallel and wedge-shaped films, Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (FizeauFringes), Newton's Rings: measurement of wavelength and refractive index, Michelson's Interferometer: Idea of form of fringes, Determination of wavelength, Wavelength difference, Refractive index, and Visibility of fringes.

UNIT-II **15 HOURS**

Fraunhoffer Diffraction: Difference between interference and diffraction, Fraunhoffer diffraction- Single slit; Circular disc, Airy disc, Double Slit. Multiple slits and Diffraction grating, Diffraction of N slits and its discussion, Diffraction grating, Missing orders, dispersive power, prism and grating, Rayleigh Criterion for resolving power, Resolving power of plane transmission grating

UNIT-III **15 HOURS**

Fresnel Diffraction: Fresnel Diffraction, Huygen-Fresnel theory, Fresnel's principle of diffraction, Half-period zones, Zone plate, Diffraction at circular aperture, Diffraction at opaque circular disc, Fresnel Diffraction pattern of a straight edge, a slit and a wire, Cornu's spiral, Difference between Fresnel and Fraunhoffer diffraction

UNIT-IV **15 HOURS**

Polarization: Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization, Polarization by transmission and reflection, Malus Law, Brewster's Law, Polarization by refraction, anisotropic crystals, Theory of double refraction, Elliptically and circularly polarized light, Quarter wave and half wave plates, Production and detection of polarized light. Nicol Prism, Optical activity, specific rotation. Half shade polarimeter

Reference Books:

1. F. A. Jenkins and H. E. White Fundamentals of Optics, McGraw-Hill , 1976.
2..H. R. Gulati and D. R. Khanna Fundamentals of Optics, R. Chand Publications, 1991

3. N. Subramanayam, B. Lal, & M. N. Avadhamulu, Textbook of Optics. New Delhi: S. Chand & Company, 2006
4. A. Ghatak,Optics. New Delhi: Tata McGraw Hill Publication, 2008

Course Title: Thermal and Statistical Physics
Paper Code: PHY234
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Unit 1. Basic Thermodynamics 15 Hours

Laws of Thermodynamics, The zeroth law, indicator or PV diagrams, work done, internal energy, Carnot cycle, Carnot's engine. Entropy as a thermodynamic variable; reversible and irreversible processes, Principle of increase of entropy, Statistical basis of entropy, Thermodynamic scale of temperature; its identity with perfect gas scale, impossibility of attaining absolute zero.

.

Unit 2. Maxwell Relations 15 Hours

Thermodynamic potentials and equilibrium of thermodynamic systems, Maxwell's equations, Clausius Clapeyron equation, Joule Thomson effect, Use of Joule Thomson effect in liquefaction of gasses, Low temperatures: Production and measurement of very low temperatures, adiabatic demagnetization, Phase transitions of first and second orders, phase diagrams of Helium, Gibbs phase rule and its applications.

Unit 3. Statistical Physics 15 Hours

Scope of statistical physics, micro and macrostates, thermodynamic probability distribution of n particles in two compartments, deviation from the state of maximum probability; equilibrium state of dynamic system, distribution of distinguishable particles in compartments and cells, phase space and its division into cells, Boltzmann statistics for ideal gas, Bose Einstein statistics and its applications to photon gas, Fermi Dirac statistics and its application to electron gas, comparison of the three statistics

Unit 4. Theory of Thermal Radiation 15 Hours

Properties of Thermal Radiation, Blackbody Radiation, Spectral distribution of Blackbody radiation, Kirchhoff's Law and applications, Radiation Pressure, Stefan Boltzmann Law Thermodynamical proof, Planck's Quantum Postulates, Planck's Law of Blackbody Radiation, Rayleigh Jeans Law, Stefan Boltzmann Law, Wien's displacement Law from Planck's Law.

Reference Books:

1. R.H. Swendsen, An Introduction to Statistical Mechanics & Thermodynamics. Oxford: Oxford University Press, 2012.
2. C. S Helrich,. Modern Thermodynamics with Statistical Mechanics. Berlin: Springer, 2009.

3. V.S. Bhatia, Statistical Physics and Thermodynamics. New Delhi: Vishal Publication, 1986.

4. M.W. Zemansky, and R.H. Dittman, Heat and Thermodynamics. New York: McGraw-Hill, 1996
5. S Lokanathan.andR. S. Gambhir, Statistical and Thermal Physics. New Delhi: Rentice Hall, 1991.

Course Title: Thermal and Statistical Physics Laboratory
Course Code: P**HY235**

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 2hours duration

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne'sconstant flow method.
2. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.
3. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
4. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method.
5. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).
6. To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its two Junctions.
7. To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method, (2) Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature.
8. To measure the thermal conductivity and thermal diffusivity of a conductor.
9. To determine the value of Stefan's Constant of radiation.
10. To find the thermal conductivity of copper

11. Measurement of Planck's constant using black body radiation.

L	T	P	Credits	Marks
0	0	4	2	50

Course Title: Numerical Methods Laboratory
Course Code: MTH 226
Course Duration: 45-60 Hours

Course Objective: The aim of this course is to teach the applications of various numerical techniques for a variety of problems occurring in daily life. At the end of the course, the students will be able to understand the basic concepts in Numerical Analysis of differential equations.

