

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Honours) Applied Physics - (specialization in Electronics)
A Four-Years Degree Program

Eligibility: Senior Secondary Examination (10+2) or equivalent with at least 50% marks (45% for SC/ST) in aggregate with Physics as one of the main subjects.

Semester I

Contact Hours = 31

S. No	Course Code	Course Title	Compulsory (C)/ Electives (E)	Load Allocation			Marks Distribution		Total	Credits
				L	T	P	Internal	External		
1	BSAP101C	Solid State Physics	C1	3	1	0	25	50	75	4
2	BSAP102C	Electromagnetism and Waves	C2	3	1	0	25	50	75	4
3	BSAP103C	Physics-I	C3	3	1	0	25	50	75	4
4	BSAP104C	Mathematics-I	C4	3	1	0	25	50	75	4
5	BSHU101C	English	C5	3	0	0	25	50	75	3
6	BSHU102C/ BSHU103C	Punjabi /Or Punjab History & Culture	C6	3	0	0	25	50	75	3
7	SBS101C	Introduction to Shaheed Bhagat Singh and his Co-patriots	C7	1	0	0	25	-	S/US	Non-Credit
8	BSAP105C	MATLAB Lab-I	C8	0	0	4	30	20	50	2
9	BSAP106C	Physics Lab-I	C9	0	0	4	30	20	50	2
Total				19	4	8	235	340	575	
Total Credits									26	

Semester II

Contact Hours = 35

S. No	Course Code	Course Title	Compulsory (C)/ Electives (E)	Load Allocation			Marks Distribution		Total	Credits
				L	T	P	Internal	External		
1	BSAP-201C	Digital Electronics	C1	3	1	0	40	60	100	4
2	BSAP-202C	Network Theory	C2	3	1	0	40	60	100	4
3	BSCE-102C	Fundamentals of Information Technology (IT)	C3	3	0	0	40	60	100	3
4	BSNM-203C	Mechanics-II	C4	3	0	0	25	50	75	3
5	BSNM-205C	Integral Calculus	C5	3	0	0	25	50	75	3
6	BSHU201C	English-II	C6	3	0	0	25	50	75	3
7	BSHU202C/ BSHU203C	Punjabi Or Punjab History & Culture	C8	3	0	0	25	50	75	3
8	BSCE-105C	Fundamentals of IT Lab	C7	0	0	4	60	40	100	2
9	BSAP-203C	Digital Electronics Lab	C9	0	0	4	60	40	100	2
10	BSNM-208C	Physics Lab-II	C10	0	0	4	30	20	50	2
Total				21	02	12	370	480	850	
Total Credits									29	

Semester III

Contact Hours = 30

S. No	Course Code	Course Title	Compulsory (C)/ Electives (E)	Load Allocation			Marks Distribution		Total	Credits
				L	T	P	Internal	External		
1	BSAP-301C	Microprocessors	C1	3	0	0	25	50	75	3
2	BSNM-303C	Thermal and Statistical Physics	C2	3	0	0	25	50	75	3
3	BSNM-304C	Optics and Laser	C3	3	0	0	25	50	75	3
4	BSNM-306C	Differential Equations	C4	3	0	0	25	50	75	3
5	BSCE-103C	Problem Solving using C	C5	3	1	0	40	60	100	4
6	EVS-101C	Environmental Studies	C6	2	0	0	40	60	100	2
7	BSNM-308C	Physics Lab-III	C7	0	0	4	30	20	50	2
8	BSCE-104C	Problem Solving using C Lab	C8	0	0	4	60	40	100	2
9	BSAP-302C	Microprocessors-Lab	C9	0	0	2	30	20	50	1
10	BMPD-301C	Mentoring and Professional Development	C10	0	0	2	Satisfactory/Un-satisfactory			Non-credit
Total				17	1	12	300	400	700	23
Total Credits										23

Semester IV

Contact Hours = 29

S. No	Course Code	Course Title	Compulsory (C)/ Electives(E)	Load Allocation			Marks Distribution		Total	Credits
				L	T	P	Internal	External		
1	BSAP-401C	Analog Circuits	C1	3	0	0	25	50	75	3
2	BSAP-402C	Microcontrollers	C2	3	0	0	25	50	75	3
3	BSAP-403C	Engineering Materials	C3	3	0	0	25	50	75	3
4	BSNM-403C	Vibration and Waves	C4	3	0	0	25	50	75	3
5	BSNM-404C	Elements of Modern Physics	C5	3	0	0	25	50	75	3
6	BSCE-203C	Object Oriented Programming Concepts using C++	C6	3	1	0	40	60	100	4
7	BSAP-404C	Analog Circuits Laboratory	C7	0	0	2	30	20	50	1
8	BSAP-405C	Microcontrollers Laboratory	C8	0	0	2	30	20	50	1
9	BSNM-408C	Physics Lab-IV	C9	0	0	4	30	20	50	2
10	BMPD-401C	Mentoring and Professional Development	C10	0	0	2	Satisfactory/Un-satisfactory			Non-credit
Total				18	1	10	255	370	625	23
Total Credits										23

1st Semester

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester	Ist			
Subject Code	BSAP101C			
Subject Name	Solid State Physics			
Contact Hours	L: 03	T: 01	P: 00	Credits: 04

Syllabus same as approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical) 2nd semester.

Course Objective

This course deals with design, basic theory, and analytical concepts of various Solid state devices like Semiconductor diodes, Transistors, FETs and their utilization in designing of different electronic circuits.

Course Outcomes

At the end of this course student will be able to:

1. Understand the basic theory of Solid state devices, materials and their properties
2. Understand the characteristics and working of different Semiconductor diodes and Transistor along with their biasing.
3. Familiar with the working and characteristics of different Rectifiers circuits
4. Understand different Fabrication processes of PCB design.
5. Understand the working of basic Electronic devices and their applications.

Units	Contents	Hours
I	Fundamentals of Solid State Physics: Introduction, Semiconductor materials, Metals, Insulators, Semiconductor, Passive and active electronic components, Structure of an atom, Energy bands, Crystal structure, atomic bonding, atomic packing, atomic shape and size, crystal imperfection, atomic diffusion, thermal properties of materials, electrical properties of materials, optical properties of materials, Local field and Clausius-Mossotti equation, free electron model of metals, density of states, Intrinsic semiconductors, Extrinsic semiconductors and their types. Industrial applications of semi-conductor physics.	8
II	Semiconductor diodes: PN junction, Junction Theory, PN Junction diode, V-I characteristics of PN-Junction diode, Ideal diode, Static and dynamic resistance of diode, Zener diode, Laser Diodes, Schottky Diode, Light Emitting diode, Varacter diode, Tunnel diodes and their applications. Rectifiers: Half wave rectifiers, Full wave rectifiers (Centre-tap and Bridge), Efficiency calculations and comparison, Regulated Power supply design.	12
III	Transistors: Types, Theory of operation, different configurations and their comparison, Input and Output characteristics of different configurations, Basic CE amplifier circuit, Transistor datasheets, Thermal runaway and heat sinks, Field-effect Transistor, MOSFETs, Different transistor biasing circuits and stabilization of operating points.	12
IV	Fabrication Processes: Oxidation; diffusion; Ion-implantation; Annealing; Photolithography; Etching; Chemical Vapour Deposition (CVD); Sputtering; Twin-tub CMOS process. Electronic Devices: CRO, Multimeter, Signal Generator, DSO.	8

Reference Books:

1. Andre Moliton, Solid-State Physics for Electronics, Wiley, 2010
2. James Patterson, Bernard Bailey, Solid State Physics, 2nd Edition, Springer, 2012
3. N N Bhargava, D C Kulshreshtha, S C Gupta, Basic electronics & Linear Circuits, Tata McGraw- Hill Publishing Company limited, 1996.
4. B L Threja, Basic Electronics- Solid state, S Chand & Company, 2012

5. G. Streetman, and S. K. Banerjee, Solid State Electronic Devices, Pearson.
6. 2. D. Neamen, D. Biswas, Semiconductor Physics and Devices, McGraw-Hill Education

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Semester	Ist			
Subject Code	BSAP102C			
Subject Name	Electromagnetism and Waves			
Contact Hours	L: 03	T: 01	P: 00	Credits: 04

Syllabus same as approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical) 1st semester.

Course Objective

This course deals with fundamental knowledge and background required for better understanding of Electromagnetic Waves (Light- and Acoustic-waves) and their propagation behaviour through different medium.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Understand basic theorems and laws of Electrostatic.
2. Understand basic theorems and laws of Magnetism.
3. Understand Maxwell's equations for electromagnetic waves.
4. Understand the characteristics and propagation of light wave through vacuum and waveguides.
5. Understand the characteristics and propagation of Acoustic waves.

