SCHEME & SYLLABUS

B.Sc Computer Science

Department of Physical Sciences

University Institute of Sciences and Humanities (UISH)

Sant Baba Bhag Singh University

2017

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16	Thermal Physics and Statistical Mechanics	**PHY 201**	**Semester –III**	**26**
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29	Logics and sets	**MAT207**	**Semester-III**	**42**
30	Electrical circuits and network skills	**PHY 206**	**Semester-IV**	**43**
31	Number theory	**MAT208**	**Semester-IV**	**44**
32	Renewable and energy harvesting	**PHY309**	**Semester-V**	**45**
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52	Nuclear &particle Physics	**PHY310**	**Semester-VI**	**72-73**
53	Integral calculus	**MAT302**	**Semester-VI**	**74-75**
54	Complex analysis	**MAT306**	**Semester-VI**	**76**
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Scheme for B.Sc. –Computer Science
Semester-I

I. Theory Subjects

S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Types of Course
1	PHY 109	Mechanics	4:0:0	4:0:0	4	4	CC
2	CSA151	Object oriented programming in C++	4:0:0	4:0:0	4	4	CC
3	MAT107	Differential Calculus	6:0:0	6:0:0	6	6	CC
4	ENG101	General English-I	3:0:0	3:0:0	3	3	AECC
5	PBI101HCP 101	General Punjabi-I/HCP	3:0:0	3:0:0	3	3	AECC
6	PT101/PT103/ PT105	NSO/NCC/NSS	2:0:0	Non-credit	2	NC	

II. Practical Subjects

1	PHY 111	Mechanics	0:0:4	0:0:2	4	2	CC
2	CSA155	Object oriented programming in C++	0:0:4	0:0:2	4	2	CC
Total					30	**24**	

Total Contact Hrs:30
Total Credit Hrs: 24

CC- Core Course

AECC- Ability Enhancement Compulsory Course

Semester-II

I. Theory Subjects **II.**

S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Types of Course
1	PHY 106	Electricity, Magnetism and EMT	4:0:0	4:0:0	4	4	CC
2	CSA152	Data structure and file processing	4:0:0	4:0:0	4	4	CC
3	MAT112	Differential Equations	6:0:0	6:0:0	6	6	CC
4	ENG102	General English-II	3:0:0	3:0:0	3	3	AEEC
5	PBI102/ HCP 102	General Punjabi-II/HCP	3:0:0	3:0:0	3	3	AEEC
6		NCC/NSS/NSO	2:0:0	Non-credit	2	NC	

II. Practical Subjects

1	PHY 108	Electricity, Magnetism and EMT	0:0:4	0:0:2	4	2	CC
2	CSA156	Data structure and file processing	0:0:4	0:0:2	4	2	CC
Total					30	24	

Total Contact Hrs:30
Total Credit Hrs: 24

CC- Core Course

AECC- Ability Enhancement Compulsory Course

Semester-III

I. Theory Subjects

S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Types of Course
1	PHY 201	Thermal Physics and Statistical Mechanics	4:0:0	4:0:0	4	4	CC
2	CSA261	Numerical computing	4:0:0	4:0:0	4	4	CC
3	MAT201	Real Analysis	6:0:0	6:0:0	6	6	CC
4	EVS201	EVS	3:0:0	3:0:0	3	3	AECC
5		Elective subject(skill Enhancement)-I	2:0:0	2:0:0	2	2	SEC-I

II. Practical Subjects

1	PHY203	Thermal Physics and Statistical Mechanics	0:0:4	0:0:2	4	2	CC
2	CSA265	Numerical computing	0:0:4	0:0:2	4	2	CC
Total					**27**	**23**	

Total Contact Hrs:27
Total Credit Hrs: 23

CC- Core Course

AECC- Ability Enhancement Compulsory Course

SEC- Skill Enhancement Course

Semester-IV

I. Theory Subjects

S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Types of Course
1	PHY202	Waves and Optics	4:0:0	4:0:0	4	4	CC
2	CSA262	Design and analysis of algorithm	4:0:0	4:0:0	4	4	CC
3	MAT202	Algebra	6:0:0	6:0:0	6	6	CC
5		Elective subject(skill Enhancement)-II	2:0:0	2:0:0	2	2	SEC-II

II. Practical Subjects

1	PHY 204	Waves and Optics	0:0:4	0:0:2	4	2	CC
2	CSA266	Design and analysis of algorithm	0:0:4	0:0:2	4	2	CC
Total					24	20	

Total Contact Hrs:24

Total Credit Hrs: 20

CC- Core Course

AECC- Ability Enhancement Compulsory Course

SEC- Skill Enhancement Course

Semester-V

I. Theory Subjects

S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Types of Course
1	PHY	Elective Subject(Discipline)-I	4:0:0	4:0:0	4	4	DSE-IA
2	CSA	Elective Subject(Discipline)-I	4:0:0	4:0:0	4	4	DSE-IIA
3	MAT	Elective Subject(Discipline))-I	6:0:0	6:0:0	6	6	DSE-IIIA
4		Elective subject(skill Enhancement)-III	2:0:0	2:0:0	2	2	SEC-III

II. Practical Subjects

1	PHY	Elective Subject(Discipline) Lab-I	0:0:4	0:0:2	4	2	DSE-IA LAB
2	CSA	Elective Subject(Discipline)Lab-I	0:0:4	0:0:2	4	2	DSE-IA LAB
Total					24	20	

Total Contact Hrs:24
Total Credit Hrs: 20

DSE- Discipline Subject Course

SEC- Skill Enhancement Course

Semester-VI

I. Theory Subjects

S No.	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Types of Course
1	PHY	Elective Subject(Discipline)-II	4:0:0	4:0:0	4	4	DSE-IB
2	CSA	Elective Subject(Discipline)-II	4:0:0	4:0:0	4	4	DSE-IIB
3	MAT	Mathematics-VI Elective Subject(Discipline)-II	6:0:0	6:0:0	6	6	DSE-IIIB
4		Elective subject(skill Enhancement)-IV	2:0:0	2:0:0	2	2	SEC-IV
5	ENG352	Communication Skill	2:0:0	0:0:0	2	NC	SEC-VI

II. Practical Subjects

1	PHY	Elective Subject(Discipline) lab-II	0:0:4	0:0:2	4	2	DSE-IB LAB
2	**CSA**	Elective Subject(Discipline) lab-II	0:0:4	0:0:2	4	2	DSE-IIB LA
Total					26	20	

Total Contact Hrs:26
Total Credit Hrs: 20

DSE- Discipline Subject Course

SEC- Skill Enhancement Course

Summarized report of Course Scheme for B.Sc Computer Science									
Sem	**L**	**T**	**P**	**Contact hrs/wk**	**Credits**	**CC**	**AECC**	**SEC**	**DSE**
1	**20**	**0**	**4**	**30**	**24**	**18**	**6**		
2	**20**	**0**	**4**	**30**	**24**	**18**	**6**		
3	**19**	**0**	**4**	**27**	**23**	**18**	**3**	**2**	
4	**16**	**0**	**4**	**24**	**20**	**18**		**2**	
5	**18**	**0**	**4**	**24**	**20**			**2**	**18**
6	**18**	**0**	**4**	**26**	**20**		**2**	**2**	**18**
Total	**111**	**0**	**24**	**161**	**131**	**72**	**17**	**8**	**36**

Course Code	**PHY109**
Course Title	**Mechanics**
Type of course	Theory
L T P	4 0 0
Credits	4
Course prerequisite	+2 PHYSICS
Course Objective(CO)	The aim of the subject is to enhance the knowledge of students in electrostatics, electrodynamics and mechanics

Syllabus

Unit -I

Vectors: Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. Ordinary Differential Equations:1storder homogeneous differential equations. 2ndorder homogeneous differential equations with constant coefficients. Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. Momentum and Energy: Conservation of momentum.

Unit-II

Work and energy. Conservation of energy. Motion of rockets. Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum. Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellitein circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).

Unit-III

Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion

Unit-IV

Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q, ηandσ by Searles method Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Introduction to Electrodynamics*	D J Griffith	Prentice-Hall of India
2	*Physics- Vol 2*	Halliday and Resnik	
3	*Electricity and Magnetism*	A S Mahajan and A ARangwala	Tata McGraw-Hill
4	*Berkeley Physics Course, Vol. 1, Mechanics*	E M Purcell, Ed	Tata McGraw-Hill
5	*Introduction to Classical Mechanics*	R G Takwale& P S Puranik	Tata McGraw-Hill

Course Code	**CSA 151**
Course Title	**Object oriented programming in C++**
Type of course	Core
L T P	4 0 0
Credits	4
Course prerequisite	Basics of Programming
Course Objective(CO)	Perform object oriented programming to develop solutions to problems. Demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.

Syllabus

Unit-I

Programming Concepts: Algorithm and its characteristics, pseudo code / flow chart, program, identifiers, variables, constants, primitive data types, expressions, structured data types, arrays, compilers and interpreters.

Unit-II

Statements: Assignment statement, if then else statements, switch statement, looping statements- while, do while, for, break, continue, input/output statements, functions/procedures. Object Oriented Concepts: Abstraction, encapsulation, objects, classes, methods, constructors, inheritance, polymorphism, static and dynamic binding, overloading. Program Development: Object oriented analysis, design, unit testing & debugging, system testing & integration, maintenance.

Unit-III

Introduction to structured programming: data types- simple data types, floating data types, character data types, string data types, arithmetic operators and operator precedence, variables and constant declarations, expressions, input using the extraction operator >> and cin, output using the insertion operator << and cout, preprocessor directives, increment (++) and decrement operations (--), creating a C++ program, input/output, relational operators, logical operators and logical expressions, if and if … else statement

Unit-IV

Switch and break statements "for", "while" and "do – while" loops, break and continue statement, nested control statement, value returning functions, void functions, value versus reference parameters, local and global variables, static and automatic variables, enumeration type, one dimensional array, two dimensional array, character array, pointer data and pointer variables

Text and Reference Books

Sr No	Author(s)	Title	Publisher
1.	Object Oriented Programming with C++	E. Balaguruswamy	Tata Mc. Graw Hill
2.	Object Oriented Programming using C++	R.Lafore	Galgotia Publications
3.	Mastering C++	A.R.Venugopal, Rajkumar, T. Ravishanker	TMH

Course Code	**MAT107**
Course Title	**Differential Calculus**
Type of course	Theory
L T P	6 0 0
Credits	6
Course prerequisite	+2 Mathematics
Course Objective(CO)	It develops the techniques to simplify algebraic expressions .In addition, it encourages students to expand their knowledge through practical application in their daily life.

Syllabus

Unit-I

Limit and Continuity (ε and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions.

Unit-II

Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves. Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates.

Unit-III

Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder

Unit-IV

Taylor's series, Maclaurin's series of sin x, cos x, e^x, log(l+x), $(l+x)^m$, Maxima and Minima, Indeterminate forms.

Text and Reference Books

S. NO	NAME	AUTHOR(S)	PUBLISHER
1	*CALCULUS*	H. ANTON, I. BIRENS AND S. DAVIS	JOHN WILEY AND SONS
2	*CALCULUS*	G.B. THOMAS AND R.L. FINNEY	PEARSON EDUCATION

Course Code	ENG101
Course Title	**General English-I**
Type Course	Theory
L T P	3 0 0
Credits	3
Course Pre-requisite	**NA**
Course Objective (CO)	1. The students will critically read and analyze the prescribed texts. 2. The students will demonstrate effective word choice, vocabulary, idioms, grammar and sentence structure allowing accurate communication of meaning in written work. 3. The students will recognize the correct usage of present/past/future tenses in contextualized speech.