List of Practicals (using any programming software)

1. Introduction to MATLAB.
2. Averaging of numbers.
3. Magnitude of a vector.
4. Sum of Sine/Cosine series.
5. Sorting of numbers.
6. Bisection Method.
7. Secant Method.
8. Regula Falsi Method.
9. Gauss-Elimination
10. Newton Interpolation.
11. Lagrange interpolation.
12. Trapezoidal rule.
13. Simpson's $1/3^{rd}$ and $3/8^{th}$ rule.
14. Euler's method.

Reference Books:

1. Shastry, S.S. *Introductory Methods of Numerical Analysis.* New Delhi: PHI Learning Private Limited, 2005. Print.
2. Iyenger, S.R.K., R.K. Jain, and Mahinder Kumar. *Numerical Methods for Scientific and Engineering Computation.* Delhi: New Age International Publishers, 2012. Print.
3. Gerald C.F., and P.O. Wheatley. *Applied Numerical Analysis.* India: Pearson Education, 2008. Print.
4. Mathews, John H., and D. Fink Kurtis. *Numerical Methods using Matlab*, 4th Ed. New Delhi: PHI Learning Private Limited, 2012. Print.
5. Grewal B.S. *Numerical Methods in Engineering and Science.* New Delhi: Khanna

Publishers, 2014. Print.

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

L	T	P	Credits	Marks
4	0	0	4	100

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: Number Theory
Course Code: MTH324
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
5	1	0	6	100

Course Objective: The objective is for the students to obtain a foundational knowledge of elements of Number Theory through step-by-step proofs of classical theorems, as well as to sharpen their skills through problem-solving. The material of the course will be such that one can be initiated to the subject gradually and thus future study will be made more natural.

UNIT-A **15 Hours**

Linear Diophantine equation, prime counting function, statement of prime number theorem, Goldbach conjecture, linear congruences, complete set of residues, Chinese Remainder theorem, Fermat's Little theorem, Wilson's theorem.

UNIT-B **15 Hours**

Number theoretic functions, sum and number of divisors, totally multiplicative functions, definition and properties of the Dirichlet product, the Mobius Inversion formula, the greatest integer function.

UNIT-C **15 Hours**

Euler's phi-function, Euler's theorem, reduced set of residues, some properties of Euler's phi-function. Order of an integer modulo n, primitive roots for primes, composite numbers having primitive roots, Euler's criterion, the Legendre symbol and its properties, quadratic reciprocity.

UNIT D **15 Hours**

Quadratic congruences with composite moduli. Public key encryption, RSA encryption and decryption, the equation $x^2 + y^2 = z^2$, Fermat's Last theorem.

Reference Books:

1. Burton, David M. *Elementary Number Theory*, 7th Ed., Delhi: Tata McGraw-Hill, 2007. Print.
2. Robinns, Neville. *Beginning Number Theory*, 2nd Ed., Delhi: Narosa Publishing House Pvt. Ltd., Delhi, 2007. Print.
3. Jones, G.A., and J.M. Jones. *Elementary Number Theory*, Springer, 1998, Print.

Course Title: Solid State Physics
Course Code: PHY303C
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Unit I Solids **17 Hours**

Amorphous and Crystalline Materials, Lattice Translation Vectors, Lattice with a Basis – Central and Non-Central Elements, Unit Cell, Types of Lattices- hexagonal close packed structure. FCC and BCC structure, simple crystal structure, Miller Indices, Reciprocal Lattice, Reciprocal lattice to SC, BCC and FCC lattic, Brillouin Zones, Diffraction of X-rays by Crystals, Bragg's Law, Atomic and Geometrical Factor.

Unit II Elementary Lattice Dynamics **12 Hours**

Lattice vibrations and phonons, phonon momentum,Wave motion on a lattice: one dimensional line of atoms and linear diatomic lattice, optical and acoustical branchs, Dulog and Petits law, Einstein and Debye theories of specific heat of solids, T3 law.

Unit-III Free Electron Theory **14 Hours**

Drude Lorentz theory, Sommerfeld model, the Fermi Dirac distribution, Effect of temperature on FD distribution, electronic specific heat, the electrical conductivity and Ohm's Law, the thermal conductivity of metals. WiedemannFrenz law, Density of states, Fermi energy.

Unit IV Elementary Band theory **17 Hours**

Electrons in periodic structure: Kronig-Penney model of one dimensional crystal, band gaps, energy bands, effective mass of electrons and holes, Classification of insulators, semiconductors and metals, P and N type of semiconductors, conductivity of semiconductors, Fermi levels in P and N type of semiconductors, mobility, Hall effect, Hall coefficient.