Units	Contents	Hours
I	Electrostatics: Gauss's theorem of electrostatics, Applications of Gauss theorem- Electric field due to point charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential, potential due to a point charge, Electric dipole, Measurement of Capacitance of parallel plate, spherical and cylindrical capacitor, Dielectric medium, Gauss's theorem in dielectrics.	8
II	Magnetism: Magnetic intensity, permeability, and susceptibility, Magnetic induction (self- and mutual induction), Faraday's laws of electromagnetic induction, Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current, Divergence and curl of magnetic field, Ampere's circuital law, Magnetic properties of dia-, para- and ferro-magnetic materials, Lenz's law.	8
III	Light waves: Basics of Electromagnetic Waves, Electromagnetic nature of light, Displacement current, Maxwell's equations, Lorentz force equation and motion of charges, Poynting vector, Energy density in electromagnetic field, Electromagnetic wave (EM) propagation through vacuum, and dielectric waveguide. Optical Fiber as dielectric medium and its types, Refractive Index, Numerical Aperture, Measurement of Numerical aperture, Measurement of power loss, Attenuation in dielectric waveguide, Dispersion of EM waves inside a dielectric waveguide, Polarization inside a dielectric waveguide, Linear and Non-linear scattering of EM waves inside a dielectric waveguide. Resonant cavities, power losses in a cavity, Earth and ionosphere as resonant cavity. Applications: Futuristic telecommunication, surveillance, transportation, and Medical-related industries.	14

- IV Acoustic Waves:** Introduction, frequency, loudness, decibel scale, octave, music scale, Fourier series, Fourier Transformation, Equation of state, continuity, Euler's equation, Linear wave equation, speed of sound in fluids, Acoustic intensity, specific acoustic impedance, spherical waves, cylindrical waves, Waveguides, transmission from one fluid to another, reflection from solid, Transmission through thin partition- Mass law.
Applications: Underwater acoustics, Telecommunication, and Explosives. **10**

Reference Books:

1. Edward M. Purcell, Electricity and Magnetism, McGraw-Hill Education 1986.
2. J.H. Fewkes & J. Yarwood. Electricity and Magnetism, Oxford Univ. Press Vol. I, 1991.
3. D C Tayal, Electricity and Magnetism, Himalaya Publishing House 1988.
4. Ronald Lane Reese, University Physics, Thomson Brooks/Cole 2003.
5. D.J. Griffiths, Introduction to Electrodynamics, Benjamin Cummings 3rd Edn, 1998.
6. D. K Mynbaev, and L. L Scheiner, Fiber and Optic Communication Technology, 1st Ed., 2002, Pearson
7. Fundamentals of Acoustics, Lawrence E. Kinsler, Austin R. Frey, 4th Ed., 2000 Wiley Publishers.
8. Noise and Vibration Control, Munjal M. L., World Scientific Publishers in Collaboration with IISc Press, Singapore, 2013

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Semester	Ist			
Subject Code	BSAP103C			
Subject Name	Physics-I			
Contact Hours	L: 03	T: 01	P: 00	Credits: 04

Syllabus same as that of 'Mechanics-I' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical) 1st semester.

Course Objective

This course deals with fundamental knowledge of classical physics including rotational dynamics, gravitational physics, and stress-strain theory.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Understand basic laws of conservation of energy and its principles.
2. Understand laws of gravitational force and its industrial applications.
3. Understand fundamentals of rotational dynamics and its applications indifferent devices.
4. Understand the physics of elastic and non-elastic scattering and their utilization in spectroscopy.

Units	Contents	Hours
I	Work and Energy: Work and Kinetic Energy Theorem. Conservative and non-conservative forces, Potential Energy, Energy diagram, Stable and unstable equilibrium, Elastic potential energy, Force as gradient of potential energy, Work done by non-conservative forces, Law of conservation of Energy.	6
II	Fundamentals of Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field, Kepler's Laws, Satellite in circular orbit and applications. Geosynchronous orbits, Inertial- and non-inertial reference frames, Galilean transformations, Galilean invariance, Momentum of variable-mass system: motion of rocket, Motion of a projectile in uniform gravitational field, Movement of Galaxy. Applications: Global positioning system (GPS), Satellite communication system.	12
III	Rotational Dynamics: Newton's Laws of Motion, Dynamics of a system of particles: Centre of Mass, Principle of conservation of momentum, Impulse, Angular Momentum about the Centre of mass, Rotational invariance, Angular momentum, Torque, Rotation about a fixed axis, Moment of Inertia and its calculation for rectangular, cylindrical and spherical bodies, Kinetic energy of rotation, Cylinder on an accelerated rough plane, Behavior of angular momentum vector, Principal axes and Euler's equations. Applications: Gyroscope, G-Sensor	10
IV	Scattering and Elasticity: Elastic- and Non-elastic scattering, Elastic and Non-elastic collision of particles of different mass and its derivations, Rutherford scattering, Hooke's law, Stress-strain diagram, Relation between elastic constants, Poisson's ratio expression in terms of elastic constants, Work done in stretching and twisting of a wire, Determination of Rigidity modulus by static torsion, Torsional pendulum, Determination of Rigidity modulus and moment of inertia. Applications: Elastic Scattering Spectroscopy Reference Books:	12
	<ol style="list-style-type: none"> 1. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill. 2. Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al. 2007, Tata McGraw-Hill. 3. Feynman Lectures, Vol-I, R.P Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education 4. Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons. 5. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000 	

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Semester	Ist			
Subject Code	BSAP104C			
Subject Name	Mathematics-I			
Contact Hours	L: 03	T: 01	P: 00	Credits: 04

Syllabus same as that of 'Differential Calculus' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical) 1st semester. Copy attached as Annexure-I(a).

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Semester	Ist			
Subject Code	BSHU101C			
Subject Name	English			
Contact Hours	L: 03	T: 00	P: 00	Credits: 03

Syllabus same as approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical) 1st semester. Copy attached as Annexure-I(b).

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Semester	Ist			
Subject Code	BSHU102C			
Subject Name	Punjabi			
Contact Hours	L: 03	T: 00	P: 00	Credits: 03

Syllabus same as approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical) 1st semester. Copy attached as Annexure-I(c).

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Semester	Ist			
Subject Code	BSHU103C			
Subject Name	Punjab History & Culture			
Contact Hours	L: 03	T: 00	P: 00	Credits: 03

Syllabus same as approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical) 1st semester. Copy attached as Annexure-I(c).

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Semester	Ist			
Subject Code	BSAP105C			
Subject Name	MATLAB Lab-I			
Contact Hours	L: 00	T: 00	P: 04	Credits: 02

Course Objective

This laboratory course deals with introduction of MATLAB development environment and general purpose coding skills in MATLAB.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Understand capabilities of development environment of MATLAB
2. Experimentation in MATLAB development environment and demonstrate general purpose programming skills in MATLAB.
3. Understanding the use of signals generation, plotting and signals handling in MATLAB.
4. Understanding of integration of hardware platforms, Artificial intelligence (AI) and Machine learning (ML) toolboxes of MATLAB.

S.No. Experiments

1. Learning of development environment of MATLAB
2. Learning of basic statements and writing programs of input/output in MATLAB.
3. Generation and operations on matrices.
4. Write the program for representing data in various types of plots and graphs.
5. Write a MATLAB program to generate the sinusoidal signal of given frequency and amplitude.
6. Writing the program for file handling.
7. Writing MATLAB code to generate GUI.
8. Write a MATLAB program to draw various types of shapes.
9. Write a program to show the various signals in continuous time form.
10. Write a program to show the various signals in discrete time form.
11. Displaying and loading the image files in MATLAB
12. Displaying and loading the video files in MATLAB
13. Loading and playing the audio files in MATLAB
14. Study of integrating hardware platforms for data capturing in MATLAB
15. Study of Artificial intelligence (AI) and Machine learning (ML) libraries of MATLAB.

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Semester	Ist			
Subject Code	BSAP106C			
Subject Name	Physics Lab-I			
Contact Hours	L: 00	T: 00	P: 04	Credits: 02

Syllabus same as approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical)

Course Objective

The main objective of this course is to provide lab experience to carry out basic measurements of electromagnetic waves and their behaviour through lens, prism, and waveguides.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Measure basic parameters of electromagnetic wave, i.e. Light and dielectric waveguide, i.e. Optical Fiber
2. Measure basic parameters of a material using different optical devices and methods.
3. Measure basic parameter like intensity and wavelength of laser light
4. Understand the working and uses of Sonometer.
5. Understand the working of Polarimeter for measuring specific rotation.

