SCHEME & SYLLABUS

B.Sc Computer Science

CHOICE BASED CREDIT SYSTEM

Department of Physical Sciences

University Institute of Sciences and Humanities (UISH)

Sant Baba Bhag Singh University

2020

ABOUT THE DEPARTMENT

Department of Physical Sciences is dynamic and progressive in its development of new course initiatives.The Department of Physical Sciences strives for excellence in creating, applying and imparting knowledge in computer science through comprehensive educational programs, research & dissemination through scholarly publications and service to professional societies, the community, the state and the nation. The Department has highly qualified, young and dynamic faculty in various fields of Physical Sciences viz. in chemistry research interests include Green Chemistry, Polymer Chemistry, Advanced controlled drug delivery systems, Advanced heterocyclic chemistry etc. The thrust area in Physics includes Materials Physics, Condensed matter Physics, Nuclear Physics and nanomaterials and their applications. The research interest of faculty of mathematics includes Numerical Analysis, Wavelet methods, topology, fixed point theory, qualitative behaviour of dynamical systems, Mathematical modelling via differential equations.The department imparts quality education ranging from the expertise in traditional software development to the modern computing technologies.

SALIENT FEATURES OF THE DEPARTMENT

• Research oriented curriculum designed to enable students to acquire all the skills needed to collect and analyze the data.

• The Institute drawing upon its strength of highly qualified well trained faculty, state of art infrastructure and innovative teaching methodology.

• Elective courses that brides the gap between industry requirements and academia.

• Hands on experience in most of the courses of computer science so as to impart practical knowledge in the relevant field.

• To keep the students at par with the emerging technologies prevailing in the market, the institute is furnished with various specialized research labs and software labs.

•The department is blessed to have specialized faculty in various fields of Physical Sciences.

•The Department keeps its students abreast of latest advancements in technology through ultra-modern computer facilities, e-learning, virtual labs, SWAYAM Courses as per UGC guidelines.

B.Sc Computer Science (BACHELOR OF SCIENCE IN COMPUTER SCIENCE)

B.Sc Computer Science is a route for the Science students of 10+2 to join the band of computer professionals. The program is designed to build programing skills for developing efficient and resource optimized software/website/cloud/mobile applications. They can also pursue masters program in computer Sciences, Mathematical and Physical Sciences after graduation.

VISION

To aspire, achieve and sustain for excellence in academics and research through scientific knowledge so as to provide solutions to global environmental issues and transform graduatess into responsible citizens and competent professionals.

MISSION

Holistic development of learner through academic excellence, employability, acquisition of analytical skills and higher research.

To explore and advance new frontiers in physical sciences and integration with interdisciplinary sciences through visionary research for the benefit of society.

To develop graduates for lifelong learning and professional growth.

To impart academic environment to seed skills and to promote creativity and to provide a student-centered and professions-oriented higher education.

ELIGIBILITY CRITERIA

10+2 with Physics, Chemistry & Mathematics with 50% marks (45% marks in case of **SC**/ST candidates) in aggregate or equivalent grade from a recognized Board/University/Council

DURATION

3 Years

CAREER PATHWAYS

The program is designed to meet the growing requirement of qualified professionals in field of IT industry and education. B.SC Computer science graduates are hired both by Government and private organizations. They can also take up their career as software developer. They may join Post Graduation Courses further.

- **Government Jobs**
  Prepare students for various government jobs such as banking sector, civil services etc. Many government information technology companies and government like BHEL, NSDL, MTNL and BSNL are hiring BCA graduates.
- **Corporate Jobs**

Multiple pathways designed according to the level of the students to prepare them for different job profiles as per needs of industrial sector.

- **Higher Studies**
  This pathway prepares students for Higher Studies and helps in their research also.

• Entrepreneurship

To set up new ventures

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

PEO1: Graduates are prepared to be employed in IT industries by providing expected domain knowledge.

PEO2: Effectively communicating computing concepts and solutions to bridge the gap between computing industry experts and business leaders to create and initiate innovation**.**

PEO3: Graduates will be employed in the computing profession, and will be engaged in learning, understanding, and applying new ideas and technologies as the field evolves.

PEO4: Developing and implementing solution based systems and/or processes that address issues and/or improve existing systems within in a computing based industry.

PROGRAMME OUTCOMES (PO)

PO1: Critical Thinking: Apply knowledge of Computer Science to identify, analyze problems and to provide effective solution in the area of Computing.

PO2: Effective Communication: Inculcate skills to excel in the fields of Information Technology and its Enabled services, Government and Private sectors, Teaching and Research.

PO3: Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4: Ethics: Instill ethical responsibilities, human and professional values and make their contribution to the society.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1: Ability to use current techniques, skills and tools necessary for computing practices.
PSO2: Ability to apply knowledge of computing, mathematics, and basic sciences that may be relevant to the domain.
PSO3: Understanding of professional, ethical, legal, security, social issue and responsibilities.
PSO4: Ability to apply knowledge of layered network models, protocols, technologies and topologies as well as incorporating security policies for building network and internet based applications.
PSO5: Ability to analyze the local and global impact of computing on society.

ABOUT THE CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. The basic idea is to look into the needs of the students so as to keep up-to-date with development of higher education in India and abroad. CBCS aims to redefine the curriculum keeping pace with the liberalization and globalization in education. CBCS allows students an easy mode of mobility to various educational institutions spread across the world along with the facility of transfer of credits earned by students.

1. Curriculum Structure: B.Sc Comp Science degree programme will have a curriculum with Syllabi consisting of following type of courses:

I. Ability Enhancement Courses (AEC): The Ability Enhancement Courses (AEC) may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). AECC courses are the courses based upon the content that leads to Knowledge enhancement; these are mandatory for all disciplines.

SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

- A. Ability Enhancement Compulsory Courses (AECC): Environmental Science, English Communication/MIL Communication.
- B. Skill Enhancement Courses (SEC): These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

- **II. Core Courses (CR):** A course, which should compulsorily by studied by a candidate as a core requirement is termed as a Core course. These courses are employability enhancement courses relevant to the chosen program of study. Program core comprises of Theory, Practical, Project, Seminar etc. Project work is considered as a special course involving application of knowledge in solving/ analyzing/exploring a real life situation/ difficult problem.

- **III. Elective Courses:** Elective course is generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or with provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill. Accordingly, elective course may be categorizes as:
- A. Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.

2. NOMENCLATURE USED:

- **A. Graduate Core Courses**

i. Core Course(CR)
ii. Theory Subject (T)
iii. Practical (P)

B. Ability Enhancement Courses (AEC): i. Ability Enhancement Compulsory Courses (AECC)

ii. Skill Enhancement Courses (SEC).