Reference Books:

1.Charles Kittel, Introduction to Solid State Physics, 8th Ed., Wiley India Pvt. Ltd. 2004.

2.J.P. Srivastava, Elements of Solid State Physics, 2nd Ed., Prentice-Hall of India, 2006.
3.Leonid V. Azaroff, Introduction to Solids, Tata Mc- Graw Hill, 2004.
4.N.W. Ashcroft and N.D. Mermin, Solid State Physics, Cengage Learning, 1976.
5.Rita John, Solid State Physics, McGraw Hill, 2014
6.H. Ibach and H. Luth, Solid-state Physics, Springer, 2009.
7.M. Ali Omar, Elementary Solid State Physics, Pearson India, 1999

8.M.A. Wahab , Solid State Physics, Narosa Publications, 2011,

Course Title: Quantum Physics
Course Code: PHY322
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

UNIT-I **17 Hours**

Time dependent and Independent Schrodinger Equation

Time dependent Schrodinger equation and dynamical evolution of a quantum state; Properties of Wave Function. Interpretation of Wave Function Probability and probability current densities in three dimensions; Conditions for Physical Acceptability of Wave Functions. Normalization. Linearity and Superposition Principles. Eigenvalues and Eigenfunctions. Position, momentum and Energy operators; commutator of position and momentum operators; Expectation values of position and momentum. Wave Function of a Free Particle. Time independent Schrodinger equation-Hamiltonian, stationary states and energy eigenvalues; expansion of an arbitrary wavefunction as a linear combination of energy eigenfunctions; General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states; Application to spread of Gaussian wave- packet for a free particle in one dimension; wave packets, Fourier transforms and momentum, space wavefunction; Position-momentum uncertainty principle.

UNIT-II **13 Hours**

Problems in ID and Quantum theory of hydrogen-like atoms

Problems in one dimension: Potential step, potential barrier,rectangular potential well, degeneracy, linear dependence, Sturm's theorem, bound states, orthogonality, linear harmonic oscillator, oscillator wave function, parity.

Time independent Schrodinger equation in spherical polar coordinates; separation of variables for second order partial differential equation; angular momentum operator & quantum numbers; Radial wave functions from Frobenius method; shapes of the probability densities for ground & first excited states; Orbital angular momentum quantum numbers l and m; s, p, d,. shells.

UNIT-III **15 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 Magneton. Normal and Anomalous Zeeman Effect. Paschen Back and Stark Effect (Qualitative Discussion only).

UNIT IV **15 Hours**

Many Electron atom

Pauli's Exclusion Principle. Symmetric & Antisymmetric Wave Functions. Periodic table. Fine structure. Spin orbit coupling. Spectral Notations for Atomic States. Total angular momentum. Vector Model. Spin-orbit coupling in atoms- L-S and J-J couplings. Hund's Rule. Term symbols. Spectra of Hydrogen and Alkali Atoms (Na etc.).

Reference Books:

1.J.L. Powell, and B. Crasemann, Quantum Mechanics.NewDelhi: Narosa. 1995.
2.D.J. Griffiths, Introduction to Quantum Mechanics.UK:Pearson, 2005.
3.E. Merzbache, rQuantum Mechanics. New York:Wiley.1970.
4.S. Gasiorowicz, Quantum Physics. New York:Wiley. 2000
5.F. Schwabl, Quantum Mechanics NewDelhi: Narosa. 1992
6.P.M.Mathews and K.Venkatesan, A Text book of Quantum Mechanics, 2 Ed., 2010, McGraw Hill

L	T	P	Credits	Marks
0	0	4	2	50

Course Title: **Quantum And Solid State Laboratory**
Course Code: **PHY323**

Course 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 sensitiveequipments.

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 measure the Magnetic susceptibility of Solids.

2.To determine the Coupling Coefficient of a Piezoelectric crystal.

3.To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis.

4.To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150oC) and to determine its band gap.

5.To determine the Hall coefficient of a semiconductor sample.

6.To study temperature coefficient of resistance of Cu.

7.To measure the thermal conductivity and thermal diffusivity of a conductor.

8.To determine the value of Stefan's Constant of radiation.

9.To measure magnetic volume susceptibility of liquid FeCl2/MnSO solution by Quincke's method.

10.To measure dielectric constant of a non-polar liquid and its applications.

11.To study the reverse saturation current to a PN junction diode at various temperatures and to find out the approximate value of the energy gap.

12.Study of Electron spin resonance- determine magnetic field as a function of the resonance frequency

13.Study of Zeeman effect: with external magnetic field; Hyperfine splitting

14.To show the tunneling effect in tunnel diode using I-V characteristics.

15.Measurement of Planck's constant using black body radiation and photo-detector

16.Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light

17.To determine the Planck's constant using LEDs of at least 4 different colours.

18.To determine the ionization potential of mercury.