Syllabus

UNIT I

Tales of Life :

a. The Umbrella (Henry Rene Albert Guy de Maupassant)
b. The Story Teller (H.H. Munro Saki)
c. The Lament (Anton Pavlovich Chakhov)

UNIT II

Prose for Young Learners:

a. Universal Declaration Of Human Rights (U.N. Charter)
b. Symptoms (Jerome K. Jerome)

Exploring Tenses in English:

a. Present and Past
b. Present Perfect and Past

UNIT III

Tales of Life:

a.The Luncheon (William Somerset Maugham)
b.The Shroud (Prem Chand)

UNIT IV

Prose for Young Learners:

a. On Spendthrifts(A.G.Gardinar)
b. The Power of Women(Richard Gardon)
c. A Dialogue On Democracy (Albert Sydney Horby)

Exploring Tenses in English:

a. Future

Text and Reference Books:

S.No.	Author(S)	Year	Title	Publisher
1	Singh, S	2008	Tales of Life	Press and Publication Department, Guru Nanak Dev University, Amritsar.
2	Tewari, A. K, Midha,V.K, Sharma, R.K	2011	Prose For Young Learners	Publication Bureau, Guru Nanak Dev University, Amritsar
3	Murphy, R	2015	English Grammar in Use	Cambridge University Press

Course Code	PBI101
Course Title	General Punjabi-I
Type of Course	Theory
L T P	3 0 0
Credits	3
Course Prerequisite	NA
Course Objectives(CO)	1. ividAwrQIAwDuinkpMjwbIkvIAWdIjIvnIqoNjwxUhoxgy[2. ividAwrQIAWnUMAwDuinkpMjwbIkivqwdIivSYgqjwxkwrI ho jwvygI[3. ividAwrQIAWiv`cryKwic`qrWdwAlocnwqmkAiDAYnkrndw hunrauqpMnhovygw[4. ividAwrQIAWnUMpMjwbIDunINivauNqbMdIsMbMDIigAw nhwisl ho jwvygw[5. ividAwrQIpMjwbIaup- BwSwvWnUMpCwnxXog ho jwxgy[

Syllabus

iekweI- a

1. **AwDuinkpMjwbIkivqw:**BweIvIrisMG (rauNru^, smW, ie`CwblqyfUMGIAWSwmW), DnIrwmcwiqRk(rwDwsMdyS, isdkWvwilAWdybyVypwrny), pRo.pUrnisMG(purwxypMjwbnUMAwvwzW), &IrozdInSr&(kurbwnI, ^YrpMjwbIdI), pRo.mohnisMG(Awaun`cIey, nvWkOqk), nMdlwlnUrpurI(cuMmcuMmr`Ko, mzdUr), AMimRqwpRIqm(bwrWmwh, sMXogivXog), fw. hrBjnisMG(qyryhzUrmyrIhwizrIdIdwsqW), iSvkumwrbtwlvI(ibrhoNdIrVHk, z^m), surjIqpwqr(cONkShIdW ‘c ausdwAwi^rIBwSx, Zzl)
2. **pMjwbdymhwnklwkwr(lyK):**ky.AY~l. sihgl, bVygulwmAlI KW, soBwisMG, ipRQvIrwjkpUr, BweIsmuMdisMG[

iekweI- A

1. pMjwbIDunIivauNq : aucwrnAMg, aucwrnsQwnqyivDIAW, svr, ivAMjn[
2. BwSwvMngIAW: BwSwdwtkswlIrUp, BwSwAqyaup- BwSwdwAMqr, pMjwbIaupBwSwvWdypCwxicMnH[

pusqksUcI

pwT-pusqkW

lyKk	swl	Pusqk	pbilSr
sMpwdk, iF`loN; h.s. AqysrgoDIAw; p.s.	2014	do rMg	pblIkySnibaUro, gurUunwnkdyvXUnIvristI, AMimRqsr
gwrgI; b.	1995	pMjwbdymhwnklwkwr	pblIkySnibaUro, gurUunwnkdyvXUnIvristI, AMimRqsr

sMbMiDqpusqkW

lyKk	swl	Pusqk	pbilSr
isMG; h.	1966	pMjwbIbwry	pMjwbIXUnIvristI, pitAwlw
isMG; qIrQ (fw.)	2014	pMjwbIAiDAwpn	AY~s. jI. pbilSrz, jlMDr
syKoN; suKivMdrisMG (fw.) AqysyKoN; mndIpkOr	2015	pMjwbIBwSwdwAiDAwpn	kilAwxIpbilSrz, luiDAwxw

Course code	**HCP101**
Course title	**History and Culture of Punjab -I**
Type of course	Theory
L T P	3 0 0
Credits	3
Course prerequisite	NA
Course objectives (CO)	1. The Student will acquire the knowledge about Punjab and its Historical Resources. 2. The Student will understand the Harppan Culture and different Vedic Periods. 3. The Students will analyze the Alexander's invasions.

Syllabus

Unit I

Ancient Punjab: Physical features, Political, Social, Economic, Geographical, Religious impact on History, Historical Sources: Literacy, Archaeological,Harappan Culture: Extent and Town Planning.

Unit II

Harppan Culture: Social, Economic and Religious life; Causes and Disappearance, Rig Vedic Age: The rise of Indo Aryans, Main features of the life in Early Vedic Age, Later Vedic Age: Political, Economic, Social, and Religious life of Later Vedic Aryans.

Unit III

Caste system: Origin and Evolution, The Epics: Historical importance of Ramayan and Mahabharat, Political condition on eve Alexander's Invasion.

Unit IV

Impact of Alexander's Invasion on Social and Culture Life., Position of Women: Harppan, Early Vedic and Later Vedic Age.

Important Historical places of Punjab: Mohenjodaro, Harappa, kotlaNihang khan, Sanghol, Banawali, Taxila, Hastinapur,Indraprastha,Srinagar, Sakala,Purusapura

Text and References Books:

S.NO.	Author's	Title	Publisher
1	Sukhdev Sharma	History And Culture Of Punjab	New Academic Publisher
2	RomilaThapar	A History of India, Vol. I	Penguin Books

Course Code	**PHY111**
Course Title	**Mechanics**
Type of course	Practical
L T P	0 0 4
Credits	2
Course prerequisite	10+2 physics
Course Objective (CO)	The aim of this course is to impart practicalknowledge to the students and provide them with exposure of basic measuring instruments, electricity and electronics apparatuses.

Syllabus

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To determine the Height of a Building using a Sextant.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the Elastic Constants of a Wire by Searle's method.
7. To determine g by Bar Pendulum.
8. To determine g by Kater's Pendulum.
9. To determine **g** and velocity for a freely falling body using Digital Timing Technique
10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g

Text and Reference Books

S. No	Name	Author(S)	Publisher
01	*Practical Physics*	C. L. Arora	S. Chand

Course Code	**CSA155**
Course Title	**Object oriented programming in C++ Lab**
Type of course	Core
L T P	0 0 4
Credits	4
Course prerequisite	Basics of Programming
Course Objective (CO)	Perform object oriented programming to develop solutions to problems. Demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.

Syllabus

Outcome: Acquire knowledge about the basic concept of writing a program. Understanding the practical use of functions, classes, objects, inheritance and polymorphism.

1. Write and execute simple program to show the working of input/output statements.
2. Write and execute programs to show the use of different types of operators.
3. Write and execute programs based on use of functions.
4. Write and execute programs to demonstrate function call by value and call by reference.
5. Write and execute programs to demonstrate inline functions.
6. Write and execute programs to demonstrate function overloading.
7. Write and execute programs to show concept of classes using public, private, protected members.
8. Write and execute programs to demonstrate use of constructor (parameterized and unparameterized constructor, copy constructor, multiple constructors in a class, constructors with default parameters).
9. Write and execute programs to demonstrate use of destructor.
10. Write and execute programs to demonstrate use of static variables and static functions.
11. Write and execute programs to illustrate different types of inheritance.
12. Write and execute programs to illustrate different access specifiers in inheritance (public, private, protected).
13. Write and execute programs to show the use of pointers to classes.
14. Write and execute programs to show the use of this pointer.
15. Write and execute programs to show the use of friend function.
16. Write and execute programs to show the concept of friend class.
17. Write and execute programs to demonstrate method overloading in classes using different parameters and different return types.
18. Write and execute programs to show the use of virtual function and pure virtual function.

19. Write and execute programs to demonstrate operator overloading in classes with different operators.
20. Write and execute programs using concept of dynamic memory allocation.

Text and Reference Books

Sr No	Author(s)	Title	Publisher
1.	Object Oriented Programming with C++	E. Balaguruswamy	Tata Mc. Graw Hill
2.	Object Oriented Programming using C++	R.Lafore	Galgotia Publications
3.	Mastering C++	A.R.Venugopal, Rajkumar, T. Ravishanker	TMH

Course Code	**PHY106**
Course Title	**Electricity AND Magnetism**
Type of course	Core
L T P	4 0 0
Credits	4
Course prerequisite	10+2 PHYSICS
Course Objective (CO)	The subject will add one more step to the students of first year in the fields of magnetism, electromagnetic theory, & properties of matter.

Syllabus

Unit-I

Vector Analysis: Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors(statement only).

Unit-II

Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

Unit-III

Magnetism:Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law.Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials

Unit-IV

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law,self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.Maxwell`s equations and Electromagnetic wave propagation: Equation of continuityof current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Introduction to Electrodynamics*	D J Griffith	Prentice-Hall of India
2	*Physics Vol 2*	Halliday and Resnik	
3	*Electricity and Magnetism*	A S Mahajan and A ARangwala	Tata McGraw-Hill
4	*Berkeley Physics Course, Vol. 1*	E M Purcell, Ed	Tata McGraw-Hill

Course Code	**CSA152**
Course Title	**Data Structures and File Processing**
Type of course	core
L T P	4 0 0
Credits	4
Course prerequisite	Knowledge of Programming Language
Course Objective (CO)	This course is intended as an introduction to data structures, algorithms, and more advanced programming techniques.

Syllabus

Unit-I

Basic Data Structures: Abstract data structures- stacks, queues, linked lists and binary trees. Sets: Dictionary implementation, use of priority queues, hashing, binary trees, balanced trees, sets with merge-find operations.

Unit-II

Searching: Internal and external searching, use of hashing and balancing techniques. Memory Management: Garbage collection algorithms for equal sized blocks, storage allocation for objects with mixed size, buddy systems.

Unit-III

Physical Devices: Characteristics of storage devices such as disks and tapes, I/O buffering. Basic File System Operations: Create, open, close, extend, delete, read-block, write-block, protection mechanisms.

Unit-IV

File Organizations: Sequential, indexed sequential, direct, inverted, multi-list, directory systems, Indexing using B-tree, B+ tree and their variants, hashing – hash function, collision handling methods, extendible hashing.

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1.	Fundamentals of Data structures	E.Horowiz and S.Sahani	Galgotia Book source Pvt. Ltd.
2.	Data Structures & Algorithms	R.S.Salaria	Khanna Book Publishing Co. (P) Ltd.
3.	Data Structures using C and C++	Y.Langsam et. Al.,	PHI

Course Code	**MAT112**
Course Title	**Differential equations**
Type of course	Core
L T P	6 0 0
Credits	6
Course prerequisite	10+ 2 mathematics
Course Objective (CO)	It develop the knowledge about Differential Equations and partial equations

Syllabus

Unit-I

First order exact differential equations. Integrating factors, rules to find an integrating factor. First order higher degree equations solvable for x, y, p. Methods for solving higher-order differential equations. Basic theory of linear differential equations, Wronskian, and its properties. Solving a differential equation by reducing its order.

Unit -II

Linear homogenous equations with constant coefficients, Linear non-homogenous equations, The method of variation of parameters, The Cauchy-Euler equation, Simultaneous differential equations, Total differential equations.

Unit-III

Order and degree of partial differential equations, Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations, Linear partial differential equation of first order,Charpit's method.