C. Elective Courses (EL)
i. Discipline Specific Elective (DSE)

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Scheme for B.Sc. –Computer Science (CBCS) 2020

Semester-I

I. Theory Subjects

S No.	Types of Course	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	CR	PHY 101	Mechanics	4:0:0	4:0:0	4	4
2	CR	CSA151	Object oriented programming in C++	4:0:0	4:0:0	4	4
3	CR	MAT101	Calculus	6:0:0	6:0:0	6	6
4	AECR	ENG101	General English-I	3:0:0	3:0:0	3	3
5	AECR	PBI101\HCP 101	General Punjabi-I/HCP	3:0:0	3:0:0	3	3
6		PT101/PT103/PT105	NSO/NCR/NSS	2:0:0	Non-credit	2	NC

II. Practical Subjects

1	CR	PHY 103	Mechanics	0:0:4	0:0:2	4	2
2	CR	CSA155	Object oriented programming in C++	0:0:4	0:0:2	4	2
			Total			30	24

Total Contact Hrs:30

Total Credit Hrs: 24

CR- Core Course

AECR- Ability Enhancement Compulsory Course

Scheme for B.Sc. –Computer Science (CBCS) 2020

Semester-II

I II. Theory Subjects

S No.	Types of Course	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	CR	PHY 102	Electricity and Magnetism	4:0:0	4:0:0	4	4
2	CR	CSA152	Data structure and file processing	4:0:0	4:0:0	4	4
3	CR	MAT102	Differential Equations	6:0:0	6:0:0	6	6
4	AECR	ENG102	General English-II	3:0:0	3:0:0	3	3
5	AECR	PBI102/ HCP 102	General Punjabi-II/HCP	3:0:0	3:0:0	3	3
6			NCR/NSS/NSO	2:0:0	Non-credit	2	NC

II. Practical Subjects

1	CR	PHY 104	Electricity and Magnetism	0:0:4	0:0:2	4	2
2	CR	CSA156	Data structure and file processing	0:0:4	0:0:2	4	2
			Total			30	24

Total Contact Hrs:30

Total Credit Hrs: 24

CR- Core Course

AECR- Ability Enhancement Compulsory Course

Scheme for B.Sc. –Computer Science (CBCS) 2020

Semester-III

I. Theory Subjects

S No.	Type of Course	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	CR	PHY 201	Thermal Physics and Statistical Mechanics	4:0:0	4:0:0	4	4
2	CR	CSA261	Numerical computing	4:0:0	4:0:0	4	4
3	CR	MAT201	Real Analysis	6:0:0	6:0:0	6	6
4	AECR	EVS 001	Environmental Science	3:0:0	3:0:0	3	3
5	SEC-1		Elective subject(skill Enhancement)-I	2:0:0	2:0:0	2	2

II. Practical Subjects

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

Total Contact Hrs:27
Total Credit Hrs: 23

CR- Core Course

AECR- Ability Enhancement Compulsory Course

SEC- Skill Enhancement Course

Scheme for B.Sc. –Computer Science (CBCS) 2020

Semester-IV

I. Theory Subjects

S No.	Type of Course	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	CR	PHY202	Waves and Optics	4:0:0	4:0:0	4	4
2	CR	CSA262	Design and analysis of algorithm	4:0:0	4:0:0	4	4
3	CR	MAT202	Algebra	6:0:0	6:0:0	6	6
4	AEC	SSC001	Gender Equity	3:0:0	3:	3	3
5	SEC-II		Elective subject(skill Enhancement)-II	2:0:0	2:0:0	2	2

II. Practical Subjects

1	CR	PHY 204	Waves and Optics	0:0:4	0:0:2	4	2
2	CR	CSA266	Design and analysis of algorithm	0:0:4	0:0:2	4	2
			Total			27	23

Total Contact Hrs:27

Total Credit Hrs: 23

CR- Core Course

AECR- Ability Enhancement Compulsory Course

SEC- Skill Enhancement Course

Scheme for B.Sc. –Computer Science (CBCS) 2020

Semester-V

I. Theory Subjects

S No.	Type of Course	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	CR	PHY	Elective Subject(Discipline)-I	4:0:0	4:0:0	4	4
2	CR	CSA	Elective Subject(Discipline)-I	4:0:0	4:0:0	4	4
3	CR	MAT	Elective Subject(Discipline))-I	6:0:0	6:0:0	6	6
4	AEC	SSC006	Human values and professional ethics	3:0:0	3:0:0	3	3
5	SEC-II		Elective subject(skill Enhancement)-III	2:0:0	2:0:0	2	2

II. Practical Subjects

1	CR	PHY	Elective Subject(Discipline) Lab-I	0:0:4	0:0:2	4	2
2	CR	CSA	Elective Subject(Discipline)Lab-I	0:0:4	0:0:2	4	2
	Total					**27**	**23**

Total Contact Hrs:27
Total Credit Hrs: 23

DSE- Discipline Subject Course

SEC- Skill Enhancement Course

AECR- Ability Enhancement

Compulsory Course

Scheme for B.Sc. –Computer Science (CBCS) 2020

Semester-VI

I. Theory Subjects

S No.	Type of Course	Sub Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	DSE-IB	PHY	Elective Subject(Discipline)-II	4:0:0	4:0:0	4	4
2	DSE-IIB	CSA	Elective Subject(Discipline)-II	4:0:0	4:0:0	4	4
3	DSE-IIIB	MAT	Mathematics-VI Elective Subject(Discipline)-II	6:0:0	6:0:0	6	6
4	SEC-IV		Elective subject(skill Enhancement)-IV	2:0:0	2:0:0	2	2
5	AEC	**ENG004**	Communication Skills and Personality Development	3:0:0	3:0:0	3	3

II. Practical Subjects

1	DSE-IA Lab	PHY	Elective Subject(Discipline) lab-II	0:0:4	0:0:2	4	2
2	DSE-IIB Lab	**CSA**	Elective Subject(Discipline) lab-II	0:0:4	0:0:2	4	2
			Total			27	23

Total Contact Hrs:27
Total Credit Hrs: 23

DSE- Discipline Subject Course

SEC- Skill Enhancement Course
AECR- Ability Enhancement Compulsory Course

Summarized report of Course Scheme for B.Sc Computer Science

Sem	L	T	P	Contact hrs/wk	Credits	CR	AECR	SEC	DSE
1	22	0	4	30	24	18	6		
2	22	0	4	30	24	18	6		
3	19	0	4	27	23	18	3	2	
4	19	0	4	27	23	18	3	2	
5	19	0	4	27	23	--------	3	2	18
6	18	0	5	27	23	------	3	2	18
Total	119	0	25	169	140	72	24	8	36

SEMESTER 1

Course Code	**PHY101**
Course Title	**Mechanics**
Type of course	Theory
L T P	4 0 0
Credits	4
Course prerequisite	+2 with Physics as core subject
Course Objective(CO)	The aim of the subject is to enhance the knowledge of students in electrostatics, electrodynamics and mechanics
Course outcomes	Student will be able to demonstrate a scientific knowledge of the core physics principles in Mechanics. Student will have a deep understanding of Newton's laws and able to solve the Newton equations for simple configurations using various methods.

Syllabus

Unit -I

Vectors: Vector algebra, Scalar and vector products Derivatives of a vector with respect to a parameter, Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order 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), Satellite in 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- 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	Tatamcgraw-Hill
4	Berkeley Physics Course, Vol. 1, Mechanics	E M Purcell, Ed	Tatamcgraw-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.
Course outcomes	Students will be able to understand how C++ improves C with object-oriented features and learn how to write inline functions for efficiency and performance.