19.To determine the absorption lines in the rotational spectrum of Iodine vapour.

20.To setup the Millikan oil drop apparatus and determine the charge of an electron.

Reference Books:

1.B.L. Flint and H.T. Worsnop, Advanced Practical Physics for students, , Asia Publishing House,1971.

2.Michael Nelson and Jon M. Ogborn, Advanced level Physics Practicals, 4 Edition,reprinted Heinemann Educational Publishers, 1985.
3.I.Prakash& Ramakrishna, A Text Book of Practical Physics, 11thEd., Kitab Maha,2011.
4.J.P. Srivastava, Elements of Solid State Physics, 2nd Ed., Prentice-Hall of India,2006

Course Title: Data Warehousing and Mining
Course Code: CSA314
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective: This course provides the knowledge to students about the data warehousing and data mining techniques, data mining software and tools being used in industries.

UNIT—A **10 Hours**

Introduction

- The need for data warehousing
- Operational & Informational Data Stores
- Data Ware house Characteristics, Data Warehouse role & Structure, The cost of warehousing data

Introduction to OLAP & OLTP: Difference between OLAP & OLTP. OLAP Operations

UNIT—B **13 Hours**

- Building a Data Warehouse
- Design/Technical/Implementation Considerations
- Data Pre-processing Overview: Data Summarization, Data Cleaning, Data Transformation, Concept Hierarchy, Structure.
- Overview of Patterns & Models and Artificial Intelligence
- Multidimensional Data Model, Schemas for Multidimensional Data (Star Schema, Snowflake Schema, Fact Constellation.

UNIT—C **12 Hours**

Data Mining

- Association Rule Mining, Market Basket Analysis, Apriori Algorithm, Mining Multilevel Association Rules, From Association Mining to Correlation Analysis, Constraint Based Association Mining,
- Introduction to Classification, Classification by decision Tree, Attribute Selection Measure

UNIT—D **10 Hours**

Introduction to Prediction techniques

- Accuracy of a Classifier
- Cross-Validation, Bootstrap, Boosting, Bagging

- Introduction to Clustering, Classification of Various Clustering Algorithms, Selecting and Using Right DM Technique, Selecting and Using Right DM Technique, Data Visualization.

Reference Books:

1. Inmon W. H., *Building the Data Warehouse*, New York: John Wiley 2002.
2. Inmon W. H.,*Data Warehousing and Knowledge Management*, ork: New YJohn Wiley 1996.
3. Romez Elmasri, Shamkant B., Navathe,*Fundamentals of Database Systems*, New Delhi:Pearson Education, 2009.
4. Han, Kamber, Morgan Kaufmann, *Data Mining: Concepts and Techniques*, 2nd Edition, Elsevier, 2012.
5. Inmon, W.H., C. L. Gassey,*Managing the Data Warehouse*, New York:John Wiley 1999.
6. Fayyad, Usama M., *Advances in Knowledge Discovery and Data Mining*, MIT Press, 1996.
7. Silberschatz, Korth andSudershan,*Database System Concepts*, New Delhi: McGraw Hill, 4th Edition, 2010.

Course Title: Basics of Artificial Intelligence
Course Code: CSA320
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objective The objective of this course is to familiarize students with concepts of AI, its tools & technologies.

UNIT – A **10 Hours**

Introduction

- Background and History
- Overview of AI applications Areas

Knowledge Representation

- Network Representation-Associative Network & Conceptual Graphs
- Structured Representation- Frames & Scripts

UNIT – B **13 Hours**

Search Strategies

- Strategies For State Space Search-Data Driven And Goal Driven Search
- Search Algorithms- Uninformed Search (Depth First, Breadth First, Depth First With Iterative Deepening) And Informed Search (Hill Climbing, Best First, A* Algorithm, etc)

Expert Systems

- Introduction, Examples
- Characteristics Architecture, People Involved and Their Role in Building an Expert Systems

UNIT – C **12 Hours**

Natural Language Processing

- Introduction to Natural Language Processing
- Component Steps of Communication
- Contrast Between Formal and Natural Languages in the Context of Grammar

Introduction to AI languages

- Introduction to LISP and Prolog

UNIT-D **10 Hours**

Planning

- Basic Representation for Planning
- Symbolic-Centralized Vs. Reactive-Distributed

Pattern Recognition

- Introduction
    - Recognition & Classification Process
    - Learning classification patterns and clustering

Reference Books:

1. Elaine Rich,Kevin Knight and Nair Shiva Shankar B,*Artificial Intelligence*, Third Edition, New Delhi: Tata-McGraw Hill, 2008.
2. Winston, P.H. and Horn, B.K.P, *LISP*, Pearson, 1993.
3. Rajasekharan, S. and VijayalakshmiPai, G. A.,*Neural Networks, Fuzzy Logic and Genetic Algorithms*, New Delhi: Prentice Hall of India, 2003.
4. Luger George F., *Artificial Intelligence*, 5th edition, Pearson Education.
5. Patterson Dan W.,*Introduction to Artificial Intelligence and Expert syste*, New Delhi: PHI, 2005.
6. Bharti &Chaitany,*Natural Language Processing*, New Delhi: PHI, 2006.