S.No. Experiments

1. To measure Numerical Aperture, Refractive index, and loss of optical signal of an Optical Fibre.
2. To measure angular divergence of a Laser beam.
3. To determine the number of lines per cm on a plane grating using laser.
4. To measure focal length of Convex lens by displacement method.
5. To determine the magnifying power of an Astronomical telescope.
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 intensity of laser in diffraction patterns of single and double slits.
9. To determine the wavelength of Laser light using diffraction of single and double Slits.
10. To determine the frequency of alternating current using a sonometer and an electromagnet.
11. To determine the Resolving Power of a Prism.
12. To determine the Polarizability of a dielectric material.
13. To determine Wavelength of sodium light using Newton's Rings and Fresnel Biprism.
14. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating.
15. To study the specific rotation of sugar using Laurent's half shade polarimeter.

2nd Semester

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Semester	2nd			
Subject Code	BSAP-201C			
Subject Name	Digital Electronics			
Contact Hours	L: 03	T: 01	P: 00	Credits: 04

Course Outcomes:

After undergoing this course, students will be able to

1. Understand the significance and use of different number systems, weighted & non-weighted codes along with their conversions. Learn Boolean algebra & its laws.
2. Minimize Boolean expressions using different techniques: Algebraic method, K-Map Technique and QM Methods, develop basic understanding of Logic gates and universal behaviour of NAND/NOR gates.
3. Obtain knowledge of combinational circuits and design procedure of various combinational logic circuits like Adder, Subtractor, Comparator, MUX/DEMUX, Parity checker etc. Classification of memory devices and to develop understanding about their Organization.
4. Know about different sequential circuits like Flip-flops, Counters & their types. To design counters and know about working of shift registers.
5. Know need of signal conversion, Study different types of signal converters: ADC and DAC along with their working.

Module 1: NUMBER SYSTEMS: Binary, Octal, Decimal, Hexadecimal. Number base conversions, 1's, 2's complements, signed Binary numbers. Binary Arithmetic, Binary codes: Weighted BCD, Gray code, Excess 3 code, ASCII. LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR. Implementations of Logic Functions using gates, NAND-NOR implementations.

Module 2 : BOOLEAN ALGEBRA: Boolean postulates and laws – De-Morgan's Theorem, Principle of Duality, Boolean expression – Boolean function, Minimization of Boolean expressions – Sum of Products (SOP), Product of Sums (POS), Minterm, Maxterm, Canonical forms, Conversion between canonical forms, Karnaugh map Minimization, Don't care conditions, Quine-McCluskey method.

Module 3: COMBINATIONAL CIRCUITS: Design procedure – Adders, Subtractors, BCD adder, Magnitude Comparator, Multiplexer/Demultiplexer, encoder/decoder, parity checker, code converters. Implementation of combinational logic using MUX, BCD to 7 segment decoder.

Module 4: SEQUENTIAL CIRCUITS: Flip flops SR, JK, T, D and Master slave, Excitation table, Edge triggering, Level Triggering, Realization of one flip flop using other flip flops. Asynchronous/Ripple counters, Synchronous counters, Modulo-n counter, Ring Counters. Design of Synchronous counters: state diagram, Circuit implementation. Shift registers.

Module 5: MEMORY DEVICES: Classification of memories, RAM organization, Write operation, Read operation, Memory cycle. ROM organization, PROM, EPROM, EEPROM, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Module 6: A/D & D/A CONVERTORS: Analog & Digital signals. sample and hold circuit, A/D and D/A conversion techniques (Weighted type, R-2R Ladder type, Counter Type, Dual Slope type, Successive Approximation type).

Recommended Text and Reference Books

1. Morris Mano, Digital Design, Prentice Hall of India Pvt. Ltd

2. Donald P. Leach and Albert Paul Malvino, Digital Principles and Applications, 5 ed., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
3. R.P. Jain, Modern Digital Electronics, 3 ed., Tata McGraw-Hill publishing company limited, New Delhi, 2003.
4. Thomas L. Floyd, Digital Fundamentals, Pearson Education, Inc, New Delhi, 2003
5. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Digital System - Principles and Applications, Pearson Education.
6. Ghosal, Digital Electronics, Cengage Learning.

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Semester **2nd**
Subject Code **BSAP-202C**
Subject Name **Network Theory**

Contact Hours **L: 03** **T: 01** **P: 00** **Credits: 04**

Syllabus same as approved by Board of Studies of ECE for B.Tech. (ECE) 2022

Course Outcomes

At the end of this course student will be able to:

1. Analyze linear networks using network theorems.
2. Use Laplace transform to analyze transient & steady state response of linear networks.
3. Comprehend network parameters to analyze two port networks.
4. Realize one port networks using Foster's and Cauer's methods.

Unit 1: Network Theorems

Node and mesh analysis; impedance matrix approach for networks analysis; Network theorems: superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tellegen's theorem as applied to AC circuits; Trigonometric and Exponential Fourier series, Fourier Transform and continuous spectra Three phase unbalanced circuit and power calculation.

Unit 2: Transient & Steady State Analysis

Transient behavior, concept of complex frequency, Driving points, Poles and Zeros, Laplace transforms and properties: singularity functions, waveform synthesis; time domain analysis of RC, RL & RLC networks with and without initial conditions; Laplace Transforms for steady state and transient response of networks, quality factor.

Unit 3: Two Port Networks

Impedance parameters; admittance parameters; transmission parameters; hybrid parameters; inter-relationships between two port network parameters; interconnection of two port networks; T and Pi representation of two port networks; image impedance; characteristic impedance; propagation constant; filters: low pass, high pass; band pass, band stop & Butterworth filter.

Unit 4: Network Synthesis

Realizability criteria: Hurwitz polynomial, positive real functions; network realization using Foster's first and second forms; network synthesis using Cauer's first and second forms.

Recommended Books

1. Van, Valkenburg, *Network Analysis*, PHI
2. F F Kuo, *Network Analysis & Synthesis*, Wiley
3. A. Sudhakar, SP Shyammoan, *Circuits and Network*, Tata McGraw-Hill
4. A William Hayt, *Engineering Circuit Analysis*, McGraw-Hill Education

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Semester **2nd**
Subject Code **BSCE-102C**
Subject Name **Fundamentals of Information Technology**

Contact Hours **L: 03** **T: 00** **P: 00** **Credits: 03**

Syllabus same as approved by Board of Studies of ECE for B.Sc. (Computer Applications & Electronics)

Course Outcome: At the end of the course the student will be able to:

1. Identify of input and output devices of Computers
2. Utilize the functioning of various components of the computer system
3. Define the role of the Operating system
4. Prepare documents using word processing, Spreadsheet, and Presentation Graphics Software.
5. Highlight Internet safety, legal, and other issues.

Unit-I: Human-Computer Interface: Concepts of Hardware and Software; Data and Information. Functional Units of Computer System: CPU, registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, and plotter.

Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks.

Data Representation: Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions, and Binary Arithmetic (Addition/ Subtraction/ Multiplication) Applications of IT.

Unit-II: Concept of Computing, Types of Languages: Machine, assembly and High level Language; Operating system as user interface, utility programs.

Word processing: Editing features, formatting features, saving, printing, table handling, page settings, spell-checking, macros, mail-merge, equation editors.

Unit-III: Spreadsheet: Workbook, worksheets, data types, operators, cell formats, freeze panes, editing features, formatting features, creating formulas, using formulas, cell references, replication, sorting, filtering, functions, Charts & Graphs.

Presentation Graphics Software: Templates, views, formatting slide, slides with graphs, animation, using special features, presenting slide shows.

Unit-IV: Electronic Payment System: Secure Electronic Transaction, Types of Payment System: Digital Cash, Electronic Cheque, Smart Card, Credit/Debit Card E-Money, Bit Coins and Crypto currency, Electronic Fund Transfer (EFT), Unified Payment Interface (UPI), Immediate Payment System (IMPS), Digital Signature and Certification Authority.

Introduction to Bluetooth, Cloud Computing, Big Data, Data Mining, Mobile Computing and Embedded Systems and Internet of Things (IoT)

Suggested Readings/ Books:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
2. Computer Fundamentals, A. Goel, 2010, Pearson Education.
3. Fundamentals of Computers, P. K.Sinha & P. Sinha, 2007, BPB Publishers.
4. IT Tools, R.K. Jain, Khanna Publishing House
5. "Introduction to Information Technology", Satish Jain, Ambrish Rai & Shashi Singh, Paperback Edition, BPB Publications, 2014.