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	**MAT101**
Course Title	**Calculus**
Type of course	Theory
L T P	6 0 0
Credits	6
Course prerequisite	+2 with maths as core subject
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.
Course outcomes	Students will be able to locate the x and y intercepts, any undefined points, and any asymptotes. Students will demonstrate the ability to compute derivatives and integrals of real valued and vector valued functions of several variables.

Unit-I

Hyperbolic functions, higher order derivatives, Leibnitz rule and its applications, concavity and inflection points, asymptotes, curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves, Indeterminate forms.

Unit-II

Reduction formulae, derivations and illustrations of reduction formulae of the type $\int \sin^n x\,dx$, $\int \cos^n x\,dx$, $\int \tan^n x\,dx$, $\int \sec^n x\,dx$, $\int (\log x)^n\,dx$, $\int \sin(nx)\sin(mx)\,dx$, parametric equations, parameterizing a curve, arc length, arc length of parametric curves, area of surface of revolution.

Unit-III

Rolle's theorem, Mean value theorems, Taylor's theorem with Lagrange's and Cauchy's form of remainder, Taylor's series, Maclaurin's series of sin x, cos x, e^x, log(1+x), $(1+x)^m$, Maxima and Minima.

Unit-IV

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

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.
Course outcomes	The students will demonstrate effective word choice, vocabulary, idioms, grammar and sentence structure allowing accurate communication of meaning in written work.

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 PavlovichChakhov)

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`qrWdwAlocnwqmkAiDAYnkrndwhunrauqpMnhovygw[4. ividAwrQIAWnUMpMjwbIDunINivauNqbMdIsMbMDIigAwnhwisl 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

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.
Course outcomes	The Student will be able to acquire the knowledge about Punjab and its Historical Resources.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	**PHY103**
Course Title	**Mechanics**
Type of course	Practical
L T P	0 0 4
Credits	2
Course prerequisite	10+2 with physics as core subject
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.
Course outcomes	Students will be able to Understand basic units of measurement, convert units, and appreciate their magnitudes.

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	2
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.
Course outcomes	Acquire knowledge about the basic concept of writing a program. Students will be able to describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects inheritance and polymorphism.

Syllabus

Write and execute simple program to show the working of input/output statements.

1. Write and execute programs to show the use of different types of operators.
2. Write and execute programs based on use of functions.
3. Write and execute programs to demonstrate function call by value and call by reference.
4. Write and execute programs to demonstrate inline functions.
5. Write and execute programs to demonstrate function overloading.
6. Write and execute programs to show concept of classes using public, private, protected members.
7. Write and execute programs to demonstrate use of constructor (parameterized and unparameterized constructor, copy constructor, multiple constructors in a class, constructors with default parameters).
8. Write and execute programs to demonstrate use of destructor.
9. Write and execute programs to demonstrate use of static variables and static functions.
10. Write and execute programs to illustrate different types of inheritance.
11. Write and execute programs to illustrate different aCRess specifiers in inheritance(public, private, protected).
12. Write and execute programs to show the use of pointers to classes.
13. Write and execute programs to show the use of this pointer.
14. Write and execute programs to show the use of friend function.
15. Write and execute programs to show the concept of friend class.
16. Write and execute programs to demonstrate method overloading in classes usingdifferent parameters and different return types.
17. Write and execute programs to show the use of virtual function and pure virtualfunction.
18. Write and execute programs to demonstrate operator overloading in classes withdifferent operators.
19. 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


SANT BABA BHAG SINGH
SBBSU
UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

SEMESTER II

Course Code	**PHY102**
Course Title	**Electricity and Magnetism**
Type of course	Core
L T P	4 0 0
Credits	4
Course prerequisite	10+2 with physics as core subject
Course Objective (CO)	The subject will add one more step to thestudents of first year in the fields of magnetism, electromagnetic theory, & properties of matter.
Course outcomes	Students will be able to learn how to analyzevarious problems electromagnetism with mathematical methods

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 continuity of 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 A Rangwala	Tata McGraw-Hill
4	*Berkeley Physics Course, Vol.*	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 advancedprogramming techniques.
Course outcomes	Students will be able to describe commonapplications for arrays, records, linked structures, stacks, queues, trees, and graphs.

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	**MAT102**
Course Title	**Differential equations**
Type of course	Core
L T P	6 0 0
Credits	6
Course prerequisite	10+ 2 with maths as core subject
Course Objective (CO)	It develop the knowledge about DifferentialEquations and partial equations
Course Outcomes	Students will be able to understand the conceptof Wronskian: its properties, its applications and Linear homogeneous and non-homogeneous equations of higher order with constant coefficients.

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.
Course outcomes	The students will do intensive and extensive reading of the prescribed texts. The students will assimilate new words and use them in communicative context.

Syllabus

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`qrWdwAlocnwqmkAiDAYnkrndwhunrauqpMnhovygw[4. ividAwrQImuhwvry, AKwxWdIFu`kvINvrqoNkrnWis`Kjwxgy
Course outcomes	ividAwrQIAW iv`c ryKw ic`qrW dw Alocnwqmk AiDAYn krn dw hunr auqpMn hovygw[
	ividAwrQIAW nUM AwDuink pMjwbI khwxI dI ivSYgq jwxkwrI ho jwvygI[
	ividAwrQI AwDuink pMjwbI khwxIkwrW dI jIvnI qoN jwxU hoxgy[

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 aCRounts of Chinese travelers.
Course outcomes	The Student will acquire the knowledge about Punjab and its Historical Resources. The Student will understand the Harppan Culture anddifferent Vedic Periods The Students will analyze the Alexander's invasions.

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 aCRounts of Chinese travelers.Fahien and HwenTsang.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	**PHY104**
Course Title	**Electricity and Magnetism (Practical)**
Type of course	Practical
L T P	0 0 4
Credits	2
Course prerequisite	B.Sc 1 with physics as core subject
Course Objective (CO)	The course is to impart practical knowledge to the students and provide them with practical exposure of electricity and magnetism.
Course outcomes	To understand the importance of basics of Electricity and Magnetism
	Better understanding of electricity and transmission of electricity
	Analyzing magnetic behaviour of different materials.

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 (Practical)**
Type of course	Core
L T P	0 0 4
Credits	2
Course prerequisite	Knowledge of Programming Language
Course Objective (CO)	The objective of this course is to teach students various data structures and to explainthem algorithms for performing various operations on these data structures. It demonstrates familiarity with major algorithms and data structures and and more advanced programming techniques.
Course outcomes	Students will able to Understand basic data structures such as arrays, linked lists, stacksand queues. Solve problem involving graphs, trees. Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data. It helps in choosing the appropriate data structure and algorithm design method for a specified application.

Syllabus

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

SEMESTER III

Course Code	**PHY201**
Course Title	**Thermal physics and statistical mechanics**
Type of course	CORE
L T P	4 0 0
Credits	4
Course prerequisite	B.Sc 1 with physics as core subject
Course Objective (CO)	The aim of this course is to impart theoretical knowledge to the students in thermal, statisticaland atomic physics.
Course outcomes	Students will be able to solve statistical mechanics problems for simple non-interactingsystems. Have a basic understanding of the phase transitions. Be able to use linear response theory and kinetic equation approach.