Unit-IV

Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Differential Equations*	Shepley L. Ross	John Wiley and Sons
2	*Elements of Partial Differential Equations*	Sneddon	McGraw-Hill

Course Code	ENG102
Course Title	**General English-II**
Type Course	Theory
L T P	3 0 0
Credits	3
Course Pre-requisite	**10+2**
Course Objective (CO)	To develop understanding of the significance of English as a subject in the present context, to feel pleasure and to develop the understanding of the significance of basic competencies in language acquisition. This course will enable students to understand the foreign language as well as the use of language and to enable students to acquire language skills such as listening, speaking, reading, and writing and integrate them for communicative purposes.

Syllabus

Texts Prescribed:

Unit-I Tales of Life

a. The Doll's House(Katherine Mansfield)
b. Eveline (James Joyce)
c. Toba Tek Singh (Saadat Hassan Manto)
d. The Taboo (Victor Astafyev)
e. A Strand of Cotton (Suneet Chopra)

Unit-II Prose for Young Learners

a. Beauty And The Beast(R.K.Narayan)
b. With A Song On Their Lips (Hugh & Colleen Gantzer)
c. My Financial Careers (Stephen Leacock)
d. The School For Sympathy (E.V. Lucas)
e. AIDS (U.N.Report)

UNIT-III Exploring Grammar

a. Modals
b. Passive

UNIT-IV

c. Reported Speech
d. Questions and Auxiliary verbs

Text and Reference Books:

S.No.	Author(S)	Year	Title	Publisher
1	Singh, S	2008	Tales of Life	Press and Publication Department, Guru Nanak Dev University, Amritsar.
2	Tewari, A. K, Midha,V.K, Sharma, R.K	2011	Prose For Young Learners	Publication Bureau, Guru Nanak Dev University, Amritsar
3	Murphy, R	2015	English Grammar in Use	Cambridge University Press

Course Code	**PBI102**
Course Title	**General Punjabi-II**
Type of Course	Theory
L T P	3 0 0
Credits	3
Course Prerequisite	NA
Course Objectives	1. ividAwrQIAwDuinkpMjwbIkhwxIkwrWdIjIvnIqoNjwxUhoxgy[2. ividAwrQIAWnUMAwDuinkpMjwbIkhwxIdIivSYgqjwxkwrI ho jwvygI[3. ividAwrQIAWiv`cryKwic`qrWdwAlocnwqmkAiDAYnkrndwhunrauqpMnhovygv[4. ividAwrQImuhwvry, AKwxWdIFu`kvINvrqoNkrnWis`Kjwxgy

Syllabus

iekweI- a

1. **pMjwbIin`kIkhwxI**: BUAw (nwnkisMG), bwZIdI DI (gurmuKisMGmuswi&r), pymIdyinAwxy(sMqisMGsyKoN), bwgWdwrwKw(sujwnisMG), qYNkIdrdnwAwieAw(krqwrisMGdu`gl), DrqIhyTlwbOlD(kulvMqisMGivrk), dUjIvwrjybk`tIgeI(nvqyjisMG), lCmI(pRympRkwS), bu`qiSkn(AjIqkOr), b`s kMfktr(dlIpkOritvwxw)[
2. **pMjwbdymhwnklwkwr (lyK):**sqISgujrwl, gurcrnisMG, TwkurisMG,blrwjswhnI, suirMdrkOr[

iekweI- A

1. SbdbxqrAqySbdrcnw: pirBwSwAqymu`FlysMklp
2. (a) pYrHwrcnw, muhwvryAqyAKwx[
   (A) pYrHwpVHkypRSnWdyau~qrdyxw[

pusqksUcI

pwT-pusqkW

LyKk	swl	pusqk	pbilSr
sMpwdk, iF`loN; h.s. AqysrgoDIAw, p.s.	2014	do rMg	pblIkySnibaUro, gurUunwnkdyvXUnIvristI, AMimRqsr
gwrgI, b.	1995	pMjwbdymhwnklwkwr	pblIkySnibaUro, gurUunwnkdyvXUnIvristI, AMimRqsr

sMbMiDqpusqkW

LyKk	swl	psqk	pbilSr
isMG, h.	1966	pMjwbIbwry	pMjwbIXUnIvristI, pitAwlw
isMG, q.	2014	pMjwbIAiDAwpn	AY~s. jI. pbilSrz, jlMDr

Course ode	**HCP-II**
Course title	**History And Culture Of Punjab –II**
Type of course	Theory
L T P	3 0 0
Credits	3
Course prerequisite	NA
Course objectives (CO)	1. The Student will acquire the knowledge Of Mauryan Empire. 2. The Student will understand the impact of Buddhism & Jainism on Punjab. 3. To aware the learners Depiction of Punjab in the accounts of Chinese travelers.

Syllabus

Unit-I

The Mauryan Empire: Social, Economic and Religious life, Buddhism and Jainism: Impact on Punjab with special reference to 4th Buddhist Council., The Kushanas: Impact of Kanishka's rule on Punjab.

Unit-II

Gandhara School of Art: Salient features, The Guptas: Cultural and Scientific Developments.

Position of Women: Under the Mauryas, the Guptas and the Vardhanas.

Unit-III

Depiction of Punjab in the accounts of Chinese travelers. Fahien and Hwen Tsang.Main developments in literature, Education: Significant Developments: Taxila.

UNIT IV

Society and Culture on the eve of the Turkish invasion of Punjab,Punjab in the Kitab-ul-Hind of Alberuni,Important Historical places: Lahore, Multan Bathinda, Uchh, Jalandhar, Thanesar, Kangra, Taxila, Kundalvana, Pehowa, Thatta.

Text and References Books:

S.NO.	Author's	Title	Publisher
1	Sukhdev Sharma	History And Culture Of Punjab	New Academic Publisher
2	RomilaThapar	A History of India, Vol. I	Penguin Books
3	L.M.Joshi	History and Culture of the Punjab, Vol. I	Punjabi University, Patiala

Course Code	**PHY108**
Course Title	**Electricity and Magnetism**
Type of course	practical
L T P	0 0 4
Credits	2
Course prerequisite	10+ 2 physics
Course Objective (CO)	The course is to impart practicalknowledge to the students and provide them with practical exposure of electricity and magnetism.

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. Ballistic Galvanometer:
   (i) Measurement of charge and current sensitivity
   (ii) Measurement of CDR
   (iii) Determine a high resistance by Leakage Method
   (iv) To determine Self Inductance of a Coil by Rayleigh's Method.
3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).
5. To study the Characteristics of a Series RC Circuit.
6. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor
7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and
   (b) Quality factor Q
8. To determine a Low Resistance by Carey Foster's Bridge.
9. To verify the Thevenin and Norton theorem
10. To verify the Superposition, and Maximum Power Transfer Theorem

S. No	Name	Author(S)	Publisher
01	*Practical Physics*	C. L. Arora	S. Chand

Course Code	**CSA156**
Course Title	**Data Structures and File Processing Lab**
Type of course	core
L T P	0 0 4
Credits	4
Course prerequisite	Knowledge of Programming Language
Course Objective (CO)	This course is intended as an introduction to data structures, algorithms, and more advanced programming techniques.

Syllabus

Outcome: The objective of this course is to teach students various data structures and to explain them algorithms for performing various operations on these data structures. It demonstrates familiarity with major algorithms and data structures. It helps in choosing the appropriate data structure and algorithm design method for a specified application.

1. Implementation of 1D Array
2. Implementation of Matrix using 2D Array
3. Implementation of singly linked lists
4. Practicing types of Linked list (double, circular)
5. Implementation of linked list operations
6. Implementation of Stack using Array
7. Implementation of Stack using Linked List
8. Implementation of stack operations
9. Implementation of Queue (Circular queue) using Array
10. Implementation of Queue (Circular queue) using Linked List
11. Implementation of queue operations
12. Implementation of Binary Tree
13. Implementation of Pre-order, Post-order and in-order traversal of tree
14. Implementation of BFS and DFS

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1.	Fundamentals of Data structures	E.Horowiz and S.Sahani	Galgotia Book source Pvt. Ltd.
2.	Data Structures & Algorithms	R.S.Salaria	Khanna Book Publishing Co. (P) Ltd.
3.	Data Structures using C and C++	Y.Langsam et. Al.,	PHI

Course Code	**PHY201**
Course Title	**Thermal physics and statistical mehanics**
Type of course	CORE
L T P	4 0 0
Credits	4
Course prerequisite	10+ 2 physics
Course Objective (CO)	The aim of this course is to impart theoretical knowledge to the students in thermal, statistical and atomic physics.

Syllabus

Unit-I

Thermodynamic Description of system: Zeroth Law of thermodynamics andtemperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between CP & CV, Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient, Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.

Unit-II

Thermodynamic Potentials**:** Enthalpy, Gibbs, Helmholtz and Internal Energyfunctions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for (CP – CV), CP/CV, TdS equations.

Unit-III

Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases. Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law.

Unit-IV

Statistical Mechanics: Phase space, Macrostate and Microstate, Entropy andThermodynamic probability, Maxwell-Boltzmann law - distribution of velocity - Quantum statistics - Fermi-Dirac distribution law - electron gas - Bose-Einstein distribution law - photon gas - comparison of three statistics.

Text and Reference Books

S. No	**Name**	**Author(S)**	**Publisher**
1	*Statistical Physics and Thermodynamis*	V S Bhatia	
2	*A Treatise on Heat*	Saha and Srivastava	Indian Press, Ahmedabad
3	*Thermal Physics*	C. Kittel & H. Kroemer	CBS Pub.
4	*Thermal Physics*	S C Garg, R M Bansal	TMH

Course Code	**CSA261**
Course Title	**Numerical computing**
Type of course	core
L T P	4 0 0
Credits	4
Course prerequisite	Basic knowledge of Mathematics.
Course Objective (CO)	Students will learn about Polynomial Equations, Differential Equations, Integration etc.

Syllabus

Unit-I

Solution to Transcendental and Polynomial Equations: Iterative methods, bisection method, secant method, Newton- Raphson method, fixed point iteration, methods for finding complex roots. Matrices and Linear System of Equations: LU decomposition method for solving systems of equations, Symmetric positive definite matrices and least square approximation, iterative algorithms for linear equation

Unit-II

Interpolation: Polynomial interpolation, Newton-Gregory, Stirling's, Bessel's and Lagrange's interpolation formula, Newton's divided differences interpolation formulae. Curve fitting: B-Spline and Approximation: Fitting linear and non-linear curves, weighted least square approximation, method of least square for continuous functions.

Unit-III

Numerical Differentiation and Integration: Numerical differentiation and errors in numerical differentiation, Newton-Cotes formulae, trapezoidal rule, Simpson's rule, Gaussian integration.

Unit-IV

Numerical Solutions of Ordinary Differential Equations: Picard's and Taylor's series, Euler's and Runge-Kutta (RK) methods. Finite Element Method: Boundary value problems, Rayleigh and Galerkin methods of approximation, applications.

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1.	Numerical Methods for Scientists and Engineers	Richard Hamming	Galgotia Book source Pvt. Ltd.
2.	Numerical Methods for Engineers	Raymond Canale and Steven C. Chapra	McGraw-Hill Education

Course Code	**MAT201**
Course Title	**Real analysis**
Type of course	Core
L T P	6 0 0
Credits	6
Course prerequisite	10+ 2 MATHEMATICS
Course Objective (CO)	To have the knowledge of basic properties of field of real numbers and convergence

Syllabus

Unit-I

Finite and infinite sets, examples of countable and uncountable sets. Real line, bounded sets, suprema and infima, completeness property of R, Archimedean property of R, intervals. Concept of cluster points and statement of Bolzano-Weierstrass theorem.

Unit-II

Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences. Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence (monotone convergence theorem without proof).

Unit-III

Infinite series. Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series, Root test, Ratio test, alternating series, Leibnitz's test (Tests of Convergence without proof). Definition and examples of absolute and conditional convergence.