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Applied Physics (specialization in Electronics)

Semester **2nd**
Subject Code **BSNM-203C**
Subject Name **Mechanics-II**

Contact Hours **L: 03** **T: 00** **P: 00** **Credits: 03**

Syllabus same as that of 'Mechanics-II' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical)

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Understand basic laws of physics in rotating coordinate systems.
2. Understand principles and physics of oscillations and measurements of their related physical quantities.
3. Understand fundamentals of special theory of relativity and transformation theories.

Contents

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Central Force Motion: Motion of a particle under a central force field. Two-body problem and its reduction to one-body problem and its solution. The energy equation and energy diagram. Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Basic idea of global positioning system. inertial frames and fictitious forces. Uniformly rotating frame. Laws of physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications. Components of velocity and acceleration in cylindrical and spherical Coordinate systems. 12

Oscillations: Simple Harmonic Oscillations (SHM). Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor. Hooke's law, 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, Torsional pendulum, Determination of Rigidity modulus and moment of inertia, q , η and σ by Searles method. 14

Special Theory of Relativity: Michelson-Morley Experiment. Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity and order of events. Lorentz contraction. Time dilation. Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless particles. Mass-energy equivalence. Relativistic kinematics. Transformation of energy and momentum. 14

Reference Books:

1. Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al. 2007, Tata McGraw-Hill.
2. Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
3. Analytical Mechanics, G.R. Fowles and G.L. Cassiday. 2005, Cengage Learning.
4. Feynman Lectures, vol-I, R. P. Feynman, R. B. Leighton, M. Sands, 2008, Pearson Education
5. Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.
6. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
7. Theoretical Mechanics, M.R. Spiegel, 2006, Tata McGraw Hill.

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester 2nd
Subject Code BSNM-205C
Subject Name Integral Calculus

Contact Hours L: 03 T: 00 P: 00 Credits: 03

Syllabus same as that of 'Integral Calculus' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical) attached as Annexure-1(a).

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Semester 2nd
Subject Code BSHU-201C
Subject Name English-II

Contact Hours L: 03 T: 00 P: 00 Credits: 03

Syllabus same as that of 'English' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical) attached as Annexure-1(b).

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Semester 2nd
Subject Code BSHU-202C
Subject Name Punjabi

Contact Hours L: 03 T: 00 P: 00 Credits: 03

Syllabus same as that of 'Punjabi' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical) attached as Annexure-1(c).

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Semester 2nd
Subject Code BSHU-203C
Subject Name Punjab History & Culture

Contact Hours L: 03 T: 00 P: 00 Credits: 03

Syllabus same as that of 'Punjab History & Culture' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical) attached as Annexure-1(d).

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Semester **2nd**
Subject Code **BSCE-105C**
Subject Name **Fundamentals of IT Lab**

Contact Hours **L: 00** **T: 00** **P: 04** **Credits: 02**

Syllabus same as approved by Board of Studies of ECE for B.Sc. (Computer Applications & Electronics)

Course Outcome: At the end of the course the student will be able to:

1. Highlight the features of word processing, spreadsheet and presentation tools
2. Identify the right components for its documents on editor, spread sheet and presentation software.
3. Prepare documents and apply formatting.
4. select the right tool for different requirements.
5. Apply various operations.

Word Orientation: The instructor needs to give an overview of word processor. Details of the four tasks and features that would be covered Using word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

1. Using word to create Resume Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

2. Creating an Assignment Features to be covered: - Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

3. Creating a Newsletter Features to be covered :- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs

4. Creating a Feedback form Features to be covered :- Forms, Text Fields, Inserting objects, Mail Merge in Word.

Excel Orientation: The instructor needs to tell the importance of Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered Excel – Accessing, overview of toolbars, saving excel files,

1. Creating a Scheduler Features to be covered :- Gridlines, Format Cells, Summation, auto fill, Formatting Text

2. Calculations Features to be covered :- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

3. Performance Analysis Features to be covered :- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

4. Game (like Cricket, badminton) Score Card Features to be covered :- Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation

Presentation Orientation:

1. Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows

2. This session helps students in making their presentations interactive. Topics covered includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

3. Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topics covered includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides. Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing

4. Power point test would be conducted. Students will be given model power point presentation which needs to be replicated

Internet and its Applications The instructor needs to tell the how to configure Web Browser and to use search engines by defining search criteria using Search Engines

1. To learn to setup an e-mail account and send and receive e-mails
2. To learn to subscribe/post on a blog and to use torrents for accelerated downloads
3. Hands on experience in online banking and Making an online payment for any domestic bill

Suggested Readings/ Books:

1. IT Tools, R.K. Jain, Khanna Publishing House.
2. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
3. Introduction to information technology, Turban, Rainer and Potter, John Wiley and Sons.
4. Problem Solving Cases in Microsoft Excel, Joseph Brady & Ellen F Monk, Thomson Learning.

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
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Semester **2nd**
Subject Code **BSAP-203C**
Subject Name **Digital Electronics Lab**

Contact Hours **L: 00** **T: 00** **P: 04** **Credits: 02**

Course Outcomes

At the end of this course, student will demonstrate the ability to:

1. Realize logic gates.
2. Realize combinational circuits using logic gates.
3. Realize sequential circuits using logic gates.

List of Experiments:

Task 1: To verify the Truth-tables of all logic gates.

Task 2: To realize and verify the Half & full adder circuits using logic gates.

Task 3: To realize Half & full subtractor circuits using logic gates.

Task 4: To realize Encoder and Decoder circuits

Task 5: To realize Multiplexer circuits

Task 6: To realize 4-bit binary to gray & gray to binary converter.

Task 7: To realize comparator circuit for two binary numbers of 2-bit each.

Task 8: To realize Full adder & full subtractor circuits using encoder.

Task 9: To design Full adder & full subtractor circuits using multiplexer.

Task 10: To design and verify the Truth tables of all flip-flops.

Task 11: To design Mod-6/Mod-9 synchronous up-down counter.

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Semester **2nd**
Subject Code **BSNM-208C**
Subject Name **Physics-II Lab**

Contact Hours **L: 00** **T: 00** **P: 04** **Credits: 02**

Syllabus same as that of 'Physics-II Lab' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical)

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Understand characteristics & working of BJT in different configurations.
2. Understand characteristics & working of MOSFET in circuits.
3. Design working circuits based on diodes, BJTs and MOSFETs in different circuits.
4. Measure Modulus of rigidity, spring constant, moment of inertia etc. using different methods.

S.No Experiments

1. To determine the energy band of a semiconductor medium.
2. To study the characteristics of p-n junction diode (Forward and Reverse biased)
3. To study a zener diode as voltage regulator.
4. To study the output waveform of a Half-wave rectifier.
5. To study the output waveform of a Full-wave centre-tapped and bridge rectifier.
6. To study Input & output V-I characteristics of NPN/PNP transistors in CE configuration
7. To study Input & output V-I characteristics of NPN/PNP transistors in CB configuration 8 To study Input & output V-I characteristics of NPN/PNP transistors in CC configuration 9 To study the functioning of a BJT as a switch.
8. To study V-I Characteristics of a MOSFET
9. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity.
10. To establish a relation between angular acceleration α and torque τ , and hence to find out the moment of Inertia of flywheel.
11. Study the dependence of the moment of Inertia on distribution of mass (by noting the time periods of oscillations) using objects of various shape but of same mass.
12. To determine the Young's Modulus of a Wire by Optical Lever Method.
13. To determine the Young's Modulus of a Wire by Searle's method.
14. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.

3rd Semester

Shaheed Bhagat Singh State University, Ferozepur
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Semester	3rd
Subject Code	BSAP-301C
Subject Name	Microprocessors
Contact Hours	L: 03 T: 00 P: 00 Credits: 03

Course Outcomes: Students will be able to

1. Acquire the knowledge of basic fundamentals of microprocessors, its applications and its technical terminology.
2. Acquire knowledge of detailed study of architecture and pin configuration of 8085 and programming techniques.
3. Interpret the detailed study of programming concepts of 8086 microprocessor, instruction set and various addressing modes.
4. Acquire knowledge of different interfacing devices used with microprocessors.

Module 1: Fundamentals of Microprocessors:

Introduction to Microprocessors: Historical Background and evolution of Microprocessors, Applications of Microprocessors, Microprocessor selection, Concept of: Assembly Language, High Level Language, Low Level Language, Machine Language, Buses and CPU, Input/ Output devices, registers, Instruction Cycle, machine cycles, memory, RISC & CISC processors

Module 2: 8085 Microprocessor

8085 Microprocessor & its internal architecture, Pin configuration, Timing & Signals: control and status signals, interrupts, Instruction Set of 8085: Instruction format, op-codes, mnemonics, Addressing Modes, Instruction Classification: Data transfer, arithmetic operations, logical operations, branching operation Counters and Time delays, Stack, & subroutine, Programming techniques.