Syllabus

Unit-I

Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermo dynamical 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 Energy functions, 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), 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 and Thermodynamic 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.

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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, and Integration.
Course outcomes	Students will be able to Understand the different numerical methods to solve the algebraic equations and to solve system of linear and non linear equations. Understand how numerical methods afford a mean to generate solutions in a manner that can be implemented on digital computers Understand the mathematical background for the different numerical methods introduced in the course.

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.

Course Code	**MAT201**
Course Title	**Real analysis**
Type of course	Core
L T P	6 0 0
Credits	6
Course prerequisite	B.Sc 1 with maths as core subject
Course Objective (CO)	To have the knowledge of basic properties of fieldof real numbers and convergence
Course outcomes	Students will able to find Bounded and unbounded sets, Infimum and supremum of a set. Understand Bolzano- Weierstrass theorem for sets, topology of real line and Rn. Understand the Theorems on limits of sequences, Subsequences, Monotone sequences, Monotone convergence Theorem.

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.Mn-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	**EVS001**
Course Title	**Environmental Science**
Type of course	Theory/ID
L T P	3 0 0
Credits	3
Course prerequisite	NA
Course objective	To connect and sensitize the students towards the environment and prevailing environmental issues (natural, physical, social and cultural).
Course Outcome	• Will Prepare students to critically examine all sides of environmental issues and apply understanding from all disciplines and religion to create informed opinions about how to interact with the environment on both a personal and a social level. • Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales. • Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.

SYLLABUS

UNIT I

Introduction: Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness.

Natural Resources: Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources.

Ecosystems: Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hot spots of biodiversity

UNIT II

Environmental Pollution: 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.

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 Public awareness.

UNIT IV

Human Population and the Environment: 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.

Text and Reference Books:

S. No	Name	Author(S)	Publisher
1	Environmental Biology	Agarwal, K.C. 2001	Nidi Publ. Ltd. Bikaner.
2	Environmental Science	Miller T.G. Jr.	Wadsworth
3	Perspectives in Environmental Studies	Anubha Kaushik and Gaurav Garg	New Age International Publishers

Course Code	**PHY203**
Course Title	**Thermal physics and statistical mechanics (Practical)**
Type of course	Practical
L T P	0 0 4
Credits	2
Course prerequisite	B.Sc 1 with physics as core subject
Course Objective (CO)	The aim of this course is to impart Practical knowledge to the students and provide them with exposure of thermodynamics.
Course outcomes	Students will be able to understand different ensemble theories to explain the behaviour of the systems. Able to analyse Connection between statistics and thermodynamics. Able to analyse Statistical behaviour of ideal Bose and Fermi systems.

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	Induprakash And Ramakrishna	Kitabmahal, New Delhi

Course Code	**CSA265**
Course Title	**Numerical computing (Practical)**
Type of course	Core
L T P	0 0 4
Credits	2
Course prerequisite	Basic knowledge of Mathematics.
Course Objective (CO)	Students will learn about Polynomial Equations,Differential Equations, Integration etc.
Course outcomes	Students will be Analyze worst-case running times of algorithms using asymptotic analysis. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Explain the major graph algorithms and their analyses.

Syllabus

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

SEMESTER

IV

Course Code	**PHY202**
Course Title	**Waves and optics**
Type of course	CORE
L T P	4 0 0
Credits	4
Course prerequisite	B.Sc 1st year with physics as core subject
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.
Course outcomes	Student will be able to provide fundamental knowledge within interferometry. The student will become able to analyze and understand interference between plane waves and spherical waves. The student will get a thorough knowledge of the polarization of light and its changes upon reflection.

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: 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. 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), Determinationof wavelength, Wavelength difference, Refractive index and Visibility of fringes.

Unit-IV

Diffraction: Fraunhofer diffraction: Single slit; Doubleslit. Multiple slits & Diffractiongrating. Fresnel Diffraction: Half-period zones. Zone plate.Fresnel Diffraction patternof a straight edge, a slit and a wire using half-period zone analysis.Polarization: Transverse nature of light waves. Plane polarized light – production andanalysis. 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 toSearching and Sorting Techniques, randomized algorithms , Graphs.
Course outcomes	Analyze the running time and space complexity of algorithms.
	Explain and apply backtracking,branch and bound and string matching techniques to deal with some hard problems
	Describe the classes P, NP, and NPComplete and be able to prove that a certain problem is NP-Complete.

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	B.Sc 1st year with Maths as core subject
Course Objective (CO)	It develops the techniques to simplify algebraic expressions using commutative,associative and distributive properties
Course outcomes	Students will have a working knowledge of important mathematical concepts in abstract algebra such as definition of a group, order of a finite group and order of an element. Students will be knowledgeable of different types of subgroups such as normal subgroups, cyclic subgroups and understand the structure and characteristics of these subgroups. Students will see and understand the connection and transition between previously studied mathematics and more advanced mathematics.

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(practical)**
Type of course	Practical
L T P	0 0 4
Credits	2
Course prerequisite	B.Sc 1st year with physics as core subject
Course Objective (CO)	This course isdesigned for improving practicalknowledge among the students andprovides them with exposure on wave and optics related experiments.
Course outcomes	Apply knowledge of thermodynamics, sound waves, and light waves to explain natural physical processes. Use an understanding of algebraic mathematics along with physical principles to effectively solve problems. Design experiments and acquire data in order to explore physical principles.

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	Induprakash And Ramakrishna	Kitabmahal, New Delhi

Course Code	**CSA266**
Course Title	**Design and analysis of algorithm(practical)**
Type of course	PRACTICAL
L T P	0 0 4
Credits	2
Course prerequisite	Basic knowledge of algorithms.
Course Objective (CO)	To get a first-hand experience of implementing well-known algorithms in a high-level language. To be able to compare the practicalperformance of different algorithms for the same problem.
Course outcomes	Analyze worst-case running times of algorithms using asymptotic analysis. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Explain the major graph algorithms and their analyses.

Syllabus

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 oCRurrences 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. 19. (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

GENDER EQUITY

Course Code	**SSC001**
Course Title	**Gender Equity**
Type of course	**ID**
L T P	3:0:0
Credits	3
Course prerequisite	NA
Course Objectives(CO)	1. The students will be able to acquire knowledge and understanding of theory and concepts related to gender and gender relations 2. The students will be able to critically reflect how gender is a development issue.
Course Outcome	The students will analyse the evolution of thinking and approaches around gender and development.

UNIT I

Concept of sex and gender

Gender attributes and questions of identity.

UNIT II

Empowerment- concept and meaning.

Definition of feminism, feminist and women movements in U.S.A, U.K., France and India

UNIT III

Women development and development organizations.

Impact of development on gender.

UNIT IV

Policies and current debates on women rights.

Role of UN in establishing gender equality.

Violence against women and need for reforms.