Course Title: Introduction to Internet of Things
Course Code: CSA321
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives

- Vision and Introduction to IoT.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.

UNIT-A

Introduction to IoT **12 Hours**

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models &APIs

UNIT-B

IoT & M2M **13 Hours**

Machine to Machine, Difference between IoT and M2M, Software Defined Network
Network & Communication aspects
Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

UNIT-C
Challenges in IoT **10 Hours**

Design challenges, Development challenges, Security challenges, Other challenges

UNIT-D

Domain specific applications of IoT **10 Hours**
Home automation, Industry applications, Surveillance applications, Other IoT applications.

Reference Books:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands On Approach."
2. WaltenegusDargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice."

L	T	P	Credits	Marks
4	1	0	6	100

Course Title: Industrial Mathematics
Course Code: MTH 326
Course Duration: 45-60 Hours

Course Objective: Industrial Mathematics is to enable students to acquire the fundamentals of applied mathematics in areas of classical and numerical analysis, differential equations and dynamical systems, and probability and statistics.

UNIT-A **15 Hours**

Medical Imaging and Inverse Problems. The content X-Ray is based on Mathematics of complex numbers and matrices and CT scan based on the knowledge of equations.
Introduction to Inverse problems: Why should we teach Inverse Problems? Illustration of Inverse problems through problems taught in Pre-Calculus, Calculus, Matrices and differential equations.

UNIT-B **15 Hours**

Geological anomalies in Earth's interior from measurements at its surface (Inverse problems for Natural disaster) and Tomography.
X-ray: Introduction, X-ray behavior and Beers Law (The fundament question of image construction) Lines in the place.

UNIT-C

15 Hours

Radon Transform: Definition and Examples, Linearity, Phantom (Shepp - Logan Phantom - Mathematical phantoms).
Back Projection: Definition, properties and examples.

UNIT-D **15 Hours**

CT Scan: Revision of properties of Fourier and inverse Fourier transforms and applications of their properties in image reconstruction. Algorithms of CT scan machine. Algebraic reconstruction techniques abbreviated as ART with application to CT scan.

Reference Books:

1. Feeman, Timothy G. *The Mathematics of Medical Imaging. A Beginners Guide*, Springer Under graduate Text in Mathematics and Technology, Springer, 2010. Print.

2. Groetsch, C.W. *Inverse Problems*. Activities for Undergraduates, The Mathematical Association of America, 1999. Print.
3. Kirsch, Andreas. *An Introduction to the Mathematical Theory of Inverse Problems* 2nd Ed. Springer, 2011. Print.

L	T	P	Credits	Marks
4	1	0	6	100

Course Title: Probability and Statistics
Course Code: MTH 328
Course Duration: 45-60 Hours

Course Objective: The course is designed to develop greater skill and understanding of statistics and probability and to explore properties of probability distributions.

UNIT-A **14 Hours**

Sample space, probability axioms, real random variables (discrete and continuous), cumulative distribution function, probability mass/density functions, mathematical expectation, moments, moment generating function.

UNIT-B **15 Hours**

Joint distribution function and its properties, joint probability density functions, marginal and conditional distributions, expectation of function of two random variables, conditional expectations, independent random variables, correlation coefficient, joint moment generating function (jmgf).

UNIT-C **14 Hours**

Discrete distributions: uniform, binomial, Poisson, geometric, negative binomial. Continuous distributions: uniform, normal, exponential.

UNIT-D **16 Hours**

Correlation: Partial correlation and multiple correlation, Scatter Diagram, Karl Pearson coefficient of correlation, Rank Correlation. Linear regression, Regression coefficients and their properties, angle between two lines of regression, Curvilinear regression.

Reference Books:

1. Gupta, S.C., and V.K. Kapoor. *Fundamentals of Mathematical Statistics*. New Delhi: S. Chand & Sons, 2002. Print.
2. Mood, A.M., F.A. Graybill, and D.C., Boes. *Introduction to the theory of Statistics*. Delhi: McGraw Hill, 1974. Print.
3. Hogg, Robert V., Joeseph McKean and Allen T Craig. *Introduction to Mathematical Statistics.* London : Pearson Education Limited, 2014. Print.

4. Baisnab, A. P., and M. Jas. *Elements of Probability and statistics*. Delhi: Tata McGraw Hill, 2004. Print.
5. Meyer, P.L., *Introductory Probability and Statistical Applications.* Delhi: Addison-Wesley Publishing Company, 1970. Print.
6. Ross, Sheldon. *Introduction to Probability Models*, 9th Ed., Academic Press, Indian Reprint, 2007. Print.