Module 3: 8086 Microprocessor

8086 internal architecture, 8086 system configuration, minimum and maximum mode, memory segmentation, addressing modes, instruction set description, Interrupts

Module 4: Peripheral memory and I/O Interfacing (8 Hours)

Introduction to Peripheral devices: Introductory concepts of 8255- Programmable peripheral interface, 8253/8254 Programmable timer/counter. 8259 programmable Interrupt Controller, 8257 - Direct Memory Access Controller

Suggested Readings/ Books:

1. R. S. Gaonkar, Microprocessor Architecture, Programming and application with 8085, Penram International Publishing Pvt. Ltd.
2. D.V. Hall, Microprocessors and Interfacing: Programming and hardware, Glencoe Publication.
3. Ali Mazidi, J. G. Mazidi, The 8051 Microcontroller and embedded Systems, Pearson Education.
4. K. J. Ayala, The 8051 Microcontroller, Cengage Learning.

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Semester 3rd
Subject Code BSNM-303C
Subject Name Thermal and Statistical Physics

Contact Hours L: 03 T: 00 P: 00 Credits: 03

Syllabus same as that of 'Thermal and Statistical Physics' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical).

Details of the Course

Unit I Thermodynamics: Laws of Thermodynamics: The zeroth law; indicator diagrams, work done, first law, internal energy, Carnot cycle, Carnot's theorem, the second law. Entropy as a thermodynamic variable; reversible and irreversible processes. Principle of increase of entropy. Thermodynamic scale of temperature; its identity with perfect gas scale, impossibility of attaining absolute zero. (10 Lectures)

Unit II Maxwell's equations: application to Clausius-Clapeyron equation and Joule-Thomson effect. Thermodynamic potentials, relation to thermodynamic variables; equilibrium in thermo dynamic systems, simple applications, Thomson and adiabatic cooling, Joule-Thomson expansion; Constancy of $U+PV$, cooling, liquefaction of gases. Low temperatures: Production and measurement of very low temperatures, adiabatic demagnetization. (10 Lectures)

Unit III Statistical Physics: The statistical basis of thermodynamics: Probability and thermodynamic probability; principle of equal a priori probabilities, probability distribution, its narrowing with increasing n , average properties, fluctuations, micro and macrostates, accessible and inaccessible states. Phase space, division of phase space into cells. (10 Lectures)

Unit IV Thermal Dynamics: Thermal equilibrium between two systems, beta parameter and its identification with $(kT)^{-1}$, probability and entropy, Boltzmann's entropy relation, statistical interpretation of second law of thermodynamics. Maxwell-Boltzmann statistics, application of M-B statistics to monoatomic gas, principle of equipartition of energy, Bose-Einstein statistics, deduction of Planck's radiation law, derivation of Wiens's displacement law and Stefan's law. Fermi-Dirac statistics, comparison of three types of statistics. (10 Lectures)

Recommended Books:

1. Statistical Physics and Thermodynamics-V.S. Bhatia, Punjab University, Chandigarh, 1977
2. Thermodynamics and Statistical Physics-Khandelwal and Loknathan, Shivrul Agnawala, Agna, 1979
3. Heat and Thermodynamics-Zemansky and Dittman, Mc Graw Hill Science/Engineering/Math-7th edition (Nov,1, 1996)

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Semester 3rd
Subject Code BSNM-304C
Subject Name Optics and Laser

Contact Hours L: 03 T: 00 P: 00 Credits: 03

Syllabus same as that of 'Optics and Laser' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical).

Unit I Interference: Definition and properties of wave front, Temporal and Spatial Coherence, Young's double slit experiment, Lloyd's single mirror and Fresnel's Biprism. Phase change on reflection, Interference in Thin Films: parallel and wedge-shaped films, Newton's Rings: Measurement of wavelength and refractive index, Interferometer: Michelson Interferometer.(10 Lectures)

Unit II Diffraction: Huygens Principle, Fraunhofer diffraction: Single slit. Circular aperture, Rayleigh criterion of resolution, Resolving Power of a telescope, Double slit, Multiple slits, Diffraction grating, Resolving power of grating, Fresnel diffraction pattern of a straight edge and circular aperture. (10 Lectures)

Unit III Polarization: Plane polarized light, Representation of Unpolarized and Polarized light, Polarization by Reflection, Brewster's law, Malus Law, Polarization by Selective absorption by Crystals, Polarization by Scattering, Polarization by Double Refraction, Nicol Prism.(10 Lectures)

Unit IV Laser: Lasers, Spontaneous emission, Stimulated absorption, Stimulated emission, Einstein coefficients, Einstein relations, Conditions for Laser actions, Population inversion, Different types of Laser Pumping mechanism: Optical Pumping, Electric Discharge and Electrical pumping, Resonators, Two, Three and Four level laser systems, Ruby laser, He-Negas Laser, CO₂ laser, applications of laser: Holography, Spectroscopy and laser welding(10 Lectures)

Recommended Books:

1. Optics: A.K. Ghatak (Tata-McGraw Hill), 1992.
2. Fundamentals of Optics: F.A. Jenkins and H.E. White (McGraw Hill), 1981.
3. Introduction to Modern Optics (2nd ed.), G.R. Fowles, Dover, ISBN 0-486-65957-7, 2012.
4. Fundamentals of Optics, F.A. Jenkins & H.E. White, McGraw-Hill, 2011.
5. Schaum's Outline of Theory and Problems of Optics, E. Hecht, McGraw-Hill, ISBN 0-07- 027730-3, 1998.

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Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester 3rd
Subject Code BSNM-306C
Subject Name Differential Equations

Contact Hours L: 03 T: 00 P: 00 Credits: 03

Syllabus same as that of 'Differential Equations' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical)

Unit	Content
I	Exact differential equations, first order and higher degree equations solvable for x, y and $p=dy/dx$. Clairaut's form, singular solution as an envelope of general solutions. Geometric meaning of a differential equation, Linear differential equations with constant coefficients. (10 Lectures)
II	Linear differential equations with variable coefficients: Cauchy and Legendre equations, Linear differential equations of second order- transformation of the equation by changing the dependent variable/ the independent variable, methods of variation of parameters and reduction of order (10 Lectures)
III	Partial differential equation: Formation of first and second order equations, linear equation of first order and integral surfaces (10 Lectures)
IV	Lagrange's linear equation. Nonlinear first order partial differential equations: Charpit's method. Classification of higher order partial differential equation. (10 Lectures)
	<p>Recommended Books:</p> <ol style="list-style-type: none"> 1. W E Boyce and R C DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley, 2009. 2. R K Jain and S R K Iyengar, Advanced Engineering Mathematics, 4th Edition, Narosa Publishing House Pvt Ltd, New Delhi, 2012 3. I N Sneddon, Elements of Partial Differential Equations, McGraw-Hill, 1957 4. S L Ross, Differential Equations, John Wiley & Sons, 2004 5. M D Raisinghania, Advanced Differential Equations, 19th Edition, S. Chand, 2018

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Semester 3rd
Subject Code BSCE-103C
Subject Name Problem Solving using C

Contact Hours L: 03 T: 01 P: 00 Credits: 04

Syllabus same as that of 'Problem Solving using C' approved by Board of Studies of Department of Electronics & Communication Engg for B.Sc. (CAE)

Course Outcome: At the end of the course, the student will be able to:

1. Express the logical flow used in Programming.
2. Design algorithms for solving various real life problems
3. Implement programs using C.
4. Choose the right data type and statements for programs.
5. Explain various concepts of C programming language.

Unit-I: Logic Development: Data Representation, Flowcharts, Problem Analysis, Decision Trees/Tables, Pseudo code and algorithms. Fundamentals: Character set, Identifiers and Key Words Data types, Constants, Variables, Expressions, Statements, Symbolic Constants. Operations and Expressions: Arithmetic operators, Unary operators, Relational Operators, Logical Operators, Assignment and Conditional Operators, Library functions.

Unit-II: Data Input and Output: formatted & unformatted input output. Control Statements: While, Do-while and For statements, Nested loops, If-else, Switch, Break – Continue statements.

Unit-III: Functions: Brief overview, defining, accessing functions, passing arguments to function, specifying argument data types, function prototypes, recursion. Arrays: Defining, processing arrays, passing arrays to a function, multi-dimensional arrays Strings: String declaration, string functions and string manipulation Program Structure Storage Class: Automatic, external and static variables.