Text and Reference Books:

S.No.	Author(S)	Year	Title	Publisher
1	Jayachandra n,Seema	2014	The Roots of Gender Inequality in DevelopingCountries	NBER Working Paper No.20380.Issued in August 2014
2	Duflo, Esther	2012	Women's Empowerment	*Journal of Economic Literature,*
			and Economic Development	*50(4): 1051-79.*

Skill Enhancement Courses (3rd sem onward)

Course Code	**PHY 205**
Course Title	**Physics Workshop Skills**
Type of course	SKILL ENHANCEMENT
L T P	2:0:0
Credits	2
Course prerequisite	B.Sc 1st year with physics as core subject
Course Objective (CO)	The aim of this course is to enable the studentsto familiar and experience with various mechanical and electrical tools through hands-on mode
Course outcomes	Student will able to know about the skill used about particular tools. understanding of basic knowledge of measuring devices. experience with various mechanical and electrical tools.

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.

UNIT III

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

UNIT IV

Introduction to prime movers: Mechanism, gear system, wheel, Fixing of gears withmotor axel. Lever mechanism, lifting of heavy weight using lever.Braking systems, pulleys.

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	Elbsedn
3	Mechanical Workshop Practice	K.C. John, 2010	Phi Learning Pvt. Ltd.

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 understandcontemporary terminology, progress, issues,and trends.
Course outcomes	Demonstrate various algorithms for scan conversion and filling of basic objects and their comparative analysis. Apply geometric transformations, viewing and clipping on graphical objects. Understand a typical graphics pipeline and have made pictures with their computer.

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	B.Sc 1st year with mathematics
Course Objective (CO)	The aim of the subjects that students have basic knowledge of sets, relation and basicoperators.
Course outcomes	They become able to understand the concept of Truth table ,conjunction and disjunction, Bi-conditional and propostions. They become able to learn sets, subsets law of theory and venn diagram. They can understand Propositinal equivalence.

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	**MAT211**
Course Title	**Statistical tools used in excel sheet**
Type of course	Skill Enhancement
L T P	2:0:0
Credits	2
Course prerequisite	B.Sc 1st year with mathematics
Course Objective (CO)	Practical/lab work to be performed on acomputer through excel
Course outcomes	Students will be able to solve simple games, mathematical equations using various statistical techniques.

Unit I: Central Tendency: Mean, median and mode, Dispersion: range, standard deviation Fitting ofBinomial, Poisson, Negative Binomial, Normal Distribution.

Unit II: Applications of Chi-square, t and F distribution UnitIII:

Calculation of correlation coefficient, Rank Correlation etcFitting of

polynomials and regression curves

Unit IV: Methods of estimation (MLE and method of moments)

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Robert V Hogg	Introduction tomathematical statistics	Pearson Education
2	Irwin Miller	Mathematical Statistics with application	Pearson Education

Course Code	**PHY206**
Course Title	**Electrical circuits and network skills**
Type of course	SKILL ENHANCEMENT
L T P	2:0:0
Credits	2
Course prerequisite	B.Sc 1st year with physics as core subject
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
Course outcomes	Analyze and solve simple technical problems related to basic electrical systems. Assist in testing and troubleshooting electrical and electronic circuits. Apply health and safety standards and best practices to workplaces.

Syllabus

UNIT I

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law.Series, parallel, and series-parallel combinations.AC Electricity and DC Electricity Familiarization with multimeter, voltmeter and ammeter.Understanding electrical circuits: Main electric circuit and their combination Rules 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. Electrical Schematics.Power circuits. Control circuits. Reading of circuit schematics.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.DC or AC sources to control heaters & motors. Solid state devices: Inductors, capacitors, diode, resistor Components .In series or in shunt. Response of inductors and capacitors with DC or AC source.

UNIT-IV Electrical Wiring: Different types of conductors and cables. Basics of wiring-Star anddelta 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: wire nuts, crimps, terminal blocks, split bolts, and solder.

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	B.Sc 1st year with Maths as core subject
Course Objective (CO)	It develops The Knowledge about numbertheory and combinations of numbers.
Course outcomes	Students will gain the knowledge of divisibility and related algorithms. Students will be able to solve the Diophantine equations. Students will understand and gain the knowledge of Mobius inversion formula, Euler's phi functions, the greatest integer functions.

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	B.Sc 2 year with physics as core subject
Course Objective (CO)	The aim of this course is not just to imparttheoretical knowledge to the students but to provide them with exposure and hands-on learning wherever possible
Course outcomes	Students will be able to have a deep understanding of renewable energy resoursces and energy harvesting. Knowlege about an extensive range of resources to resolve the energy-related problems. Knowledge for Solar energy harvesting with application of nanotechnology.

Syllabus

UNIT I

Fossil fuels and Alternate Sources of energ**y:** Fossil fuels and Nuclear Energy, theirlimitation, need of renewable energy, non-conventional energy sources. Tidal Energy, Wave energy systems, Ocean. Solar energy, biomass, biochemical conversion, biogas generation, tidal energy, Hydroelectricity

UNIT II

Wind Energy harvesting: Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Ocean Energy: Ocean Energy Potential against Wind and Solar, Ocean Thermal Energy.

UNIT III

Geothermal Energy: Thermal Energy Conversion, Geothermal Resources, Geothermal Technologies.Hydro Energy: Hydropower resources, hydropower technologies, environmental impact of hydro power sources. Piezoelectric Energy harvesting: Introduction: piezoelectric and Piezoelectricity.

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.Drai	Khanna Publishers, New Delhi
2	Solar Energy	M P Agarwal	S Chand And Co. Ltd.
3	Solar Energy	Suhas P Sukhative	Tatamcgraw - Hill

Course Code	**MAT305**
Course Title	**Vector Calculus**
Type of course	Skill enhancement course
L T P	2:0:0
Credits	2
Course prerequisite	Bsc. Ist, IInd year with Mathematics as core subject
Course Objective (CO)	It Helps to define vector space , Null Space , nullity and linear transformation
Course outcome	CO1 Students will be familiar with differentiation and partial differentiation of vector functions. CO2 Students will be able to find the derivatives of sum, dot product and cross product of two vector functions. CO3 Students will be able to find the gradient, divergence and curl of functions.

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

Course Code	**CSA393**
Course Title	**Electronic commerce**
Type of course	SKILL ENHANCEMENT
L T P	2 0 0
Credits	2
Course prerequisite	NA
Course Objective (CO)	It explains the main concepts related to e-commerce. Enable students to understand the enablingtechnologies for ecommerce.
Course outcomes	Demonstrate an understanding of the foundations and importance of E-commerce. Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational. Describe the key features of Internet, Intranets and Extranets and explain how they relate to each other.

Syllabus

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	**Radiology and Safety**
Type of course	SKILL ENHANCEMENT
L T P	2 0 0
Credits	2
Course prerequisite	B.Sc 2 year with physics as core subject
Course Objective (CO)	The aim of this course is to enable thestudents to enhance the knowledge ofradiation physics through hands-on mode.
Course outcomes	Students will be able to Familiar with specific opportunities for improving care to patients. Students will be able to get Knowledge about Development of patient safety information and learning systems. Students will be able to analyse Radiology and Nuclear Medicine Procedures.