Unit-IV

Sequences and series of functions, Pointwise and uniform convergence. M_n-test, M-test, Statements of the results about uniform convergence and integrability and differentiability of functions,

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Introduction to Real Analysis*	R.G. Bartle and D. R Sherbert	John Wiley and Sons
2	*Elementary Analysis*	K.A. Ross	Springer Verlag,
3	*Intermediate Real Analysis*	E. Fischer	Springer Verlag

Course Code	EVS101
Course Title	**Environmental Science**
Type of course	Theory
L T P	3 0 0
Credits	2
Course prerequisite	NA
Course Objective (CO)	To make students aware about environment and need of maintaining it with best possible knowledge.

Syllabus

UNIT-I

Introduction to Environment and Ecosystem: Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness, Concept of Ecosystem, Structure, interrelationship, producers, Consumers and decomposers, ecological pyramids-biodiversity and importance. Hot spots of biodiversity.

UNIT-II

Environmental Pollution & Natural Resources: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes.Role of an individual in prevention of pollution. Pollution case studies.Disaster Management: Floods, earthquake, cyclone and landslides, Natural Resources and associated problems, use and over exploitation, case studies of forest mresources and water resources.

UNIT-III

Social Issues and the Environment :From Unsustainable to Sustainable development, Urban problems 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. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation

UNIT-IV

Human Population and the Environment & Field Work: Population growth, variation among nations. Population explosion –Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Case studies

Visit to a local area to document environemntalassetsriver/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.

Text and reference books:

S. No	Title	Author(S)	Publisher
1	A Textbook for Environmental Studies	ErachBharucha	
2	Environmental Biology,	Agarwal, K.C. 2001	Nidi Publ. Ltd. Bikaner.
3	Environmental Science,	Miller T.G. Jr.	Wadsworth

Course Code	**PHY203**
Course Title	**Thermal physics and statistical mechanics**
Type of course	practical
L T P	0 0 4
Credits	2
Course prerequisite	10+ 2 physics
Course Objective (CO)	The aim of this course is to impart practicalknowledge to the students and provide them with exposure of thermodynamics.

Syllabus

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.
2. Measurement of Planck's constant using black body radiation.
3. To determine Stefan's Constant.
4. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.
5. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
6. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.
7. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.
8. To study the variation of thermoemf across two junctions of a thermocouple with temperature.
9. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system
10. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Advanced Practical Physics for students*	B.L. Flint & H.T. Worsnop	Asia Publishing House.
2	*Advanced level Physics Practicals*	Michael Nelson and Jon M. Ogborn	Heinemann Educational Publishers

3	*A Text Book of Practical Physics*	Indu Prakash and Ramakrishna	Kitab Mahal, New Delhi

Course Code	**CSA265**
Course Title	**Numerical computing Lab**
Type of course	core
L T P	0 0 4
Credits	4
Course prerequisite	Basic knowledge of Mathematics.
Course Objective (CO)	Students will learn about Polynomial Equations, Differential Equations, Integration etc.

Syllabus

Objective: The aim of this course is to impart practical knowledge of c++to the students and provide them with exposure of mathematical computation.

1. Finding the truncation error in a series of Approximation
2. Calculate the value of integration using trapezoidal rule. The function to be integrated is f(x) = 1/x
3. Calculate the value of integration using Simpson's 1/3 rule. The function to be integrated is f(x) 1/(1+x)
4. Calculate the value of integration using Simpson's 3/8 rule. The function to be integrated is f(x) = 4 + 2 sinx
5. calculate the value of y at given value of x using Euler's method. The function y' = f(x,y) = x * x+ y
6. Calculate the value of y at given value of x using Second order of Rungakutta method. The function y' = f(x,y) = (1 + x*x + y*y) 7) Newton Rap son method to find the root of an equation. The function f(x) = x^5 + 5x^2 + 1 f'(x) = 5x^4 + 10x

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1.	Numerical Methods for Scientists and Engineers	Richard Hamming	Galgotia Book source Pvt. Ltd.
2.	Numerical Methods for Engineers	Raymond Canale and Steven C. Chapra	McGraw-Hill Education

Course Code	**PHY202**
Course Title	**Waves and optics**
Type of course	CORE
L T P	4 0 0
Credits	4
Course prerequisite	10+ 2 physics
Course Objective (CO)	The main objective of the course is to enhance the knowledge of students in wave and optics, the two key subjects of physics.

Syllabus

Unit-I

Superposition of Two Collinear Harmonic oscillations: Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats).Superposition of Two Perpendicular Harmonic Oscillations: Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses.Waves Motion-General: Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity.

Unit-II

Fluids: Surface Tension: Synclastic and anticlastic surface - Excess of pressure - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaegar's method. Viscosity: Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid - Variations of viscosity of a liquid with temperature lubrication. Physics of low pressure - production and measurement of low pressure - Rotary pump - Diffusion pump - Molecular pump - Knudsen absolute gauge - penning and pirani gauge – Detection of leakageSound: Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - Decibels - Intensity levels - musical notes - musical scale. Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient - Sabine's formula - measurement of reverberation time - Acoustic aspects of halls and auditoria.

Unit-III

Wave Optics: Electromagnetic nature of light. Definition and Properties of wave front.Huygens Principle. Interference: Interference: Division of amplitude and division of wavefront. 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 (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index. Michelson's Interferometer: Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index and Visibility of fringes.

Unit-IV

Diffraction: Fraunhofer diffraction: Single slit; Double Slit. Multiple slits &Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis. Polarization: Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*University Physics*	FW Sears, MW Zemansky and HD Young 13/e	Addison-Wesley
2	*Fundamentals of Optics*	H.R. Gulati and D.R. Khanna	R. Chand Publication
3	*Fundamentals of Optics*	F A Jenkins and H E White	McGraw-Hill

Course Code	**CSA262**
Course Title	**Design and analysis of algorithm**
Type of course	core
L T P	4 0 0
Credits	4
Course prerequisite	Basic knowledge of algorithms.
Course Objective (CO)	This course is intended as an introduction to Searching and Sorting Techniques, randomized algorithms , Graphs.

Syllabus

Unit-I

Introduction: RAM model, O(log n) bit model. Review of data structures: Balanced trees, Mergeable sets. Algorithm Design Techniques: Iterative techniques, Divide and conquer, dynamic programming, greedy algorithms.

Unit-II

Searching and Sorting Techniques: Review of elementary sorting techniques-selection sort, bubble sort, insertion sort, more sorting techniques-quick sort, heap sort, merge sort, shell sort, external sorting. Lower bounding techniques: Decision Trees, Adversaries. String Processing: KMP, Boyre-Moore, Robin Karp algorithms.

Unit-III

Introduction to randomized algorithms: Random numbers, randomized Qsort, randomly Built BST Number Theoretic Algorithms: GCD, Addition and Multiplication of two large numbers, polynomial arithmetic, Fast-Fourier Transforms

Unit-IV

Graphs: Analysis of Graph algorithms Depth-First Search and its applications, minimum Spanning Trees and Shortest Paths. Introduction to Complexity Theory: Class P, NP, NP-Hard, NP Completeness. Introduction to Approximation Algorithms

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1.	The Design and Analysis of Algorithms	Dexter Kozen	Addison Wesley
2.	The Design and Analysis of Computer Algorithms	A. V. Aho, J. E. Hopcroft, and J. D. Ullman	Addison Wesley

Course Code	**MAT202**
Course Title	**ALGEBRA**
Type of course	Core
L T P	6 0 0
Credits	6
Course prerequisite	10+ 2 MATHEMATICS
Course Objective (CO)	It develops the techniques to simplify algebraic expressions using commutative, associative and distributive properties

Syllabus

Unit-I

Definition and examples of groups, examples of abelian and non-abelian groups, the group Z_n of integers under addition modulo n and the group U(n) of units under multiplication modulo n. Cyclic groups from number systems .

Unit-II

Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of group, examples of subgroups including the center of a group. Cosets, Index of subgroup, Lagrange's theorem, order of an element, Normal subgroups: their definition, examples, and characterizations, Quotient groups.

Unit-III

Definition and examples of rings, examples of commutative and non- commutative rings: rings from number systems, Z_n the ring of integers modulo n, ring of real quaternions, rings of matrices, polynomial rings, and rings of continuous functions.

Unit-IV

Subrings and ideals, Integral domains and fields, examples of fields: Z_p, Q, R, and C. Field of rational functions.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*A First Course in Abstract Algebra*	John B. Fraleigh	Pearson
2	*Abstract Algebra*	M. Artin	Pearson
3	*Contemporary Abstract Algebra*	Joseph A Gallian	Narosa

Course Code	**PHY204**
Course Title	**Waves and optics**
Type of course	Practical
L T P	0 0 4
Credits	2
Course prerequisite	10+ 2 physics
Course Objective (CO)	This course isdesigned for improving practicalknowledge among the students and provides them with exposure on wave and optics related experiments.

Syllabus

1. To investigate the motion of coupled oscillators
2. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify λ^2 – T Law.
3. To study Lissajous Figures
4. Familiarization with Schuster`s focussing; determination of angle of prism.
5. To determine the Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
6. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
7. To determine Dispersive Power of the Material of a given Prism using Mercury Light
8. To determine the value of Cauchy Constants of a material of a prism.
9. To determine the Resolving Power of a Prism.
10. To determine wavelength of sodium light using Fresnel Biprism.
11. To determine wavelength of sodium light using Newton's Rings.
12. To determine the wavelength of Laser light using Diffraction of Single Slit.
13. To determine wavelength of (1) Sodium & (2) spectrum of Mercury light using plane diffraction Grating
14. To determine the Resolving Power of a Plane Diffraction Grating.
15. To measure the intensity using photosensor and laser in diffraction patterns of single and double slits.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Advanced Practical Physics for students*	B.L. Flint & H.T. Worsnop	Asia Publishing House.
2	*Advanced level Physics Practicals*	Michael Nelson and Jon M. Ogborn	Heinemann Educational Publishers
3	*A Text Book of Practical Physics*	Indu Prakash and Ramakrishna	Kitab Mahal, New Delhi

Course Code	**CSA266**
Course Title	**Design and analysis of algorithm Lab**
Type of course	core
L T P	0 0 4
Credits	4
Course prerequisite	Basic knowledge of algorithms.
Course Objective (CO)	This course is intended as an introduction to Searching and Sorting Techniques, randomized algorithms , Graphs.

Syllabus

Objective: To get a first-hand experience of implementing well-known algorithms in a high-level language. To be able to compare the practical performance of different algorithms for the same problem.

1. Code and analyze to compute the greatest common divisor (GCD) of two numbers.
2. Code and analyze to find the median element in an array of integers.
3. Code and analyze to find the majority element in an array of integers.
4. Code and analyze to sort an array of integers using Heap sort.
5. Code and analyze to sort an array of integers using Merge sort.
6. Code and analyze to sort an array of integers using Quick sort.
7. Code and analyze to find the edit distance between two character strings using dynamic programming.
8. Code and analyze to find an optimal solution to weighted interval scheduling using dynamic programming.
9. Code and analyze to find an optimal solution to matrix chain multiplication using dynamic programming.
10. Code and analyze to do a depth-first search (DFS) on an undirected graph. Implementing an application of DFS such as (i) to find the topological sort of a directed acyclic graph, OR (ii) to find a path from source to goal in a maze.
11. Code and analyze to do a breadth-first search (BFS) on an undirected graph. Implementing an application of BFS such as (i) to find connected components of an undirected graph, OR (ii) to check whether a given graph is bipartite.
12. Code and analyze to find shortest paths in a graph with positive edge weights using Dijkstra's algorithm.

13. Code and analyze to find shortest paths in a graph with arbitrary edge weights using Bellman-Ford algorithm.

14. Code and analyze to find the minimum spanning tree in a weighted, undirected graph.
15. Code and analyze to find all occurrences of a pattern P in a given string S.
16. Code and analyze to multiply two large integers using Karatsuba algorithm.
17. Code and analyze to compute the convex hull of a set of points in the plane. 18. (Mini-project Topic) Program to multiply two polynomials using Fast Fourier Transform (FFT).