Unit-IV: Structures & Unions: Defining and processing a structure, user defined data types, structures and pointers, passing structures to functions, unions. Pointers: Understanding Pointers, Accessing the Address of a Variable, Declaration and Initialization of Pointer Variables, Accessing a Variable through its Pointer, Pointers and Arrays; File Handling: File Operations, Processing a Data File

Suggested Readings/ Books:

1. Programming in ANSI C, E. Balagurusami, Fourth Edition, Tata McGraw Hill.
2. Programming in C, Third Edition, Stephen G Kochan, Pearson.
3. The C Programming Language, Kernighan & Richie, Second Edition, PHI Publication

Shaheed Bhagat Singh State University, Ferozepur
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Semester	3rd
Subject Code	EVS-101C
Subject Name	Environmental Studies
Contact Hours	L: 02 T: 00 P: 00 Credits: 02

Course Outcomes:

1. Students will enable to understand environmental problems at local and national level through literature and general awareness.
2. The students will gain practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.
3. The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate these problems.
1. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world

UNIT I: Introduction to Environmental Studies

Multidisciplinary nature of Environmental Studies: Scope & Importance; Need for Public Awareness

UNIT II: Ecosystems

Concept of an Ecosystem: Structure & functions of an ecosystem (Producers, Consumers & Decomposers); Energy Flow in an ecosystem: Food Chain, Food web and Ecological Pyramids
Characteristic features, structure & functions of following Ecosystems:

- Forest Ecosystem
- Aquatic Ecosystem (Ponds, Lakes, River & Ocean)

UNIT III: Natural Resources

Renewable & Non-renewable resources:

Forest Resources: their uses, functions & values (Biodiversity conservation, role in climate change, medicines) & threats (Over-exploitation, Deforestation, Timber extraction, Agriculture Pressure), Forest Conservation Act.

Water Resources: Their uses (Agriculture, Domestic & Industrial), functions & values, Overexploitation and Pollution of Ground & Surface water resources (Case study of Punjab), Water Conservation, Rainwater Harvesting,

Land Resources: Land as a resource; Land degradation, soil erosion and desertification

Energy Resources: Renewable & non-renewable energy resources, use of alternate energy resources (Solar, Wind, Biomass, Thermal), Urban problems related to Energy

UNIT IV: Biodiversity & its conservation

Types of Biodiversity: Species, Genetic & Ecosystem, India as a mega biodiversity nation, Biodiversity hot spots and biogeographic regions of India, Examples of Endangered & Endemic species of India, Red data book.

UNIT V: Environmental Pollution & Social Issues

Types, Causes, Effects & Control of Air, Water, Soil & Noise Pollution; Nuclear hazards and accidents & Health risks; Global Climate Change: Global warming, Ozone depletion, Acid rain, Melting of Glaciers & Ice caps, Rising sea levels; Environmental disasters: Earthquakes, Floods, Cyclones, Landslides.

UNIT VI: Field Work

1. Visit to a National Park, Biosphere Reserve, Wildlife Sanctuary
2. Documentation & preparation of a Biodiversity (flora & fauna) register of campus/river/forest
3. Visit to a local polluted site: Urban/Rural/Industrial/Agricultural
4. Identification & Photography of resident or migratory birds, insects (butterflies)
5. Public hearing on environmental issues in a village

Suggested Readings/ Books:

1. Bharucha, E. Text Book for Environmental Studies. University Grants Commission, New Delhi.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down to Earth, Centre for Science and Environment (R)
9. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
10. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
11. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
12. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection & Laws. Himalaya Pub. House, Delhi 284p.
13. Mckinney, M.L. & School, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition. 639p.
14. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
15. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
16. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
17. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
18. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
19. Survey of the Environment, The Hindu (M)
20. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
21. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
22. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
Applied Physics (Specialization in Electronics)

Semester	3 rd			
Subject Code	BSNM-308C			
Subject Name	Physics Lab-III			
Contact Hours	L: 00	T: 00	P: 04	Credits: 02

Syllabus same as that of 'Physics Lab-III' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical).

At least 08 experiments from the following:

1. To study the laser beam characteristics like; wave length using diffraction grating aperture & divergence.
2. Study of diffraction using laser beam and thus to determine the grating element.
3. To study laser interference using Michelson's Interferometer.
4. To study wavelength of sodium light using Newton Rings.
5. To determine the numerical aperture of a given optic fibre and hence to find its acceptance angle.
6. To find the refractive index of a material/glass using spectrometer.
7. To find the refractive index of a liquid using spectrometer
8. To find the velocity of ultrasound in liquid.
9. To determine the specific rotation of sugar using Laurent's half-shade polarimeter.
10. To determine the coefficient of thermal conductivity of a bad conductor using Lee's disc apparatus.
11. To compare heat transfer between different material surface and the black body surface by radiation.
12. To find the emissivity of different material surface.

REFERENCE BOOKS:

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. Engineering Practical Physics, S.Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.
4. Practical Physics, G.L. Squires, 2015, 4th Edition, Cambridge University Press.
5. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Edn, 201, Kitab Mahal.
6. B Sc. Practical Physics, C. L. Arora, S. Chand & Co.
7. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Shaheed Bhagat Singh State University, Ferozepur
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Semester	3 rd
Subject Code	BSCE-104C
Subject Name	Problem Solving using C Lab
Contact Hours	L: 00 T: 00 P: 04 Credits: 02

Syllabus same as that of 'Problem Solving using C Lab' approved by Board of Studies of Department of Electronics & Communication Engg for B.Sc. (CAE)

Course Outcome: At the end of the course, the student will be able to:

1. Select the right statement for the program.
2. Experiment with different input values.
3. Test the output with boundary conditions.
4. Distinguish between various control statements and data types.
5. Implement programs for various problems.

Assignments: Develop all programs in C programming language.

1. Write a program to display your name. Write another program to print message with inputted name.
2. Write a program to add two numbers.
3. Write a program to find the square of a given number.
4. Write a program to calculate the average of three real numbers.
5. Write a program to find ascii value of a character
6. Write a program to find the size of int, float, double and char.
6. Write a program to compute quotient and remainder
7. Write a program to accept the values of two variables.
8. Write a program to find the simple interest, inputs are amount, period in years and rate of interest.
9. Basic salary of an employee is input through the keyboard. The da is 25% of the basic salary while the hra is 15% of the basic salary. Provident fund is deducted at the rate of 10% of the gross salary (bs+da+hra). Write a program to calculate the net salary.
10. Write a program to find area of a circle using pi as constant.
11. Write a program to find volume of a cube using side as input from user.
12. Write a program using various unformatted input functions.
13. Write a program to find area of rectangle and print the result using unformatted output functions.
14. Write a program to find the larger of two numbers.
15. Write a program to find greater of three numbers using nested if.
16. Write a program to find whether the given number is even or odd.
17. Write a program to generate multiplication table using for loop
18. Write a program to generate multiplication table using while loop
19. Write a program to make a simple calculator using switch...case
20. Write a program to find whether the given number is a prime number.
21. Write a program using function to find the largest of three numbers
22. Write a program using function to print first 20 numbers and its squares.
23. Write a program to find the factorial of a given number.
24. Write a program to print the sum of two matrices
25. Write a program to find the length of a string
26. Write a program to copy string using strcpy ()

27. Write a program to compare a string
28. Write a program to reverse a string
29. Write a program to reverse a string
30. Write a program to multiply two numbers using pointers.
31. Write a program to display address of variable using pointers
32. Write a program to show the memory occupied by structure and union
33. Write a program to create student i-card using a structure
34. Write a program to read data from a file from a file
35. Write a program to save employee details in a file using file handling

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester	3rd
Subject Code	BSAP-302C
Subject Name	Microprocessors-Lab
Contact Hours	L: 00 T: 00 P: 02 Credits: 01

Course Objectives:

The main aim of this course is to make the students familiar with microprocessor 8085 Programming and their Applications.

Course Outcomes:

After undergoing this course students will be able to

- I. Familiarize with the 8085 Microprocessor kits.
- II. Knowledge of 8085 instruction set and ability to utilize it in assembly language programming.
- III. Understand the programming and application of Microprocessor 8085.
- VI. Know how to Interface various devices to 8085.

LIST OF EXPERIMENTS

List of Experiments using 8085:

1. Study of 8085 and 8086 Microprocessor Kits.
2. Write a program to add two 8-bit number using 8085.
3. Write a program to add two 16-bit number using 8085.
4. Write a program to subtract two 8-bit number using 8085.
5. Write a program to subtract two 16-bit number using 8085.
6. Write a program to multiply two 8 bit numbers by repetitive addition method using 8085.
7. Write a program to sort series using bubble sort algorithm using 8085.
8. Write a program to copy 12 bytes of data from source to destination using 8085.
9. Write a program to find maximum and minimum from series using 8085.
10. Write a program to control speed of DC motor using 8085 microprocessors and 8255 PPI.