L	T	P	Credits	Marks
4	1	0	6	100

Course Title: Mechanics I
Course Code: MTH 341
Course Duration: 45-60 Hours

Course Objective: The objective of this paper is to make students understand the concepts and basics of Mechanics and to clarify the foundations of Statics. The students will be made familiar about the forces and their consequences when acting on bodies, the forces being so arranged that the bodies remain at rest. One Unit has also been devoted to center of gravity and friction.

UNIT-A **14 Hours**

Preliminary concepts; Force and System of forces - parallel, coplanar, collinear, concurrent, equivalent; Composition and Resolution of forces- parallelogram law, resolved part of a force, triangle law, $\lambda - \mu$ theorem, Lami's theorem; Polygon law, resultant of number of coplanar concurrent forces and their equilibrium conditions; Parallel forces.

UNIT-B **14 Hours**

Moments- definition, sign conventions, geometrical representation, Varignon's theorem, resultant of number of coplanar forces, generalized theorem of moments, moment about a line; Couples- definition, zero couple, moment of a couple, equilibrium of two couples, resultant of coplanar couples, resultant of a force and a couple, triangle theorem of moments, conditions for a system of coplanar forces to reduce to a single force or a single couple.

UNIT C **14 Hours**

Equilibrium of a rigid body acted on by three coplanar forces, $m - n$ theorem; General conditions of equilibrium of a body acted upon by coplanar forces; Virtual work- Definition, principle of virtual work and related problems.

UNIT D **14 Hours**

Centre of Gravity (C.G.)-definition and concept, C.G. of different rigid bodies via uniform rod, laminas with specific geometrical shapes, tetrahedron, cone, hemisphere etc.; Friction- definition and nature of friction, types and laws of friction, angle of friction, coefficient of friction, and equilibrium of a particle on a rough inclined plane.

Reference Books:

1. S.L. Loney, *The elements of statics and dynamics*, 5th edition, Cambridge University Press, 1947.

2. Nelson E.W., Best C.L. and Mclean W.G., *Schaum's outline of theory and problems of engineering mechanics-statics and dynamics*, 5th edition, Mc Graw Hill Book Company, New Delhi, 1997.

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

L	T	P	Credits	Marks
4	0	0	4	100

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: 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

L	T	P	Credits	Marks
4	0	0	4	100

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

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*.
6. Reema Thareja, S. Rama Sree , *Advanced Data Structures*, Oxford University Press.

L	T	P	Credits	Marks

0	**0**	**4**	**2**	**50**

Course Title: Data Structure using C Laboratory
Course Code: CSA374
Implementation of Data Structures using C

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

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

L	T	P	Credits	Marks
4	**0**	**0**	**4**	**100**

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.

Course Title: Nuclear Physics
Course Code: PHY331
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	4	4	100

Unit I Nuclear Properties **15 Hours**

Historical overview of nuclear physics, Constituents of nucleus, non-existence of electrons in nucleus, Nuclear charge and mass, nuclear radius, spin, parity, angular momentum, magnetic moment, electric quadrupole moment, binding energy, binding energy per nucleon and its observed variation with mass number of the nucleus, explanation of the binding energy curve, qualitative discussion of two-body nuclear forces.

Unit II Radioactive decays **18 Hours**

Radioactive decay law, decay constant and half life; methods of measurement of half life, Type of decays, Natural radioactivity, chart of nuclides and domain of instabilities, radioactive dating, units for measuring radiations, constituents of Cosmic rays. Beta decays :

ß-, ß+ and electron capture decays, Fermi's theory, angular momentum and parity selection rules, neutrino and antineutrino, parity violation in □-decay and its experimental verification. Alpha decay: Stability of heavy nuclei against break up, Geiger-Nuttal law, Gamow's explanation, angular momentum and parity in a decay, energy release in alpha decay. Gamma transitions : Excited levels, isomeric levels, gamma transitions, multipole moments, selection rules, transition probabilities, internal conversion.

Unit III Nuclear reactions and Nuclear Models **13 Hours**

Rutherford's experiment of nuclear transmutation, Types of nuclear reactions, reactions cross section, conservation laws, Kinematics of nuclear reaction, Q-value and its physical significance. Nuclear fission, neutron reactions, Fermi and transuranic elements, chain reactions, Nuclear reactor, reactor criticality, moderators. Liquid drop model, semi-empirical mass formula,

condition of stability, evidence for nuclear magic numbers.

Unit IV Interaction and Detection of radiation **14 Hours**

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, solid state nuclear track detectors.

Reference Books:

1. W. E. Burcham, and M. Jobes, Nuclear and Particle Physics, United Kingdom : Pearson 1995.
2. V. K. Mittal, R. C. Verma, and S.C. Gupta, Introduction to Nuclear and Particle Physics. New Delhi: Prentice Hall of India, 2013.
3. K. S. Krane Introductory Nuclear Physics, John Wiley & Sons, 1988.
4. K. Hyde, Basic Ideas and Concepts in Nuclear Physics United Kingdom: Institute of Physics 2004.
5. H. Enge, .Introduction to Nuclear Physics, London: Addison-Wesley 1971.
6. Kaplan Nuclear Physics, New Delhi: Narosa 2002.