Syllabus

Unit-I

Basics of Atomic and Nuclear Physics: Basic concept of atomic strpucture; 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, basic concept of alpha, beta and gamma decay, concept of cross section and kinematics of nuclear reactions, types of nuclear reaction, Fusion, fission.

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, Beta Particles- Collision and Radiation loss (Bremsstrahlung), Interaction of Neutrons- Collision, slowing down and Moderation.

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.

Unit-V

Application of nuclear techniques: Application in medical science (e.g., MRI, PET, Mining and oil. Industrial Uses: Tracing, Gauging, Material Modification, Sterization, Food preservation.

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, Adamhilger 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	Johnwilley& 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	B.Sc 2 year with Maths as core subject
Course Objective (CO)	To develops the knowledge about Mathematical Formulation and Games With Mixed Strategies
Course outcomes	Students will be able to solve transportation problems arising in real life applications. Students will be able to solve simple games using various techniques. Students will be able to identify strategic situations and represent them as games.

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

SEMESTER-V

Human values & Professional Ethics

Course Code	**SSC006**
Course Title	**Human values& Professional Ethics**
Type of Course	ID
L T P	3:0:0
Credits	3
Course Prerequisites	None
Course Objectives (CO)	To help the students to discriminate between valuable and superficial in the life. To help students develop sensitivity and awareness; leading to commitment and courage to act on their own belief. This Course will encourage the students to discover what they consider valuable. This course is an effort to fulfill our responsibility to provide our students significant input about understanding
Course Outcome	1. Students will behave ethically and promote human values in society. 2. Students will behave professionally. 3. Able to discriminate between valuable and the superficial in real situations in their life.

UNIT-I:Course Introduction-Need, Basic Guidelines, Content and Process for Value Education : Understanding the need, basic guidelines, content and process for Value Education, Understanding Happiness and Prosperity correctly.
Understanding Harmony in the Human Being : Understanding the harmony with self and the Body: Sanyam and Swasthya.
UNIT II:Harmony in Human Relationship: Understanding harmony in the Family- the basic unit of human interaction, visualizing a universal harmonious order in society **Understanding Harmony in the Nature and Existence:** Understanding the harmony in the Nature, Holistic perception of harmony at all levels of existence
UNIT III: Understanding of Harmony on Professional Ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems
.
UNIT IV:Strategy for transition from the present state to Universal Human Order: At the level of individual, at the level of society. **Case studies**: typical holistic technologies, management models and production systems
Recommended Books

S. No.	Author(S)	Year	Publisher
1	A Foundation Course in Value Education	R R Gaur, R Sangal	Excel Books Publishers
2	Energy & Equity	Ivan Illich	.The Trinity Press, Worcester, and HarperCollins, USA
3	Human Values and Professional Ethics	RishabhAnand	Satya Prakashan, New Delhi
4	Jeevan VidyaekParichay.	A Nagraj	Divya Path Sansthan,Amarkantak.

Discipline Elective Courses

Course Code	**PHY301**
Course Title	**Digital And Analog Circuits AndInstrumentation**
Type of course	DISCIPLINE ELECTIVE(THEORY)
L T P	4 0 0
Credits	4
Course prerequisite	B.Sc 2 year with Physics as core subject
Course Objective (CO)	The aim of this course is not just to impart theoretical knowledge to the students aboutdigital electronics and analog circuits and instrumentations.
Course outcomes	Able to analyze logic processes and implement logical. Able to understand concepts of sequential circuits . Develop a digital logic and apply it to solve real life problems.

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 andCRConfigurations.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	Book 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. Sureshkumar, 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,	Tatamcgraw Hill.

Course Code	**PHY 303**
Course Title	**Digital, analog circuits and instrumentation (practical)**
Type of course	DISCIPLINE ELECTIVE(PRACTICAL)
L T P	0 0 4
Credits	2
Course prerequisite	B.Sc 2 year with Physics as core subject
Course Objective (CO)	The aim of this course is not just to impart theoretical knowledge to the students but toprovide them with exposure and hands-on learning wherever possible.
Course outcomes	Become to analyze, design and implement combinational logic circuits. Enable to Classify different semiconductor memories. Enable to analyze, design and implement sequential logic circuits.

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	Tatamcgraw 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 with physics as core subject
Course Objective (CO)	To impart theoretical knowledge of physics, quantum mechanics, knowledge of mechanics at micro-state level.
Course outcomes	CO1 They have Ability to solving physical problems. CO2 To have Ability of searching solutions of physical problems in scientific and technical literature. CO3 To become have understanding of physical processes and technology.

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 for hydrogen like atoms and their spectra Position measurement – gamma ray microscope thought duality , Heisenberg uncertainty principle- impossibility trajectory , Energy time uncertainty 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; stationary states; physical interpretation of wave function, probabilities and normalization; Probability and probability current densities in one dimension.

UNIT III

Quantum dot as an example; Quantum mechanical scattering and tunneling 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,	Arthurbeiser, 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 (Practical)**
Type of course	Discipline elective(practical)
L T P	0:0:4
Credits	2
Course prerequisite	B.Sc Ist, IInd with Physics as one core subject
Course Objective (CO)	The aim of this course is to impart practical knowledge of physics, quantum mechanics and mechanics at micro-state level.
Course outcomes	CO1 EnableTo kindle the interest for research in students. CO2 Become to understand the importance of experiment as the basis of the scientific method. CO3 To become excel in Experimental and Theoretical in Modern Physics.

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	6:0:0
Credits	6
Course prerequisite	B.Sc Ist, IInd with Mathematics as one core subject
Course Objective (CO)	To provide an introduction to Basic concept of Matrices and Matrix Transformation in geometric
Course outcomes	CO1 Student should be able to know the concept of Linear Independence and examples of different bases. CO2 Student should be able to presents the matrix form of basic geometric transformations and interpretation of eigen values and eigen vectors for such transformations and eigen spaces as invariant subspaces. CO3 Students will be able to use elementary row operations to reduce matrices into echelon forms and computation of matrix inverses by using elementary row operations.

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 Course
L T P	6:0:0
Credits	6
Course prerequisite	B.Sc Ist, IInd with Mathematics as one core subject
Course Objective (CO)	To have the knowledge of basic Quotient Space, linear Transformation , invertibility and Isomorphism
	CO1 Students completing this course will be able to compute the inverse of an invertible matrix. CO2 Students completing this course will be able to find the null space of a matrix and represent it as the span of independent vectors. CO3 Students completing this course will be able to find the matrix representation of a linear transformation given bases of the relevant vector spaces.

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 DOSWindows
Course Objective (CO)	The objective of this course is to help students become familiar with the fundamental conceptsof operating systems and provide students withsufficient understanding of operating system design.
Course outcomes	Describe the important computer system resources and the role of operating system in their management policies and algorithms.
	Understand the process management policies and scheduling of processes by CPU.
	Evaluate the requirement for process synchronization and coordination handled by operating system.

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, aCRess 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, anddatabase systems. Principles and methodologiesof database design, and techniques for database application development.
Course outcomes	Able to Explain the features of database. Students can apply knowledge of computing and mathematics appropriate to the discipline. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.