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1.	The Design and Analysis of Algorithms	Dexter Kozen	Addison Wesley
2.	The Design and Analysis of Computer Algorithms	A. V. Aho, J. E. Hopcroft, and J. D. Ullman	Addison Wesley

Skill Enhancement Courses

Course Code	**PHY 205**
Course Title	**PHYSICS WORKSHOP SKILL**
Type of course	SKILL ENHANCEMENT
L T P	0 0 4
Credits	2
Course prerequisite	10+ 2 physics
Course Objective (CO)	The aim of this course is to enable the students to familiar and experience with various mechanical and electrical tools through hands-on mode

Syllabus

UNIT I:

Measuring units. conversion to SI and CGS. Familiarization with meterscale, Vernier calliper, Screw gauge and their utility. Measure the dimension of a solid block, volume of cylindrical beaker/glass, diameter of a thin wire, thickness of metal sheet, etc. Use of Sextant to measure height of buildings, mountains, etc.

UNIT II:

Concept of workshop practice. Overview of manufacturing methods:casting, foundry, machining, forming and welding. Types of welding joints and welding defects. Common materials used for manufacturing like steel, copper, iron, metal sheets, composites and alloy, wood. Concept of machine processing, introduction to common machine tools like lathe, shaper, drilling, milling and surface machines. Cutting tools, lubricating oils. Cutting of a metal sheet using blade. Smoothening of cutting edge of sheet using file. Drilling of holes of different diameter in metal sheet and wooden block.Use of bench vice and tools for fitting. Make funnel using metal sheet

UNIT III:

Electrical and Electronic Skill: Use of Multimeter. Soldering of electrical circuits having discrete components (R, L, C, diode) and ICs on PCB. Operation of oscilloscope. Making regulated power supply. Timer circuit, Electronic switch using transistor andrelay

UNIT IV:

Introduction to prime movers: Mechanism, gear system, wheel, Fixing of gears with motor axel. Lever mechanism, Lifting of heavy weight using lever. braking systems, pulleys, working principle of power generation systems. Demonstration of pulleyexperiment**Text and Reference Books**

S. No	Name	Author(S)	Publisher
1	*A TEXT BOOK IN ELECTRICAL TECHNOLOGY*	B L THERAJA	S. CHAND AND COMPANY
2	*PERFORMANCE AND DESIGN OF AC MACHINES*	M.G. SAY	ELBS EDN
3	*MECHANICAL WORKSHOP PRACTICE*	K.C. JOHN, 2010	PHI LEARNING PVT. LTD.
4.	*WORKSHOP PROCESSES*	BRUCE J BLACK 20	3RD EDN., EDITOR

Course Code	**CSA281**
Course Title	**Computer Graphics**
Type of course	SKILL ENHANCEMENT
L T P	2 0 0
Credits	2
Course prerequisite	Basic Knowledge graphics
Course Objective (CO)	This course is designed to provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.

Syllabus

UNIT I:

Development of computer Graphics: Raster Scan and Random Scan graphics storages, displays processors

UNIT II

Character generator color display techniques, interactive input/output devices.

UNIT III:

Points, lines and curves: Scan conversion, line-drawing algorithms, circle and ellipse generation, conic-section generation, polygon filling anti aliasing

UNIT IV:

Two-dimensional viewing: Coordinate systems, linear transformations, line and polygon clipping algorithms.

Text and Reference Books

RECOMMENDED BOOKS			
Sr. no.	**Name**	**AUTHOR(S)**	**PUBLISHER**
1.	Computer Graphics	Donald Hearn & M. Pauline Baker	PHI
2.	Computer Graphics	Hill Jr	PrenticeHall
3.	Computer Graphics	Steven Harrington	McGraw-Hill

Course Code	**MAT207**
Course Title	**Logic and sets**
Type of course	SKILL ENHANCEMENT
L T P	2 0 0
Credits	2
Course prerequisite	10+ 2 mathematics
Course Objective (CO)	The aim of the subjects that students have basic knowledge of sets, relation and basic operators.

Syllabus

UNIT I

Introduction , propositions, truth table, negation, conjunction and disjunction. Implications, biconditionalpropositions ,converse, contra positive and inverse propositions and precedence of logical operators.

UNIT II

Propositional equivalence: Logical equivalences. Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations.

UNIT III

Sets, subsets, Set operations, the laws of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle. Empty set, properties of empty set. Standard set operations. Classes of sets. Power set of a set.

UNIT IV

Difference and Symmetric difference of two sets. Set identities, Generalized union and intersections. Relation: Product set, Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Discrete Mathematics and Combinatorial Mathematics*	R.P. Grimaldi	Pearson Education
2	*Naive Set Theory*	P.R. Halmos	Springer
3	*Theory of Sets*	E. Kamke	Dover Publishers,

Course Code	**PHY206**
Course Title	**Electrical circuits and network skills**
Type of course	SKILL ENHANCEMENT
L T P	0 0 4
Credits	2
Course prerequisite	10+ 2 physics
Course Objective (CO)	The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode

Syllabus

Unit I:

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC Electricity and DC ElectricityFamiliarization with multimeter, voltmeter and ammeter.Understanding electrical circuits: Main electric circuit and their combinationRules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex powercomponents of AC source. Power factor. Saving energy and money.

UNIT II:

Electrical Drawing and Symbols: Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow andvoltage drop. Generators and Transformers: DC Power sources. AC/DC generators. Inductance,capacitance, and impedance. Operation of transformers.

UNIT III:

Electric Motors: Single-phase, three-phase & DC motors.Basic design. Interfacing. DC or AC sources to control heaters & motors. Speed & power of acmotor Solidstate devices: Inductors, capacitors, diode, resistor Components
Inseries or in shunt. Response of inductors and capacitors with DC or AC source.

UNIT-IV:

Electrical Protection relays fuses and disconnect switches circuit breakers Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Interfacing DC or AC sources to control elements (relay protection device)Electrical Wiring: Different types of conductors and cables. Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays. Splices: wirenuts, crimps, terminal blocks, split bolts, and solder. Preparation of extension board.

Text and Reference Books

S. NO	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	*A TEXT BOOK IN ELECTRICAL TECHNOLOGY*	B L THERAJA	S CHAND & CO.
2.	*ELECTRICAL TECHNOLOGY*	A K THERAJA	S CHAND & CO.

Course Code	**MAT208**
Course Title	**NUMBER THEORY**
Type of course	SKILL ENHANCEMENT
L T P	2 0 0
Credits	2
Course prerequisite	10+ 2 mathematics
Course Objective (CO)	. It develops The Knowledge about number theory and combinations of numbers.

Syllabus

UNIT I:

Division algorithm, Lame's theorem, linear Diophantine equation, fundamental theorem of arithmetic, prime counting function, statement of prime number theorem,

UNIT II:

Goldbach conjecture, binary and decimal representation of integers, linear congruences, complete set of residues.

UNIT III:

Number theoretic functions, sum and number of divisors, totally multiplicative functions, definition and properties of the Dirichlet product,

UNIT IV:

Mobius inversion formula, the greatest integer function, Euler's phi-function

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Elementary Number Theory*	David M. Burton	Tata McGraw-Hill
2	*Beginning Number Theory*	Neville Robinns	Narosa Publishing

Course Code	**PHY309**
Course Title	**Renewable and Energy Harvesting**
Type of course	SKILL ENHANCEMENT
L T P	2 0 0
Credits	2
Course prerequisite	10+ 2 physics
Course Objective (CO)	The aim of this course is not just to impart theoretical knowledge to the students but to provide them with exposure and hands-on learning wherever possible

Syllabus

UNIT I

Fossil fuels and Alternate Sources of energy: Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean.Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity

Solar energy: Solar energy, its importance, storage of solar energy, solar pond, non convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking system

UNIT II

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies. Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy,Osmotic Power, Ocean Bio-mass.

UNIT III

Geothermal Energy: Geothermal Resources, Geothermal Technologies. Hydro Energy: Hydropower resources, hydropower technologies, environmental impactof hydro power sources.Piezoelectric Energy harvesting: Introduction, Physics and characteristics ofpiezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power

UNIT IV:

Electromagnetic Energy Harvesting: Linear generators, physics mathematical models, recent application carbon captured technologies, cell, batteries , power consumption Environmental issues and Renewable sources of energy, sustainability

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Non-conventional energy sources*	G.D Rai	Khanna Publishers, New Delhi
2	*Solar energy*	M P Agarwal	S Chand and Co. Ltd.
3	*Solar energy*	Suhas P Sukhative	Tata McGraw - Hill

Course Code	**MAT305**
Course Title	**VECTOR CALCULUS**
Type of course	SKILL ENHANCEMENT
L T P	2 0 0
Credits	2
Course prerequisite	10+ 2 mathematics
Course Objective (CO)	. It Helps to define vector space , Null Space , nulitity and linear transformation and

Syllabus

UNIT I:

Differentiation

UNIT II:

partial differentiation of a vector function.

UNIT III:

Derivative of sum, dot product and cross product of two vectors.

UNIT IV:

Gradient, divergence and curl.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Calculus*	H. Anton	John Wiley and Sons
2	*Vector Calculus*	P.C. Matthew's	London Limited

Syllabus

Course Code	**CSA393**
Course Title	**Electronic commerce**
Type of course	SKILL ENHANCEMENT
L T P	2 0 0
Credits	2
Course prerequisite	Nil
Course Objective (CO)	It explains the main concepts related to e-commerce. Enable students to understand the enabling technologies for ecommerce.

UNIT I:

Building Blocks of Electronic Commerce: Introduction, internet and networking technologies, Internet and network protocols, web server scalability, software technologies for building

UNIT II:

E-commerce applications, distributed objects, object request brokers, component technology, web services, web application architectures.

UNIT III:

Design of auction, optimization algorithms, for market places, multi-agent systems.

UNIT IV:

Global E-commerce and Law: Cyber law in India. Comparative evaluation of Cyber laws of certain countries.

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1.	E-Commerce	David Whiteley	Tata McGraw Hill
2.	Electronic Commerce	Eframi Turban, Jae Lee, David King	Pearson Education
3.	E-commerce	Laudon, K.C. and Traver, C.G	Prentice Hall

Course Code	**PHY314**
Course Title	**Radiation Safety**
Type of course	SKILL ENHANCEMENT
L T P	2 0 0
Credits	2
Course prerequisite	10+ 2 physics
Course Objective (CO)	The aim of this course is to enable the students to enhance the knowledge of radiation physics through hands-on mode.