Course Title: Particle Physics
Course Code: PHY339
Course Duration: 45-60 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Unit I Accelerators **15 Hours**

Need of accelerators, Cockroft, Walton, Van de Graff, cyclic accelerators, cyclotron, High energy Cyclotrons, synchrocyclotron, variable energy cyclotron, phase stability, superconducting magnets, and colliding beam machines. Calorimetry and multilayer detection.

Unit II Cosmic rays **15 Hours**

Discovery of cosmic rays: hard and soft components, discovery of muon, pion, heavy mesons and hyperons, mass and life time determination for muon and pion. Primary Cosmic Rays: Extensive air showers, solar modulation of primary cosmic rays, effect of earth's magnetic field on the cosmic ray trajectories.

Unit III Elementary particles-I **15 Hours**

Historical introduction to elementary particles, fermions and bosons, particles and antiparticles, Classification of particles, leptons, hadrons, gauge quanta, types of interactions, electromagnetic, weak, strong interactions, gravitational interactions, isospin, Strangeness, conservation of strangeness in particle interactions, introduction to quarks and qualitative idea of quark model.

Unit IV Elementary particles-II **15 Hours**

High energy physics units, high energy electron scattering from protons, basic interactions of quark and leptons, quantum numbers of elementary paticles, determination of properties of leptons, conservation laws governing particle decay, interrelation between particle physics and cosmology

Reference Books:

1. W. E. Burcham, and M. Jobes, Nuclear and Particle Physics, United Kingdom : Pearson 1995.

2. V. K. Mittal,R. C. Verma, and S.C. Gupta, Introduction to Nuclear and Particle Physics. New Delhi: Prentice Hall of India, 2013

3. Enge, Introduction to Nuclear Physics, London: Addison-Wesley 1971.

4. D. H. Perkins, Introduction to High Energy Physics United Kingdom: Cambridge University Press, 4th ed. 2001.

5. K. Hyde, Basic Ideas and Concepts in Nuclear Physics United Kingdom: Institute of Physics 2004.

6. I. S. Hughes Elementary Particles. Cambridge University, 3rd ed. 1991.

Course Title: EMT and Nuclear Physics Laboratory
Course Code: PHY332

L	T	P	Credits	Marks
0	0	4	2	50

List of Experiments:

Electromagnetic Theory Lab

1. To verify the law of Malus for plane polarized light.
2. To determine the specific rotation of sugar solution using Polarimeter.
3. To analyze elliptically polarized Light by using a Babinet's compensator.
4. To study dependence of radiation on angle for a simple Dipole antenna.
5. To determine the wavelength and velocity of ultrasonic waves in a liquid (Kerosene Oil, Xylene,
6. etc.) by studying the diffraction through ultrasonic grating.
7. To study the reflection, refraction of microwaves
8. To study Polarization and double slit interference in microwaves.
9. To determine the refractive index of liquid by total internal reflection using Wollaston's air-film.
10. To determine the refractive Index of (1) glass and (2) a liquid by total internal reflection using a
11. Gaussian eyepiece.
12. To study the polarization of light by reflection and determine the polarizing angle for air- glass
13. interface.
14. To verify the Stefan`s law of radiation and to determine Stefan's constant.
15. To determine the Boltzmann constant using V-I characteristics of PN junction diode.

Nuclear Physics Lab

1. Study the background radiation levels using Radiation meter

Characteristics of Geiger Muller (GM) Counter:

2. Study of characteristics of GM tube and determination of operating voltage and plateau length using background radiation as source (without commercial source).
3. Study of counting statistics using background radiation using GM counter.
4. Study of radiation in various materials (e.g. KSO4 etc.). Investigation of possible radiation in different routine materials by operating GM at operating voltage.
5. Study of absorption of beta particles in Aluminum using GM counter.
6. Detection of α particles using reference source & determining its half-life using spark counter
7. Gamma spectrum of Gas Light mantle (Source of Thorium)

Course Title: Linear Algebra
Course Code: MTH348
Course Duration: 45-60 Hours

L	T	P	Credits
5	1	0	6

Course Objective: The main objective is to introduce basic notions in linear algebra that is often used in mathematics and in other fields.

UNIT-A **15 Hours**

Introduction and examples of: Groups, Subgroups, Rings and Fields.
Introduction: Vector Spaces, Examples of Vector Spaces, General Properties of Vector Spaces, Vector Subspaces, Algebra of Subspaces.