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, RiCRardi	Pearson Education
3.	An Introduction to Database System	Bipin Desai	West Publishing Company

Course Code	**CSA391**
Course Title	**Database application (practical)**
Type of course	DISCIPLINE ELECTIVE
L T P	00 4
Credits	2
Course prerequisite	Computer fundamentals and record keeping
Course Objective (CO)	This course covers fundamentals of database architecture, database management systems, anddatabase systems. Principles and methodologiesof database design, and techniques for database application development.
Course outcomes	Able to acquire Knowledge on SQL and able to create tables with and without constraints.
	Able to make relation between two or more tables.
	Able to retrieve data based on various conditions.

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)	To study principles and protocols of internet work, To Understand the basic issues in information security, the concept of ciphers andcryptography, various ciphers, digital signatures and email security policies, malicious software and their remedies.
Course outcomes	Describe the functions of each layer in OSI and TCP/IP model. Describe various layers and services provided by them. To understand how C++ improves C with object-oriented features.

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 aCRess, 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 (practical)**
Type of course	DISCIPLINE ELECTIVE
L T P	0 0 4
Credits	2
Course prerequisite	Basics of Computer Networks
Course Objective (CO)	To study principles and protocols of internet work, To Understand the basic issues in information security, the concept of ciphers andcryptography, various ciphers, digital signatures and email security policies, malicious software and their remedies.
Course outcomes	Explore the basis of computer networks and various protocols and also understand the World Wide Web concepts. understand easily the concepts of network security. Enumerate the layers of the OSI model and TCP/IP, explain the function(s) of each layer.

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.

SEMESTER VI


SANT BABA BHAG SINGH
SBBSU
UNIVERSITY
KHIALA, DISTT. JALANDHAR (PUNJAB)

Communication Skills and Personality Development

Course Code	**ENG004**
Course Title	**Communication Skills and Personality Development**
Type of course	**ID**
L T P	2 0 2
Credits	3 0 0
Course prerequisite	10+2 (Non Medical or Medical) or Equivalent
Course objective	To introduce the students to communication skills and personality development.
Course Outcome	Students will use their communication skills and personality effectively.

Theory

UNIT-1 Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication.

UNIT-1I

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

UNIT-III

Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting.

UNIT-1V

Individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical

1. Listening and note taking, writing skills, oral presentation skills.
2. Field diary and lab record; indexing, footnote and bibliographic procedures.
3. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations.

Recommended Books:

S. No	Name	Author(S)	Publisher
1	Agriculture Demonstration and Extension Communication	Ram Krishan	P S Jayasinghe Asia Publishing House
2	Communication Skills and Personality Development		Kalyani Publishers. Ludhiana,
3	Communication Skills and Personality Development		Nirali Prakashan

Course Code	**PHY302**
Course Title	**Solid state physics**
Type of course	Discipline elective(theory)
L T P	4:0:0
Credits	4
Course prerequisite	B.Sc Ist, IInd with Physics as one core subject
Course Objective (CO)	To understand ,analyse and different properties of matter.
Course outcomes	CO1 They have Basic understanding of symmetry and thermodynamic properties of solid state systems . CO2 Analyze the success and failure of free electron theory, the origin of band gap and Hall effect. CO3 Enable transition from theoretical physical subjects towards the basic properties of solid state.

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	Charleskittel	Wileyindiapvt .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 (Practical)**
Type of course	Discipline elective(Practical)
L T P	0:0:4
Credits	2
Course prerequisite	B.Sc Ist, IInd with Physics as one core subject
Course Objective (CO)	The course is to impart practical knowledge to the students and provide them with practical exposure of solid State Physics.
Course outcomes	Able to understand of symmetry and thermodynamic properties of solid state systems . Analyze the success and failure of free electron theory, the origin of band gap and Hall effect. Enable transition from theoretical physical subjects towards the basic properties of solid state.

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	Book NAME	AUTHOR(S)	PUBLISHER
1	Advanced Practical PhysicsFor Students	B.L. Flint And H.T.Worsnop, 1971	Asia• Publishing House
2	Advanced Level PhysicsPracticals,	J Michael Nelson And Jon M. Ogborn, 4th Edition,•Reprinted 1985,	Heinemann Educational Publishers
3	A Text Book Of PracticalPhysics,	Induprakash And Ramakrishna, 11th Ed., 2011	,•Kitabmahal, 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	**Quantum mechanics**
Type of course	Discipline elective (theory)
L T P	4:0:0
Credits	4
Course prerequisite	B.Sc Ist, IInd with Physics as one core subject
Course Objective (CO)	To impart theoretical knowledge to the students about quantum mechanics and mechanics at micro-state level
Course outcomes	CO1 They have understanding about the central concepts and principles in quantum mechanics. CO2 Enable to solve the Schrödinger equation on their own for simple systems in one to three dimensions. CO3 They understand both analytic and numerical solutions in quantum mechanics.

Syllabus

UNIT I

Time dependent Schrodinger equation: Time dependent Schrodinger equation ,Properties of Wave Function. Interpretation of Wave Function Probability and probability current densities in three dimensions; Conditions for Physical ACReptability 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 energy eigenvalues; General solution of the time dependent Schrodinger equation in terms of linear combinations of stationary states; wave packets, Fourier transforms and momentum space wavefunction; 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;; 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 AntisymmetricWave 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.

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 ,	Roberteisberg And Robertresnick, 2ndedn., 2002	Wiley.
3	Quantum Mechanics ,	Leonard I. Schiff, 3rdedn. 2010,	Tatamcgraw Hill
4.	Quantum Mechanics	G. Aruldhas, 2ndedn. 2002,	Phi Learning Of India
	Quantum Mechanics	Brucecameron Reed, 2008,	Jones And Bartlett Learning.

Course Code	**PHY308**
Course Title	**Quantum mechanics (Practical)**
Type of course	Discipline elective(practical)
L T P	0:0:4
Credits	2
Course prerequisite	B.Sc Ist, IInd with Physics as one core subject
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
Course outcomes	CO1 They familiar to discuss and interpret experiments that reveal the wave properties of matter. CO2 They have developed ability for independent analytical work in physics through a project. CO3 Enable for new approximation methods and other developments, especially in the field of scattering.

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 aCRuracy 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 aCRuracy 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, cħ = 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 aCRuracy of threesignificant 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	B.Sc Ist, IInd with Physics as one core subject
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
Course outcomes	CO1 They have experience of nuclear structures and dynamics, as well as nuclear reactions . CO2 They can calculate the kinematics of various reactions and decay processes by relativistic calculations. CO3 Evaluate radiation energy losses by passage through matter.