Syllabus

Unit-I

Basics of Atomic and Nuclear Physics: Basic concept of atomic structure; X rays characteristic and production; concept of bremsstrahlung and auger electron, The composition of nucleus and its properties, mass number, isotopes of element, spin, binding energy, stable and unstable isotopes, law of radioactive decay, Mean life and 43 half life, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission. (6 Lectures)

Unit-II

Interaction of Radiation with matter: Types of Radiation: Alpha, Beta, Gamma and Neutron and their sources, sealed and unsealed sources, Interaction of Photons - Photoelectric effect, Compton Scattering, Pair Production, Linear and Mass Attenuation Coefficients, Interaction of Charged Particles: Heavy charged particles - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling, Channeling and Cherenkov radiation. Beta Particles- Collision and Radiation loss (Bremsstrahlung), Interaction of Neutrons- Collision, slowing down and Moderation. (7 Lectures)

Unit-III

Radiation detection and monitoring devices: Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, Annual Limit of Intake (ALI) and derived Air Concentration (DAC). Radiation detection: Basic concept and working principle of gas detectors (Ionization Chambers, Proportional Counter, Multi-Wire Proportional Counters (MWPC) and Gieger Muller Counter), Scintillation Detectors (Inorganic and Organic Scintillators), Solid States Detectors and Neutron Detectors, Thermo luminescent Dosimetry. (7 Lectures)

Unit-IV

Radiation safety management: Biological effects of ionizing radiation, Operational limits and basics of radiation hazards evaluation and control: radiation protection standards, International Commission on Radiological Protection (ICRP) principles, justification, optimization, limitation, introduction of safety and risk management of radiation. Nuclear waste and disposal management. Brief idea about Accelerator driven Sub-critical system (ADS) for waste management. (5 Lectures)

Unit-V

Application of nuclear techniques: Application in medical science (e.g., MRI, PET, Projection Imaging Gamma Camera, radiation therapy), Archaeology, Art, Crime detection, Mining and oil. Industrial Uses: Tracing, Gauging, Material Modification, Sterization, Food preservation. (5 Lectures)

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Fundamental Physics of Radiology*	W.J. Meredith and J.B. Massey	John Wright and Sons, UK, 1989.
2	*"Fundamentals of Radiation Dosimetry"*	J.R. Greening	Medical Physics Hand Book Series, No.6, Adam Hilger Ltd., Bristol 1981..
3	*Practical Applications of Radioactivity and Nuclear Radiations,*	G.C. Lowental and P.L. Airey	Cambridge University Press, U.K., 2001
4	*"Medical Radiation Physics"*	W.R. Hendee	Year Book – Medical Publishers Inc. London, 1981
5	*An Introduction to Radiation Protection,*	A. Martin and S.A. Harbisor	John Willey & Sons, Inc. New York, 1981.

Course Code	**MAT310**
Course Title	**Transportation and game theory**
Type of course	SKILL ENHANCEMENT
L T P	2 0 0
Credits	2
Course prerequisite	10+ 2 mathematics
Course Objective (CO)	. The aim of Subject To develops The knowledge about Mathematical Formulation and Games With Mixed Strategies

Syllabus

UNIT I:

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,

UNIT II:

assignment problem and its mathematical formulation,Hungarian method for solving assignment problem.

UNIT III:

Game theory: formulation of two person zero sum games, solving two person zero sum games,

Unit IV:

games with mixed strategies, graphical solution procedure

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Linear Programming and netgwork flows*	Mokhtar S. Bazaraa	John Wiley and Sons
2	*Introduction to Operations Researc*	F. S. Hillier and G. J. Lieberman	Tata McGraw Hill
3	*Operations Research, An Introduction*	Hamdy A. Taha	Prentice-Hall

Discipline Elective Course

Course Code	**PHY301**
Course Title	**DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION**
Type of course	DISCIPLINE ELECTIVE(THEORY)
L T P	4 0 0
Credits	4
Course prerequisite	10+ 2 PHYSICS
Course Objective (CO)	The aim of this course is not just to impart theoretical knowledge to the students about digital electronics and analog circuits and instrumentations.

Syllabus

UNIT-I

Digital CircuitsDifference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates. De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) KarnaughMap.Binary Addition. Binary Subtraction using 2's Complement Method).Half Adders andFull Adders and Subtractors, 4-bit binary Adder-Subtractor.

UNIT-II

Semiconductor Devices and Amplifiers:Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static and Dynamic Resistance. Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell.Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE andCC Configurations. Active, Cutoff, and Saturation Regions. Current gains α and β. Relations between α and β. Load Line a nalysis of Transistors. DC Load line and Q-point. Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and OutputImpedance. Current, Voltage and Power Gains. Class A, B, and C Amplifier

UNIT-III

Operational Amplifiers (Black Box approach):Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop& Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator,(6) Zero Crossing Detector. Sinusoidal OscillatorsBarkhausen'sCriterion for Self-sustainedOscillations.Determination of Frequency of RC Oscillator

UNIT-IV

Instrumentations:Introduction to CRO: Block Diagram of CRO. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about

capacitorfilter, Zener Diode and Voltage RegulationTimer IC:IC555 Pin diagram and its application as Astable&MonostableMultivibrator

Text and Reference Books

S. NO	NAME	AUTHOR(S)	PUBLISHER
1	*INTEGRATED ELECTRONICS*	J. MILLMAN AND C.C. HALKIAS, 1991	TATA MC-GRAW HILL.
2	*ELECTRONIC DEVICES AND CIRCUITS*	S. SALIVAHANAN AND N. SURESH KUMAR, 2012,	TATA MC-GRAW HILL.
3	*MICROELECTRONIC CIRCUITS*	M.H. RASHID, 2NDEDN.,2011	CENGAGE LEARNING.
4	*MODERN ELECTRONIC INSTRUMENTATION & MEASUREMENT TECH*	HELFRICK&COOPER,1990	PHI LEARNING
5	*DIGITAL PRINCIPLES & APPLICATIONS,*	A.P. MALVINO, D.P. LEACH & SAHA, 7TH ED.,2011,	TATA MCGRAW HILL.

Course Code	**PHY 303**
Course Title	**DIGITAL AND ANALOG CIRCUITS AND INSTRUMENTATION lab**
Type of course	DISCIPLINE ELECTIVE(PRACTICAL)
L T P	0 0 4
Credits	2
Course prerequisite	10+ 2 PHYSICS
Course Objective (CO)	The aim of this course is not just to impart theoretical knowledge to the students but to provide them with exposure and hands-on learning wherever possible.

Syllabus

1. To measure (a) Voltage, and (b) Frequency of a periodic waveform using a CRO
2. To verify and design AND, OR, NOT and XOR gates using NAND gates.
3. To minimize a given logic circuit.
4. Half adder, Full adder and 4-bit Binary Adder.
5. Adder-Subtractor using Full Adder I.C.
6. To design an astablemultivibrator of given specifications using 555 Timer.
7. To design a monostablemultivibrator of given specifications using 555 Timer.
8. To study IV characteristics of PN diode, Zener and Light emitting diode
9. To study the characteristics of a Transistor in CE configuration.
10. To design a CE amplifier of a given gain (mid-gain) using voltage divider bias.
11. To design an inverting amplifier of given gain using Op-amp 741 and study its frequency response.
12. To design a non-inverting amplifier of given gain using Op-amp 741 and study its Frequency Response.
13. To study a precision Differential Amplifier of given I/O specification using Op-amp.
14. To investigate the use of an op-amp as a Differentiator
15. To design a Wien Bridge Oscillator using an op-amp.

Text and Reference Books

S. NO	NAME	AUTHOR(S)	PUBLISHER
1	*BASIC ELECTRONICS: A TEXT LAB MANUAL,*	P.B. ZBAR, A.P. MALVINO, M.A. MILLER, 1994,	TATA MC-GRAW HILL.
2	*ELECTRONICS: FUNDAMENTALS AND APPLICATIONS,*	J.D. RYDER, 2004,	PRENTICE HALL..
3	*MICROELECTRONIC CIRCUITS,*	M.H. RASHID, 2NDEDN.,2011	CENGAGE LEARNING.
4	*OP-AMPS AND LINEAR INTEGRATED CIRCUIT,*	R. A. GAYAKWAD, 4TH EDITION, 2000,	PRENTICE HALL.
5	*ELECTRONIC PRINCIPLE*	ALBERT MALVINO, 2008	TATA MCGRAW HILL.

Course Code	**PHY305**
Course Title	**ELEMENTS OF MODERN PHYSICS**
Type of course	DISCIPLINE ELECTIVE(THEORY)
L T P	4 0 0
Credits	4
Course prerequisite	10+ 2 PHYSICS
Course Objective (CO)	The aim of this course is just to impart theoretical knowledge to the students with the one more important subject of physics, named as quantum mechanics. This is addition in the knowledge of mechanics at micro-state level.

Syllabus

UNIT I

Planck's quantum, Planck's constant and light as a collection of photons; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment. Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels forhydrogen like atoms and their spectra Position measurement – gamma ray microscope thought duality , Heisenberg uncertainty principle- impossibility trajectory , Estimating minimum energy of a confined principle , Energy time uncertainity principle

UNIT II

Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles; Momentum and Energy operators; stationarystates;physical interpretation of wavefunction, probabilities and normalization;Probabilityandprobability current densities in one dimension.One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization;

UNIT III

Quantum dot as an example; Quantum mechanical scattering and tunnelling in one dimension - across a step potential and across a rectangular potential barrier.Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy. Radioactivity: stability of nucleus; Law of radioactive decay; Mean life & half-life; α decay; β decay - energy released, spectrum and Pauli's prediction of neutrino; γ-ray emission.

UNIT IV

Fission and fusion - mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting withUranium235; Fusion and thermonuclear reactions

TEXT AND REFERENCE BOOKS

S. NO	NAME	AUTHOR(S)	PUBLISHER
1	*CONCEPTS OF MODERN PHYSICS,*	ARTHUR BEISER, 2009	TATA MC-GRAW HILL.
2	*SIX IDEAS THAT SHAPED PHYSICS: PARTICLE BEHAVE LIKE WAVES*	THOMAS A. MOORE, 2003,,	TATA MC-GRAW HILL.
3	*QUANTUM PHYSICS*	BERKELEY PHYSICS COURSE VOL.4. E.H. WICHMAN, 2008	TATA MC-GRAW HILL.

Course Code	**PHY307**
Course Title	**ELEMENTS OF MODERN PHYSICS**
Type of course	DISCIPLINE ELECTIVE(PRACTICAL)
L T P	0 0 4
Credits	2
Course prerequisite	10+ 2 PHYSICS
Course Objective (CO)	The aim of this course is just to impart practical knowledge to the students with the one more important subject of physics, named as quantum mechanics. This is addition in the knowledge of mechanics at micro-state level.

Syllabus

1. To determine value of Boltzmann constant using V-I characteristic of PN diode.
2. To determine work function of material of filament of directly heated vacuum diode.
3. To determine value of Planck's constant using LEDs of at least 4 different colours.
4. To determine the ionization potential of mercury.
5. To determine the wavelength of H-alpha emission line of Hydrogen atom.
6. To determine the absorption lines in the rotational spectrum of Iodine vapour.
7. To study the diffraction patterns of single and double slits using laser source and measure its intensity variation using Photosensor and compare with incoherent source – Na light.
8. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
9. To determine the value of e/m by magnetic focusing.
10. 10.To setup the Millikan oil drop apparatus and determine the charge of an electron**Text and Reference Book**

S. NO	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	*ADVANCED PRACTICAL PHYSICS FOR STUDENTS*	B.L. FLINT & H.T. WORSNOP, 1971	ASIA PUBLISHING HOUSE..
2	*ADVANCED LEVEL PHYSICS PRACTICALS*	MICHAEL NELSON AND JON M. OGBORN, 4TH EDITION.	HEINEMANN EDUCATIONAL PUBLISHERS.

Course Code	**MAT301**
Course Title	**MATRICES**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	10+ 2 MATHEMATICS
Course Objective (CO)	. . To provide an introduction to Basic concept of Matrices and Matrix Transformation in geometric

Syllabus

UNIT I:

R, R^2, R^3 as vector spaces over R. Standard basis for each of them. Concept of Linear Independence and examples of different bases. Subspaces of R^2, R^3. Translation, Dilation, Rotation, Reflection in a point, line and plane.

UNIT II:

Matrix form of basic geometric transformations. Interpretation of Eigen values and eigenvectors for such transformations and Eigen spaces as invariant subspaces. Matrices in diagonal form.

UNIT III:

Reduction to diagonal form up to matrices of order 3.

UNIT IV:

Computation of matrix inverses using elementary row operations. Rank of matrix. Solutions of a system of linear equations using matrices. concepts from Geometry, Physics, Combinations and Statistics.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Introduction to Algebra*	A.I. Kostrikin	Springer Verlag
2	*Linear Algebra*	S. H. Friedberg	Prentice Hall of India Pvt. Ltd
3	Theory and Problems of Matrix Operations	Richard Bronson	Tata McGraw Hall

Course Code	**MAT303**
Course Title	**LINEAR ALGEBRA**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	10+ 2 MATHEMATICS
Course Objective (CO)	. To have the knowledge of basic Quotient Space, linear Transformation , invertibility and Isomorphism

Syllabus

UNIT I:

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

UNIT II:

Linear transformations, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation, algebra of linear transformations.