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Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester	3rd
Subject Code	BMPD-301C
Subject Name	Mentoring and Professional Development
Contact Hours	L: 00 T: 00 P: 02 Credits: Non-Credit

Syllabus same as that of ‘**Mentoring and Professional Development**’ B.Tech. ECE-2022

The objective of mentoring will be development of:

- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities. For achieving the above, suggestive list of activities to be conducted are:

Part – A

(Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B (Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B

Mentors/Faculty incharges shall maintain proper record of students for each activity conducted and the same shall be submitted to the department.

4th Semester

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester	4 th			
Subject Code	BSAP-401C			
Subject Name	Analog Circuits			
Contact Hours	L: 03	T: 00	P: 00	Credits: 03

Syllabus same as approved by Board of Studies of ECE for B.Tech. (ECE) 2022

Course Objective

This course deals design & analytical concepts of various Analog circuits like BJT/FET circuits, feedback amplifiers, oscillators, power amplifiers.

Course Outcomes

At the end of this course student will be able to:

1. Understand the biasing of transistors and analyze BJT/FET amplifiers
2. Analyze various rectifier and amplifier circuits
3. Analyze sinusoidal and non-sinusoidal oscillators
4. Understand various types of Power Amplifiers

Unit 1: Diode and Transistor Amplifier Circuits

Diode Circuits, Amplifiers types: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier; biasing schemes for BJT and FET amplifiers; bias stability; transistor configurations: CE/CS, CB/CG, CC/CD and their features; small-signal analysis; low-frequency transistor models; amplifier analysis: current gain, voltage gain, input resistance and output resistance; amplifier design procedure; low frequency analysis of multistage amplifiers. High frequency transistor models.

Unit 2: Feedback Amplifiers

Feedback topologies: Voltage series, current series, voltage shunt and current shunt feedback; effect of feedback on gain, bandwidth, input & output impedances; concept of stability, gain margin and phase margin.

Unit 3: Oscillators Introduction, Types of Oscillators, Barkhausen criterion, RC-phase shift, Wien bridge, Hartley, Colpitts, Clapp oscillators and Non-sinusoidal oscillators.

Unit 4: Power Amplifiers

Class A, B, AB and C power amplifiers, their efficiency and distortions; frequency response: single stage, multistage amplifiers and cascade amplifier.

Recommended Books

1. J Millman & A Grabel, *Microelectronics*, McGraw Hill
2. J Millman & C Halkias, *Integrated Electronics*, Tata McGraw Hill
3. A Ramakant, Gayakwad, *Op-Amps And Linear Integrated Circuits*, PHI
4. P Horowitz & W Hill, *The Art of Electronics*, Cambridge University Press
5. AS Sedra & KC Smith, *Microelectronic Circuits*, Saunder's College Publishing

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester	4th			
Subject Code	BSAP-402C			
Subject Name	Microcontrollers			
Contact Hours	L: 03	T: 00	P: 00	Credits: 03

Course Objectives:

The objective of the course is to develop an in-depth understanding of the operation of microcontrollers, machine language programming & interfacing techniques. Students will be able to interface the microcontroller with the I/O devices to develop simple applications on microprocessor and microcontroller-based systems.

Course Outcomes:

After undergoing this course students will be able to

- I. Understand the importance of micro-processors and micro-controllers, detailed study of architecture and pin configuration of 8051
- II. Interpret the detailed study of programming concepts of 8051 micro-controller, instruction set and various addressing modes of 8051.
- III. Analyze the concept of serial communication and interfacing the external devices with the 8051 Microcontroller
- IV. To gain technical know-how about Interfacing 8051 microcontroller to different external devices

Module 1: Introduction to 8051 Microcontroller

Comparison of microprocessor & microcontrollers, Overview of 4,8,16 & 32 bit microcontrollers, microcontroller 8051: architecture, pin configuration, flag-bits and PSW register, input-output ports, register banks and stack; Semiconductor memories: ROM, SRAM, DRAM, concept of cache memory; memory organization

Module 2: 8051 Microcontroller Assembly Language Programming

Assembly language programming; data types and directives; jump loop and call instructions; I/O port programming; addressing modes and accessing memory using various addressing modes; arithmetic instructions and programs; logic instructions and programs; single bit instructions and programming,

Module 3: Interrupts & Serial Communication in 8051 Microcontroller

8051 interrupts; timer/counter programming in the 8051, Universal Synchronous Asynchronous Receiver Transmitter (USART), 8051 connection to RS 232, 8051 serial communication programming

Module 4: Microcontroller 8051 Interfacing

Real World Interfacing of 8051 Microcontroller to LCD, Analog to Digital Converter, Digital to Analog converter, Stepper motor, sensors, keyboard and external memory.

Recommended Text and Reference Books

1. Ali Mazidi, J. G. Mazidi, The 8051 Microcontroller and embedded Systems, Pearson Education.
2. K. J. Ayala, The 8051 Microcontroller, Cengage Learning.
3. D. V. Hall, Microprocessors and Interfacing: Programming and hardware, Glencoe Publication.

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester	4th
Subject Code	BSAP-403C
Subject Name	Engineering Materials
Contact Hours	L: 03 T: 00 P: 00 Credits: 03

Course Objectives:

The objective of this course is to provide basic understanding of engineering materials and their mechanical, electrical and magnetic properties.

Course Outcomes:

After undergoing this course students will be able to

- I. Understand the importance of engineering materials, their classification and types of defects involved in engineering materials.
- II. Analyze the various kinds of mechanical properties such as Stiffness, Ductility, Brittleness, Resilience etc. of materials.
- III. Analyze the properties and applications of electrical and magnetic materials and factors affecting electrical resistance of materials.
- IV. Understand about selection of engineering materials for a particular application on the basis of their properties.

Unit I: Structure of solids

Classification of engineering materials, Structure - property relationship in engineering materials, Crystalline and non-Crystalline materials. Defects: Point, Line and Surface defects.

Unit II: Mechanical properties of materials

Elastic, Inelastic and Viscoelastic materials, Yielding and yield strength, Stiffness, Ductility, Brittleness, Resilience, Toughness, True stress – true strain relationship, Hardness, Shrinkage, Plastic deformation by twinning and slip, Movement of dislocation, Critical shear stress, Strengthening mechanism and creep

Unit III: Electrical and Magnetic Materials

Factors affecting electrical resistance of materials, Superconductivity, Properties and applications of conducting materials, Properties and applications of semi-conducting materials, Properties and applications of insulating materials; Magnetic materials, soft and hard magnetic materials and their applications; Smart materials: sensors and actuators, piezoelectric, magnetostrictive and electrostatic materials

Unit IV: Materials Selection

Overview of properties of engineering materials, Material selection in design based on properties covering timber, aluminium, glass, polymers and ceramics

Recommended text and Reference Books

1. W.D. Callister, Materials Science and Engineering; John Wiley & Sons
2. W.F. Smith, Principles of Materials Science and Engineering: An Introduction; Tata Mc-GrawHill
3. Raghavan, Introduction to Materials Science and Engineering; PHI
4. S. O. Kasap, Principles of Electronic Engineering Materials; Tata Mc-Graw Hill
5. L. H. Van Vlack, Elements of Material Science and Engineering; Thomas Press

Shaheed Bhagat Singh State University, Ferozpur
Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester	4 th
Subject Code	BSNM-403C
Subject Name	Vibration and Waves
Contact Hours	L: 03 T: 00 P: 00 Credits: 03

Syllabus same as that of 'Vibration and Waves' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical).

Unit I Simple and Damped Harmonic Motion: Simple harmonic motion, energy of a SHO, Compound pendulum, Torsional pendulum, Electrical Oscillations, Lattice Vibrations, Transverse Vibrations of a mass on a string, Anharmonic Oscillations. Damped simple harmonic motion, Decay of free Vibrations due to damping, types of damping, Determination of damping coefficients – Logarithmic decrement, relaxation time and Q-factor. Electromagnetic damping. (10 Lectures)

Unit II Forced Vibrations and Resonance: Forced mechanical and electrical oscillator, Transient and Steady State Oscillations, Displacement and velocity variation with driving force frequency, Variation of phase with frequency resonance, Power supplied to forced oscillator by the driving force. Q-factor and band width of a forced oscillator, Electrical and nuclear magnetic resonances. (8 Lectures)

Unit III Coupled Oscillations: Stiffness coupled oscillators, Normal coordinates and modes of vibrations. Inductance coupling of electrical oscillators, Normal frequencies, Forced vibrations and resonance for coupled oscillators, Masses on string-coupled oscillators. (8 Lectures)

Unit IV Waves in Physical Media: Types of waves, wave equation (transverse) and its solution characteristics impedance of a string, Impedance matching, Reflection and Transmission of waves at boundary, Energy of vibrating string, wave and group velocity. (10 Lectures)

Recommended Books:

1. Text Book of Vibrations and Waves: S.P. Puri (Macmillan India), 2004.
2. The Physics of Vibrations and Waves: H.J. Pain (Wiley and ELBS), 1976.