UNIT-B **15 Hours**

Linear Combinations, Spanning Sets, Linear Spans, Row Space of a Matrix, Linear Dependence and Independence, Basis of Vector Spaces, Finite-dimensional Vector Spaces, Dimension of Subspaces. Quotient Space

UNIT-C **15 Hours**

Linear Transformations, Linear Operator, Properties of Linear Transformation, Range and Null Space, Rank, Nullity of Linear Transformation, Algebra of Linear Transformation. Singular and Non-Singular Transformations.

UNIT-D **15 Hours**

Matrix; Representation of Transformations by Matrices, Change of Basis, Similarity of Matrices,

Determinant of Linear Transformations on a Finite dimensional, Trace of Matrices.

Reference Books:

1. Hoffman, Kenneth, and Ray Alden Kunze. *Linear Algebra, 2nd edition.* Prentice-Hall of India Pvt. Ltd., 1971.
2. Lang,S. I*ntroduction to Linear Algebra,2nd Ed.,* Springer, 2005.
3. Strang, Gilbert.*Linear Algebra and its Applications,* Thomson, 2007.
4. Artin, M. *Abstract Algebra, 2nd Ed.,* Pearson, 2011.
5. Gallian, Joseph A. *Contemporary Abstract Algebra, 4th Ed.,*Narosa Publishing House, 1999.
6. Bhattacharya, P.B., S.K.Jain, and S.R.Nagpal. *Basic Abstract Algebra, 2nd edition.*U.K: Cambridge University Press, 2004.

Course Title: Linear Programming
Course Code: MTH333
Course Duration: 45-60 Hours

L	T	P	Credits
5	1	0	6

Course Objective: The aim of this course is setting up optimization models from problem description and solving linear programming problems using the simplex method. The role of duality for linear programming problems is examined.

UNIT-A **16 Hours**

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

UNIT-B **14 Hours**

Duality, formulation of the dual problem, primal-dual relationships, economic interpretation of the dual.
Theorem of Weak duality, strong duality, Basic duality theorem, Weak complementary slackness theorem, Strong complementary slackness theorem, their applications, Application of Duality to Farkas' lemma and solutions of linear inequalities.

UNIT-C **15 Hours**

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

UNIT-D **14 Hours**

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

Reference Books:

1. Bazaraa,Mokhtar S, John J. Jarvis and Hanif D. Sherali. *Linear Programming and Network Flows,* India: John Wiley and Sons, 2004. Print.
2. Hillier, F.S. and G.J. Lieberman. *Introduction to Operations Research,* Singapore: Tata McGraw Hill, 2009.Print.
3. Taha, Hamdy A. *Operations Research, An Introduction,* India: Prentice-Hall, 2006.Print.
4. Hadley,G. *Linear Programming,* New Delhi: Narosa Publishing House , 2002.Print.

Course Title: Mechanics II
Course Code: MTH344
Course Duration: 45-60 Hours

L	T	P	Credits
5	1	0	6

Course Objective: The objective of this paper is to get acquainted the students about the different mathematical concepts and laws during the motion of bodies under the action of forces.

UNIT-A **14 Hours**

Basis definitions and preliminary concepts; Motion in a straight line with constant acceleration, velocity-time curve; Vertical motion under gravity; Newton's laws of motion, absolute and gravitational units of force, concept of weight and mass, motion on a smooth inclined plane; Relative motion.

UNIT-B **14 Hours**

Applications of laws of motion- motion of two particles connected by a string passing over a smooth pulley considering different situations *via* two particles hanging freely, one particle being placed on a smooth table and the other hanging freely, one particle being placed on a smooth inclined plane, both particles being placed on two equally rough inclined planes placed back to back etc., weight carried by a lift; Motion under variable acceleration; Simple harmonic motion-center of attraction, mean position, extreme positions; SHM as a periodic motion, time period and frequency.

UNIT-C **14 Hours**

Projectile motion in a vertical plane under gravity - equation of trajectory, range, time of flight, greatest height achieved and related problems; Projectile on an inclined plane; Curvilinear motion of particle- expressions of velocity and acceleration in Rectangular components, in tangential and normal components, in radial and transverse components; motion along a smooth circle as special case.

UNIT-D **14 Hours**

Angular velocity and angular acceleration, Centripetal and centrifugal forces, Central force motion- areal velocity and angular momentum, differential equation of central orbit, law of force, Kepler's laws of planetary motion; Work, power and energy- absolute and gravitational units of work and power, kinetic and potential energy, principle of work and energy, principle of conservation of energy.

.

Reference Books:

1. S.L. Loney, *The elements of statics and dynamics*, 5th edition, Cambridge University Press, 1947.
2. Nelson E.W., Best C.L. and Mclean W.G., *Schaum's outline of theory and problems of engineering mechanics-statics and dynamics*, 5th edition, Mc Graw Hill Book Company, New Delhi, 1997.
3. Synge, J. L., Griffth, B. A., *Principles of mechanics*, 2nd edition, Mc-Graw Hill Book Comapny, 1947.
4. Chorlton, F.,*Text book of Dynamics*. CBS Publishers, Reprint 2002.