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 ACRelerators: ACRelerator facility available in India: Van-de Graaff generator (Tandem aCRelerator), Linear aCRelerator, 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.	Tatamcgraw Hill, 1998
3	Radiation Detection And Measurement	G.F. Knoll	John Wiley& Sons, 2000
4.	Quarks And Leptons	F. Halzen And A.D. Martin,	Wileyindia, New Delhi

Course code	**PHY312**
Course Title	**Nuclear & Particle Physics (Practical)**
Type of course	Practical
L T P	0:0:4
Credits	2
Course prerequisite	B.Sc Ist, IInd with Physics as one core subject
Course Objective	The aim of this course is to impart practical knowledge to the students about the counters.
Course Outcome	CO1 They have new ideas from fundamental research of nuclear physics is used in medicine. CO2 They can express alpha ,beta and gamma decay and conservation laws of nuclear physics. CO3 Enable to gain knowledge on particle detectors and accelerators.

1.To draw the plateau of a GM counter and find its dead time.
2.To study the statistical fluctuations and end point energy of beta particles using GM counter.
3.To study the absorption of beta particles in aluminium using GM counter and determine the absorption coefficient of beta particles from it.
4.To study Gaussian distribution using G.M. counter.
5.To determine the Source strength of a beta source using G.M. counter.
6.Study of Poisson distribution using GM counter.
7.To calibrate the scintillation counter using a known Gamma Source.
8.To study absorption of gamma radiation by scintillation counter.

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

Course Code	**MAT302**
Course Title	**Integral Calculus**
Type of course	Discipline Elective
L T P	6:0:0
Credits	6
Course prerequisite	B.Sc Ist, IInd with Mathematics as one core subject
Course Objective (CO)	.It help to students Understand partial Integration
Course outcomes	CO1 Student will be able to evaluate the integration of rational and irrational functions and to evaluate the reduction formulae for integrals of rational, trigonometric, exponential and logarithmic functions and of their combinations. CO2 Students will be able to find the areas and lengths of curves in the plane, volumes and surfaces of solids of revolution. CO3 Students will be able to find the double and triple 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	6:0:0
Credits	6
Course prerequisite	B.Sc Ist, IInd with Mathematics as one core subject
Course Objective (CO)	It develops the knowledge Analytic function ,derivative function and Cauchy-Riemann equation
Course outcomes	CO1 Students will have the knowledge and skills to explain the fundamental concepts of complex analysis and their role in modern mathematics and applied contexts. CO2 Students will be able to demonstrate accurate and efficient use of complex analysis techniques. CO3 Students will be able to express analytic functions in terms of power series and Laurent series and also calculate complex line integrals and some infinite real integrals using Cauchy's integral theorem.

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	6:0:0
Credits	6
Course prerequisite	B.Sc Ist, IInd with Mathematics as one core subject
Course Objective (CO)	It help to students Understand Simplex Method ,Big M Method and Primal – dual Relationship.
Course outcomes	CO1 The field of linear programming provides the appropriate methods for the efficient computation of optimal solutions of a problem which is modeled by a linear objective function and a set of linear constraints. CO2 Students will be ready to model a problem as a linear programming problem and to apply the appropriate method in order to find an optimal solution. CO3 Students should be able to identify parametersthat will influence the optimal solution of an Linear programming problem and derive feasible solution using atechnique of operational research.

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)	To impart basic knowledge of internet work, Understand the basic issues ininformation security, the concept of ciphers and cryptography, various ciphers, digital signatures and email security policies, malicious software and their remedies.
Course outcomes	understand the CIA triad of Confidentiality, Integrity and Availability. Provide security of the data and information over the network and implement various network protocols. Do research in the emerging areas of cryptography and network security.

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, ECR 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	**CSA386**
Course Title	**Information Security Practical**
Type of course	Practical
L T P	0 0 4
Credits	2
Course prerequisite	Basics of Computer Lab
Course Objective (CO)	To provide students research opportunity on data transmission security data recovery and complexities associated with threat to security on data transmission.
Course outcomes	Students will exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization Do research in the emerging areas of cryptography and network security.

Syllabus

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat
2. Use of Password cracking tools: John the Ripper, Ophcrack. Verify the strength of passwords using these tools.
3. Perform encryption and decryption of Caesar cipher. Write a script for performing these operations.
4. Perform encryption and decryption of a Rail fence cipher. Write a script for performing these operations.

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5. Use nmap/zenmap to analyse a remote machine.
6. Use Burp proxy to capture and modify the message.
7. Demonstrate sending of a protected word document.
8. Demonstrate sending of a digitally signed document.
9. Demonstrate sending of a protected worksheet.
10. Demonstrate use of steganography tools.
11. Demonstrate use of gpg utility for signing and encrypting purposes

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Security in Computing	Security in Computing	Prentice Hall of India, 2006
2	Network Security Essentials	W. Stallings	S. L. Pfleeger

Course Code	**CSA396**
Course Title	**Cloud computing**
Type of course	DISCIPLINE ELECTIVE
L T P	4 0 0
Credits	4
Course prerequisite	Knowledge of Cloud computing
Course Objective (CO)	To develop an understanding of Cloud as a learning environment and deliver advanced technology for hands-ontraining
Course outcomes	Identify appropriate data mining algorithms to solve real world problems. Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining. Describe complex data types with respect to spatial and web mining.

Syllabus

UNIT I: Overview of Computing Paradigm, Recent trends in Computing: Grid Computing, Cluster Computing, Distributed Computing, Utility Computing, Cloud Computing

UNIT II:

Introduction to Cloud Computing, Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Benefits and limitations of Cloud Computing

UNIT III:

Cloud Computing Architecture ,Comparison with traditional computing architecture (client/server), Services provided at various levels, Service Models- Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), How Cloud Computing Works, DeploymentModels- Public cloud, Private cloud, Hybrid cloud, Community cloud, Case study of NIST architecture.

UNIT IV: Cloud Security Infrastructure Security- Network level security, Host level security, Application level security, Data security and Storage- Data privacy and security Issues, Jurisdictional issues raised by Data location, Authentication in cloud computing.

Text and Reference Books

Sr. no.	Name	AUTHOR(S)	PUBLISHER
1	Cloud Computing Bible	Barrie Sosinsky	Wiley-India, 2010
2	Cloud Security	Ronald L. Krutz	Russell Dean Vines, Wiley India, 2010
3	Enterprise Cloud Computing Technology Architecture Applications	Gautam Shroff	McGraw Hills, 2010

Course Code	**CSA398**
Course Title	**Cloud computing Practical**
Type of course	Practical
L T P	0 0 4
Credits	2
Course prerequisite	Knowledge of Cloud computing
Course Objective (CO)	To improving students' understanding of the material provided through practical experience with the finer details and subjects' complexities
Course outcomes	Students will experience training process with the aid of e-learning platforms.
	Identify appropriate data mining algorithms to solve real world problems.
	Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining.
	Describe complex data types with respect to spatial and web mining.

Syllabus

1. Create virtual machines that access different programs on same platform.

2. Create virtual machines that access different programs on different platforms.

3. Working on tools used in cloud computing online- a) Storage

b) Sharing of data

c) Manage your calendar, to-do lists,

d) A document editing tool

4 .Exploring Google cloud

5.Exploring Microsoft cloud

6.Exploring amazon cloud

S. NO	NAME	AUTHOR(S)	PUBLISHER
1	Cloud Computing, A Practical Approach	Toby Velte	McGraw Hills, 2010
2	Cloud Security	Ronald L	Wiley-India, 2010

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