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester	4 th			
Subject Code	BSNM-40C			
Subject Name	Elements of Modern Physics			
Contact Hours	L: 03	T: 00	P: 00	Credits: 03

Syllabus same as that of 'Elements of Modern Physics' approved by Board of Studies of Department of Applied Sciences for B.Sc. (Non-Medical).

Unit I Dual Nature of Waves and Particles: Black body radiation, 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; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle. Lecture (10)

Unit II Quantum Mechanics: Two slit interference experiment with photons, atoms & 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 wavefunction, probabilities and normalization; Probability and probability current densities in one dimension. One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; Quantum dot as an example Lecture (10)

Unit III Atomic structure: The nuclear atom, Electron orbits, Atomic spectra, The Bohr Model, Energy level and spectra, Correspondence principle, Nuclear motion, Atomic excitation, Many electron atoms, Exclusion Principle, electron spin, spin orbit coupling, X-ray spectra. Zeeman effect, Stern-Gerlach experiment. Lecture (10)

Unit IV Special Theory of Relativity: Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity and order of events. Lorentz contraction. Time dilation. Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum. Energy-Momentum Four Vector. Lecture (10)

Recommended Books:

1. Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
2. Modern Physics, J.R. Taylor, C.D. Zafiratos, M.A. Dubson, 2009, PHI Learning
3. Six Ideas that Shaped Physics: Particle Behave like Waves, Thomas A. Moore, 2003, McGraw Hill
4. Quantum Physics, Berkeley Physics, Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co.
5. Modern Physics, R.A. Serway, C.J. Moses, and C.A. Moyer, 2005, Cengage Learning

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester	4th
Subject Code	BSCE-203C
Subject Name	Object Oriented Programming using C++
Contact Hours	L: 03 T: 01 P: 00 Credits: 04

Course Outcome: At the end of the course the student will be able to:

1. Outline the role of programming for solving real world problems.
2. Explain Object oriented approach for finding Solutions to various problems with the help of C++ language.
3. Implement computer based solutions to various real-world problems using C++
4. Select the right Object Oriented Concept for optimal solution.
5. Review different solutions for a common problem.

Unit-I Principles of object oriented programming

Introduction to OOP and its basic features, Basic components of a C++, Program and program structure, Compiling and Executing C++ Program. Difference between Procedure Oriented Language(C) and Object Oriented Language

Unit-II Classes & Objects and Concept of Constructors

Defining classes, Defining member functions, Declaration of objects to class, Access to member variables from objects, Different forms of member functions, Access specifiers (Private, public, protected), Array of objects. Introduction to constructors, Parameterized constructors, Copy Constructor, Multiple constructors in class, Dynamic initialization of objects, Destructors

Unit-III Inheritance and Operator overloading

Introduction to Inheritance, Types of inheritance: - Single inheritance, Multiple inheritance, Multilevel inheritance, Hierarchical inheritance, Hybrid inheritance, Defining operator overloading, Overloading of Unary and Binary operators, Rules for overloading operators

Unit-IV Polymorphism and File Handling

Early Binding, Late Binding, Virtual Functions, pure virtual functions, Abstract Classes. Opening and Closing File, Reading and Writing a file

Suggested Readings/ Books:

1. Object Oriented Programming with C++, E. Balagurusami, Fourth Edition, Tata Mc-Graw Hill.
2. Object Oriented Programming in Turbo C++, Robert Lafore, Fourth Edition Galgotia Publications.
3. The C++ Programming Language, Bjarna Stroustrup, Third Edition, Addison-Wesley Publishing Company.
4. Object Oriented Programming Using C++, Salaria, R. S, Fourth Edition, Khanna Book Publishing.

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester	4th
Subject Code	BSAP-404C
Subject Name	Analog Circuits Lab
Contact Hours	L: 00 T: 00 P: 02 Credits: 01

Syllabus same as that of 'Analog Circuits Lab' approved by Board of Studies of Department of ECE for B.Tech. ECE -2022

Course Objective

This laboratory course deals design & analytical concepts of various analog circuits like BJT/FET circuits, feedback amplifiers, oscillators, power amplifiers.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. study and verify the characteristics of diodes/BJTs in circuits with proper understanding to their working.
2. Understand frequency response & working of various types of Oscillators.
3. Understand characteristics & working of Power amplifiers.
4. Think and design working circuits based on diodes, BJTs and MOSFETs.

Part-A: Experiments

List of Experiments:

- 1.To Study the Output waveforms of diode clipper and Diode Clamper circuits.
- 2.To study BJT amplifier in CE configuration.
3. To study V-I Characteristics of FET/MOSFET.
- 3.To study Emitter follower circuit.
4. To calculate the frequency and observe the output waveform of RC phase shift oscillator.
- 5.To measure the frequency and observe the output waveform of Wein bridge oscillator.
6. To measure the frequency and observe the output waveform of Hartley oscillator.
7. To measure the frequency and observe the output waveform of Colpitt's oscillator.
8. To study Output waveform of Class-A Power Amplifier.
9. To study Output waveform of Class-B Power Amplifier.

Part-B: Lab Projects

Every individual student is required design one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. BJT audio amplifier/power amplifier
2. Any project based on IoT/Arduino platform

Shaheed Bhagat Singh State University, Ferozepur
Bachelor of Science (Hons)
Applied Physics (specialization in Electronics)

Semester	4th
Subject Code	BSAP-405C
Subject Name	Microcontrollers Laboratory
Contact Hours	L: 00 T: 00 P: 02 Credits: 01

Course Objectives:

The main aim of this course is to make the students familiar with microcontroller Programming and their applications.

Course Outcomes:

After undergoing this course students will be able to

- I. Familiarize with the 8051/8031 Micro controller kits.
- II. Knowledge of 8051 instruction set and ability to utilize it in assembly language programming.
- III. Understand the programming and application of Microcontrollers.
- IV. Know how to Interface various devices to 8051.

List of Experiments using 8051:

1. Study of 8051 Micro controller kits.
2. Write a program to add two numbers lying at two memory locations and display the result.
3. Write a program for multiplication of two numbers lying at memory location and display the result.
4. Write a Program to arrange 10 numbers stored in memory location in ascending and descending order.
5. Write a program to convert packed BCD to two ASCII numbers.
6. Write a program to show the use of INT0 and INT1.
7. Write a program of Flashing LED connected to port 1 of the Micro Controller
8. Write a program to generate a Ramp waveform using DAC with micro controller.
9. Write a program to interface the ADC.
10. Write a program to control a stepper motor in direction, speed and numbers of steps.

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Applied Physics (specialization in Electronics)

Semester	4th			
Subject Code	BSNM-408C			
Subject Name	Physics Lab-IV			
Contact Hours	L: 00	T: 00	P: 04	Credits: 02

At least 08 experiments from the following:

1. To determine the value of horizontal component of Earth's magnetic field B_h .
2. To determine unknown capacitance by flashing and quenching method.
3. To study the magnetic field of a circular coil carrying current.
4. To find out polarizability of a dielectric substance.
5. To determine the frequency of an electrically maintained tuning fork by
 - i) Transverse mode of vibration
 - ii) Longitudinal mode of vibration
6. To find out the frequency of AC mains using electric-vibrator/sonometer.
7. Experiment to study Doppler effect
8. To study V-I characteristic of a Ge-Si junction.
9. Analyze the suitability of a given Zener diode as a power regulator.
10. To study the band gap of a Ge semiconductor.

REFERENCE BOOKS:

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. Engineering Practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
4. Practical Physics, G.L. Squires, 2015, 4th Edition, Cambridge University Press.
5. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Edn, 201, Kitab Mahal.
6. B Sc. Practical Physics, C. L. Arora, S. Chand & Co.
7. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Shaheed Bhagat Singh State University, Ferozpur
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Applied Physics (specialization in Electronics)

Semester	4th
Subject Code	BMPD-401C
Subject Name	Mentoring and Professional Development
Contact Hours	L: 00 T: 00 P: 02 Credits: Non-Credit

Syllabus same as that of 'Mentoring and Professional Development' B.Tech. ECE-2022

The objective of mentoring will be development of:

- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities. For achieving the above, suggestive list of activities to be conducted are:

Part – A

(Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B

(Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B

Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted and the same shall be submitted to the department.