UNIT III:

Dual Space, Dual Basis, Double Dual, Eigen values and Eigen vectors, Characteristic Polynomial.

UNIT IV:

Isomorphism's, Isomorphism theorems, inevitability and isomorphism's, change of coordinate matrix.**Text and Reference Books**

S. No	Name	Author(S)	Publisher
1	*Linear Algebra,*	Stephen H. Friedberg	Prentice-Hall of India
2	*Linear Algebra and its Applications*	David C. Lay	1. Pearson Education Asia, Indian
3	*Introduction to Linear Algebra*	S. Lang,	., Springer
4	*Linear Algebra and its Applications*	Gilbert Strang	Thomson

Course Code	**CSA383**
Course Title	**OPERATING SYSTEM**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	Basic computer knowledge and OS DOS Windows
Course Objective (CO)	The objective of this course is to help students become familiar with the fundamental concepts of operating systems and provide students with sufficient understanding of operating system design.

Syllabus

UNIT I:

Introduction: Operating System as a resource manager, operating system classification, system calls, traps, architectures for operating systems. Device Management: Goals of I/O software,

UNIT II:

Design of device drivers. Processor Management: Process overview, process states and state transition, multiprogramming, multi-tasking, levels of schedulers and scheduling algorithms.

UNIT III:

Process Synchronization - Critical section and mutual exclusion problem, classical synchronization problems, deadlock prevention. Multithreading Memory Management: Classical memory management techniques, paging, segmentation, virtual memory.

UNIT IV:

File Management: Overview of file management system, disk space management, directory structures. Protection domains, access control lists, protection models.

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	MS-Dos 6.22	Russell A Stultz	BPB Publication
2	Teach yourself Windows 2000	Brain Underdahl .	Wiley Publishers
3	Maximizing Windows	Peter Norton	Teachmedia
4	Advanced MS-Dos Programming	Ray Duncan	BPB
5	DOS for Dummies	Dan Gookin	John Wiley & Sons

Course Code	**CSA385**
Course Title	**DATABASE APPLICATION**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	Computer fundamentals and record keeping
Course Objective (CO)	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.

Syllabus

UNIT I:

Application Design and Development: User interfaces and tools, web interfaces toDatabases Web Fundamentals: HTML, static vs. dynamic web pages, client (Java script/VB) and serverside scripting (JSP/ASP/PHP/VB), web servers and sessions, two level & three level architecture,

UNIT II:

Real Life Application Development using Popular DBMS: SQL, procedures & functions, exception handling, triggers, large objects, user defined data types, collection types, bulk loading of data.

UNIT III:

Query Optimization: Query Processing, query tree, query plans, measures of query cost, estimates of basic operations, equivalent relational algebra expressions, evaluation of expressions.

UNIT IV:

Authorizations in SQL: System and user privileges, granting and revoking privileges, roles, authorization on views, functions and procedures, limitations of SQL authorizations, audit trails Application Security: Encryption techniques, digital signatures and digital certificates.

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1.	Database System Concepts	Henry Korth and A. Silberschatz	McGraw-Hill
2.	File Structure	Michael J. Folk, Greg, Riccardi	Pearson Education
3.	An Introduction to Database System	Bipin Desai	West Publishing Company

Course Code	**CSA391**
Course Title	**DATABASE APPLICATION LAB**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	Computer fundamentals and record keeping
Course Objective (CO)	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.

Syllabus

1. Introduction to various database.(Oracle,MySQL,MS Server)

2.How to create a table.(Using Sqletc)

3.Perform various operations like insert,update,retrieve,delete using database.

4.Study of joins.

5.How to implement sub queries.

6.Study of encryption.

Course Code	**CSA387**
Course Title	**COMPUTER NETWORK**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	Basics of Computer Networks
Course Objective (CO)	Be aware of principles and protocols of internetwork, Understand the basic issues in information security, the concept of ciphers and cryptography, various ciphers, digital signatures and email security policies, malicious software and their remedies.

Syllabus

UNIT I:

Basic Concepts: Components of data communication, distributed processing, Line configuration, topology, transmission mode, and categories of networks. OSI and TCP/IP Models: Layers and their functions, comparison of models.

UNIT II:

Digital Transmission: Interfaces and Modems: DTE-DCE Interface, modems, cable modems. Transmission Media: Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon Capacity.

UNIT III:

Telephony: Multiplexing, error detection and correction, Many to one, one to many, WDM, TDM, FDM, circuit switching, packet switching and message switching. DataLink control protocols: Line discipline, flow control, error control, synchronous and asynchronous protocol sover view. ISDN: Services, historical outline, subscriber's access, ISDN, Layers, and broadband ISDN.

UNIT IV:

Devices: Repeaters, bridges, gateways, routers, The Network Layer, Design Issues, Network Layer Addressing and Routing concepts (Forwarding Function, Filtering Function);Routing Methods (Static and dynamic routing, Distributed routing, Hierarchical Routing);Distance Vector Protocol, Link State protocol. Transport and upper layers in OSI Model: Transport layer functions, connection management, Functions of session layers, Presentation layer, and Application layer.

RECOMMENDED BOOKS

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1.	Computer Networks, 4th Edition,	Andrew S. Tanenbaum	Pearson Education
2.	Data Communication & Networking, 4th Edition,	Behrouz A. Forouzan	Tata McGraw Hill.
3.	Computer Networking,	James F. Kurose	Pearson Education

Course Code	**CSA397**
Course Title	**COMPUTER NETWORK LAB**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	Basics of Computer Networks
Course Objective (CO)	Be aware of principles and protocols of internetwork, Understand the basic issues in information security, the concept of ciphers and cryptography, various ciphers, digital signatures and email security policies, malicious softwares and their remedies.

Syllabus

1. Introduction to network topologies.

2.Brief description of various cables.

3.How to create connectors.(RJ 45)

4.Working of Routers,Switches,Gateways,Bridges.

5.Flow of data between various layers of OSI Model.

6.Differentiate between OSI model and TCP/IP model.

7.How to establish a connection with LAN.

8.Calssification of IP addresses.

Course Code	**PHY302**
Course Title	**SOLID STATE PHYSICS**
Type of course	DISCIPLINE ELECTIVE(THEORY)
L T P	4 0 0
Credits	4
Course prerequisite	10+ 2 PHYSICS
Course Objective (CO)	The subject will add one more step to the students of first year in the fields of magnetism, electromagnetic theory, & properties of matter.

Syllabus

Unit I

Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals. Bragg's Law. Atomic and Geometrical Factor.Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T^3 law

Unit II

Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss.

Unit III

Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. ClausiusMosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons.

Unit IV

Elementary band theory: Kronig Penny model. Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect, Hall coefficient.**Superconductivity:** Experimental Results. Critical Temperature. Critical magnetic field.Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect.

TEXT AND REFERENCE BOOKS

S. NO	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	*INTRODUCTION TO SOLID STATE PHYSICS*	CHARLES KITTEL	WILEY INDIA PVT .LTD.
2	*ELEMENTS OF SOLID STATE PHYSICS*	J.P. SRIVASTAVA,	PRENTICE-HALL OF INDIA .
3	*INTRODUCTION TO SOLIDS*	LEONID V. AZAROFF	TATA MC-GRAW HILL.
4.	*SOLID STATE PHYSICS*	NEIL W. ASHCROFT	CENGAGE

Course Code	**PHY304**
Course Title	**SOLID STATE PHYSICS**
Type of course	DISCIPLINE ELECTIVE(PRACTICAL)
L T P	0 0 4
Credits	2
Course prerequisite	10+ 2 PHYSICS
Course Objective (CO)	The course is to impart practicalknowledge to the students and provide them with practical exposure of electricity and magnetism.

Syllabus

1. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method)
2. To measure the Magnetic susceptibility of Solids.
3. To determine the Coupling Coefficient of a Piezoelectric crystal.
4. To measure the Dielectric Constant of a dielectric Materials with frequency
5. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR)
6. To determine the refractive index of a dielectric layer using SPR
7. To study the PE Hysteresis loop of a Ferroelectric Crystal.
8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.
9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four-probe method (from room temperature to 150 ^{o}C) and to determine its band gap.
10. To determine the Hall coefficient of a semiconductor sample.

TEXT AND REFERENCE BOOKS

S. NO	NAME	AUTHOR(S)	PUBLISHER
1	*ADVANCED PRACTICAL PHYSICS FOR STUDENTS*	B.L. FLINT AND H.T. WORSNOP, 1971	ASIA• PUBLISHING HOUSE
2	*ADVANCED LEVEL PHYSICS PRACTICALS,*	J MICHAEL NELSON AND JON M. OGBORN, 4TH EDITION,• REPRINTED 1985,	HEINEMANN EDUCATIONAL PUBLISHERS
3	*A TEXT BOOK OF PRACTICAL PHYSICS,*	INDU PRAKASH AND RAMAKRISHNA, 11TH ED., 2011	,• KITAB MAHAL, NEW DELHI
4.	*ELEMENTS OF SOLID STATE PHYSICS*	J.P. SRIVASTAVA, 2ND ED., 2006	J.P. SRIVASTAVA, 2ND ED., 2006

Course Code	**PHY306**
Course Title	**QUANTAM MECHANICS**
Type of course	DISCIPLINE ELECTIVE (THEORY)
L T P	4 00
Credits	4
Course prerequisite	10+ 2 PHYSICS
Course Objective (CO)	The aim of this course is just to impart theoretical knowledge to the students with the one more important subject of physics, named as quantum mechanics. This is addition in the knowledge of mechanics at micro-state level

Syllabus

Unit I:

Time dependent 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 & 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 energyeigenvalues; expansion of an arbitrary wave function 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 the spread of Gaussian wave packet for a free particle in one dimension; wave packets, Fourier transforms and momentum space wave function; Position-momentum uncertainty principle

Unit II:

General discussion of bound states in an arbitrary potential- continuity of wave function, boundary condition and emergence of discrete energy levels; application to one-dimensional problem- square well potential; Quantum mechanics of simple harmonic oscillator-energy levels and energy eigenfunctions using Frobenius method.
Quantum theory of hydrogen-like atoms: time independent Schrodinger equation in spherical polar coordinates; separation of variables for the second order partial differential equation; angular momentum operator and quantum numbers; Radial wavefunctions from Frobenius method; Orbital angular momentum quantum numbers land m; s, p, d,.. shells (idea only

Unit III:

Atoms in Electric and 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.

UNIT IV:

Atoms in External Magnetic Fields:- Normal and Anomalous Zeeman Effect.Many electron atoms:- Pauli's Exclusion Principle. Symmetric and 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.

TEXT AND REFERENCE BOOKS

S. NO	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	*A Text book of Quantum Mechanics*	P.M. Mathews & K. Venkatesan, 2nd Ed., 2010	McGraw Hill
2	*Quantum Mechanics* ,	Robert Eisberg and Robert Resnick, 2ndEdn., 2002	Wiley.
3	*Quantum Mechanics* ,	Leonard I. Schiff, 3rdEdn. 2010,	Tata McGraw Hill
4.	*Quantum Mechanics*	G. Aruldhas, 2ndEdn. 2002,	PHI Learning of India
	Quantum Mechanics	Bruce Cameron Reed, 2008,	Jones and Bartlett Learning.

Course Code	**PHY308**
Course Title	**QUANTUM MECHANICS**
Type of course	DISCIPLINE ELECTIVE(PRACTICAL)
L T P	0 0 4
Credits	2
Course prerequisite	10+ 2 PHYSICS
Course Objective (CO)	The aim of this course is just to impart practical knowledge to the students with the one more important subject of physics, named as quantum mechanics. This is addition in the knowledge of mechanics at micro-state level

Syllabus

1.Solve the s-wave Schrodinger equation for the ground state and the first excited state of the hydrogen atom:

Here, m is the reduced mass of the electron. Obtain the energy eigenvalues and plot the corresponding wavefunctions. Remember that the ground state energy of the hydrogen atom is ≈ -13.6 eV. Take e = 3.795 $(eVÅ)^{1/2}$, ħc = 1973 (eVÅ) and m = $0.511x10^6 eV/c^2$.

2.Solve the s-wave radial Schrodinger equation for an atom

here m is the reduced mass of the system (which can be chosen to be the mass of an electron), for the screened coulomb potential

Find the energy (in eV) of the ground state of the atom to an accuracy of threesignificant digits. Also, plot the corresponding wavefunction. Take e = 3.795 $(eVÅ)^{1/2}$, m = $0.511x10^6 eV/c^2$, and a = 3 Å, 5 Å, 7 Å. In these units ħc = 1973(eVÅ). The ground state energy is expected to be above -12 eV in all three cases.

3.Solve the s-wave radial Schrodinger equation for a particle For the anharmonic oscillator potential for the ground state energy (in MeV) of the particle to an accuracy of three significant digits. Also, plot the corresponding wave function. Choose m = 940 MeV/c^2, k = 100 MeV fm^{-2}, b = 0, 10, 30 MeV fm^{-3}In these units, ch = 197.3 MeV fm. The ground state energy I expected to lie between 90 and 110 MeV for all three cases.

4 Solve the s-wave radial Schrodinger equation for the vibrations of hydrogen molecule:

Find the lowest vibrational energy (in MeV) of the molecule to an accuracy of three significant digits. Also plot the corresponding wave function.

Take: m = $940x10^6 eV/C^2$, D = 0.755501 eV, α = 1.44, r_o = 0.131349 Å

Laboratory based experiments:

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

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

3.To study the quantum tunnelling effect with solid state device, e.g. tunnelling current in backward diode or tunnel diode.

TEXT AND REFERENCE BOOKS

S. NO	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1	*SCHAUM'S OUTLINE OF PROGRAMMING WITH C++*	J.HUBBARD, 2000	MCGRAW HILL
2	. *NUMERICAL RECIPES IN C: THE ART OF SCIENTIFIC COMPUTING ,*	W.H.PRESS ET AL.,• 3RDEDN., 2007,	CAMBRIDGE UNIVERSITY PRESS
3	*A GUIDE TO MATLAB,*	B.R. HUNT, R.L. LIPSMAN, J.M. ROSENBERG, 2014, 3RD EDN.	CAMBRIDGE UNIVERSITY PRESS

Course Code	**PHY310**
Course Title	**Nuclear & Particle Physics**
Type of course	DISCIPLINE ELECTIVE (THEORY)
L T P	4 0 0
Credits	4
Course prerequisite	10+ 2 PHYSICS
Course Objective (CO)	The aim of this course is just to impart theoretical knowledge to the students with the one more important subject of physics, named as nuclear physics

Syllabus

UNIT I

General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties ,quantitative facts about size, mass, charge density (matter energy), binding energy, average binding energy and its variation withmass number, main features of binding ,energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments, nuclear excites states. Nuclear Models: Liquid drop model approach, semi empirical mass formula and significance of various terms, condition of nuclear stability. Two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force.

UNIT II

Radioactivity decay:(a) Alpha decay: basics of α-decay processes, theory of α-emission, Gamow factor, Geiger Nuttall law, α-decay spectroscopy. (b) β-decay: energy kinematics for β-decay, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays emission & kinematics, internal conversion.

Nuclear Reactions: Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct reaction, resonance reaction, Coulomb scattering (Rutherford scattering).

UNIT III:

Interaction of Nuclear Radiation with matter: Energy loss due to ionization (Bethe- Block formula), energy loss of electrons, Cerenkov radiation, Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, neutron interaction with matter.

Detector for Nuclear Radiations: Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation 32 Detectors and construction of photo-multiplier tube (PMT). Semiconductor Detectors (Si & Ge) for charge particle and photon detection (concept of charge carrier and mobility).

UNIT IV

Particle Accelerators: Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator), Linear accelerator, Cyclotron, Synchrotrons. Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons.

TEXT AND REFERENCE BOOKS

S. NO	NAME	AUTHOR(S)	PUBLISHER
1	*Introductory nuclear Physics*	Kenneth S. Krane .	Wiley (1978)
2	*Concepts of nuclear physics*	Bernard L. Cohen.	Tata Mcgraw Hill, 1998
3	*Radiation detection and measurement*	G.F. Knoll	John Wiley & Sons, 2000
4.	*Quarks and Leptons*	F. Halzen and A.D. Martin,	Wiley India, New Delhi

Course Code	**MAT302**
Course Title	**INTEGRAL CALCULUS**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	10+ 2 MATHEMATICS
Course Objective (CO)	. It help to students Understand partial Integration

Syllabus

UNIT I:

Integration by Partial fractions, integration of rational and irrational functions.

UNIT II:

Integration of definite integrals. Reduction formulae for integrals of rational, trigonometric, exponential and logarithmic functions and of their combinations.

UNIT III:

Areas and lengths of curves in the plane, volumes and surfaces of solids of revolution.

UNIT IV:

Double and Triple integrals.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Calculus*,	G.B. Thomas and R.L. Finney	Pearson Education
2	*Calculus*	H. Anton, I. Bivens and S. Davis	John Wiley and Sons

Course Code	**MAT306**
Course Title	**COMPLEX ANALYSIS**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	10+ 2 MATHEMATICS
Course Objective (CO)	. It develops the knowledge Analytic function ,derivative function and Cauchy-Riemann equation

Syllabus

UNIT I:

Limits, Limits involving the point at infinity, continuity. Properties of complex numbers, regions in the complex plane, functions of complex variable, mappings. Derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient conditions for differentiability.

UNIT II:

Analytic functions, examples of analytic functions, exponential function, Logarithmic function, trigonometric function, derivatives of functions, definite integrals of functions. Contours, Contour integrals and its examples, upper bounds for moduli of contour integrals.

UNIT III:

Cauchy-Goursat theorem, Cauchy integral formula.Liouville's theorem and the fundamental theorem of algebra.

UNIT IV:

Convergence of sequences and series, Taylor series and its examples.Laurent series and its examples, absolute and uniform convergence of power series.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Complex Variables and Applications*	James Ward Brown and Ruel V. Churchill	Hill International Edition
2	*Complex analysis*	Joseph Bak and Donald J. Newman	Springer-Verlag New York

Course Code	**MAT308**
Course Title	**LINEAR PROGRAMMING**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	10+ 2 MATHEMATICS
Course Objective (CO)	It help to students Understand Simplex Method ,Big M Method and Primal – dual Relationship

Syllabus

UNIT I:

Linear Programming Problems, Graphical Approach for Solving some Linear Programs. Convex Sets, Supporting and Separating Hyper planes.

UNIT II

Theory of simplex method, optimality and unboundedness, the simplex algorithm, simplex method in tableau format

UNIT III:

Introduction to artificial variables two-phase method, Big-M method and their comparison.

UNIT IV:

Duality, formulation of the dual problem, primal- dual relationships, economic interpretation of the dual, sensitivity analysis.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	*Linear programming and Network flows*	Mokhtar S. Bazaraa	John Wiley and Sons
2	*Linear programming*	Mokhtar S. Bazaraa	Tata McGraw Hill

Course Code	**CSA384**
Course Title	**INFORMATION SECURITY**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	Basics of Computer Networks
Course Objective (CO)	Be aware of principles and protocols of internetwork, Understand the basic issues in information security, the concept of ciphers and cryptography, various ciphers, digital signatures and email security policies, malicious software and their remedies.

Syllabus

UNIT I:

Overview of Security: Protection versus security; aspects of security–data integrity, data availability, privacy; security problems, user authentication, Orange Book.

UNIT II:

Security Threats: Program threats, worms, viruses, Trojan horse, trap door, stack and buffer overflow; system threats- intruders; communication threats- tapping and piracy. Cryptography: Substitution, transposition ciphers, symmetric-key algorithms-

UNIT III:

Data Encryption Standard, advanced encryption standards, public key encryption - RSA; Diffie-Hellman key exchange, ECC cryptography, Message Authentication-MAC, hash functions.

UNIT IV:

Digital signatures: Symmetric key signatures, public key signatures, message digests, public key infrastructures. Security Mechanisms: Intrusion detection, auditing and logging, tripwire, system-call monitoring;

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Information Security The Complete Reference	Mark Rhodes-Ousley	McGraw-Hill Education
2	Information Security: Principles and Practice	Mark Stamp	Wiley-Blackwell

Course Code	**CSA396**
Course Title	**DATA MINING**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	Knowledge of Database Management Systems
Course Objective (CO)	To develop an understanding of the strengths of data mining techniques and business applications of data mining. To know basics of warehousing

Syllabus

UNIT I:

Overview: The process of knowledge discovery in databases, predictive and descriptive data mining techniques, supervised and unsupervised learning techniques.

UNIT II:

Techniques of Data Mining: Link analysis, predictive modeling, database segmentation, score functions for data mining algorithms, Bayesian techniques in data mining.

UNIT III:

Issues in Data Mining: Scalability and data management issues in data mining algorithms.

UNIT IV:

parallel and distributed data mining, privacy, social, ethical issues in KDD and data mining, pitfalls of KDD and data mining.

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Data Warehousing Fundamentals	PaulrajPonnian	John Wiley
2	Data Mining Concepts and Techniques	Han, Kamber	Morgan Kaufmann
3	Data Mining Introductory and Advanced Topics Data Mining Concepts and Techniques	M.H. Dunham	Pearson Education

Course Code	**ENG352**
Course Title	**Communication Skills**
Type of Course	Theory
L T P	2:0:0
Credits	-
Course pre-requisite	NA
Course Objectives	The objective of this course is to : 1.assist the students to acquire proficiency, both in spoken and written language 2. to develop comprehension, improve writing skills, and enhance skills in spoken English.

Syllabus

UNIT-I

Basics of Communication Skills:
Communication, Process of Communication, Types of Communication-Verbal and Non verbal communication, Channels of Communication- Upward, Downward, Horizontal, Barriers to Communication, Role of Communication in society.
Grammar: Parts of Speech, Use of appropriate tense, Voice , Reported Speech, Sentence Structure; Simple, Compound, Complex, Vocabulary-One word substitution.
UNIT-II

Listening Skills:
Listening Process, Hearing and Listening, Types of Listening, Effective Listening, Barriers of Effective Listening, Note Taking
Reading Skills:
Purpose of reading, Process of reading, reading skills Models and strategies, scanning, skimming, SQ3R, Approaches of Reading, Comprehension passages for practice.
UNIT III

Writing Skills:
Purpose of writing, Effective writing, Types of writing, Business Correspondence, Precise writing, Memo writing, minutes of meeting. Application for employment , Resume Writing

,Paragraph Writing Construction-Kinds of Paragraphs, Preparing of Matter for meeting : Notice, agenda ,Conference

UNIT-IV

Speaking Skills: Effective oral Presentation, Slide making, Use of audio Visual aids.
Speech process, Skills of effective speaking, Role of audience, Feedback Skill, Oral Presentation.

Text and Reference Books:

Sr No	Author(s)	Title	Publisher
1.	BhupenderKour	Effectual Communication Skills	S.K. Kataria and Sons
2.	R. Datta Roy and K.K. Dheer	Communications Skills	Vishal Publishing Company
3	The Essence of Effective Communication	Ludlow and Panthon	Prentice Hall of India
4	Essentials of Business Comunication	Pal and Roruallling	S. Chand and Sons. New Delhi