



Course Structure and Syllabus for the Second Semester

B. Sc. (Applied Physics) Program

SECOND SEMESTER (January-June)

Sl No.	Sub Code	Subject	Hrs / Week			Credits
			L	T	P	C
Theory						
1	MA161201	Mathematics II	3	2	0	4
2	BAP161202	Computer Science II	2	2	0	3
3	BAP161203	Basic Concepts of Mechanics	3	0	0	3
4	BAP161204	Basic Electronics	2	2	0	3
5	BAP161205	Basic Thermal Physics	2	2	0	3
6	BAP161206	Physical and Geometrical Optics	2	2	0	3
Practical						
7	BAP161214	Physics Lab III (Electronics)	0	0	4	2
8	BAP161217	Physics Lab IV (Thermal physics and Optics)	0	0	4	2
9	BAP161212	Computer Science Lab II	0	0	4	2
Total			14	10	12	25
Total Contact Hours = 36						
Total Credits = 25						

Subject code: MA161201

Subject: Mathematics-II

L-T-P: 3-2-0

Credit 4

Modules	Topics	Course Content	Hours
1	Matrices	Some special type of matrices like symmetric and skew symmetric-Hermitian and skew Hermitian Triangular and Echelon form, Inverse of the matrix, Theorems of inverse, Reduction of matrices to triangular form and normal form, Inverse by Partitioning, Rank of a matrix, Evaluation of rank, Theorem of rank.	12
2	Discrete and Continuous Probability	Discrete probability. Randomness, Finite probability space, Probability measure, Events, Conditional probability, Independence, Baye's theorem, Discrete random variables continuous probability, Continuous random variables, Joint distribution, Exponential and normal distribution, The central limit theorem and the implications.	12
3	Linear Programming	Formulation and graphical solutions, Convex sets and properties, Simplex methods, Duality assignment, Transportation problems, Duality, Big- M method, Integer programming.	12
4	De Moiver's theorem and applications	Find n^{th} roots of a complex number- Expansion of $\cos^n \theta$, $\sin^n \theta$, in power of $\cos \theta$, $\sin \theta$ - Expansion of $\cos^n \theta$, $\sin^n \theta$ in multiple angles of θ - Series for $\cos^n \theta$, $\sin^n \theta$ in power of θ - Hyperbolic functions.	12
	-	Total	48

Text Books/Reference Books:

1. Linear Programming, R.K. Gupta.
2. Matrices, A.R. Vaistha.
3. Basis statistics, A.L. Nagar and R.K. Das
4. Probability, Random variables and Random processes, D.Tata, M.C.Graw-Hill
5. B.Sc Mathematics, Krishna Prakashan.

Subject Code: BAP161202
Subject: Computer Science - II

L-T-P: 2-2-0

Credit: 3

Modules	Topics	Course Content	Hours
1	Introduction	Introduction to programming, Concept of algorithms, Flow Charts, Data Flow diagrams etc, variables, data types and sizes, constants, declarations, operators in c, type conversion, conditional expressions, precedence and order of evaluation, C assignment statements, extension of assignment of the operations. C primitive input output functions, C Statements.	10
2	Programming using C++	History, Structure of a C++ program, tokens, keywords, identifiers, data types, expressions, control structures, declaration and initialization of variables, operators, expressions and implicit conversions. Functions in C++.	8
3	Concept Of OOP	Introduction to Object Oriented Programming, Need of OOP, Development, Concepts, and Benefits of OOP, features.	8
4	Introduction to HTML	Introduction, HTML browsers, history of HTML, HTML command tags, tags with automatic line breaks, URL, domain names, links, web page creation, defining web page, putting headers, adding paragraph, text formatting, using preformatted text, blinking text, lists in HTML, creating lists, creating a link, hyperlink, inserting graphics, scaling an image, image alignment, creating banner .	10
Total			36

Text Books/Reference Books :

1. Computer Programming in C by Godfried.
2. Object Oriented System Development by Ali Bahrami, McGraw Hill.
3. Object Oriented Programming using C++by E. Balaguruswamy,
4. Web Technology & Design by Xavier C., New Age Publication.

Subject Code: BAP161203**Subject: Basic Concepts of Mechanics**

L-T-P: 3-0-0

Credit 3

Module	Topics	Course Content	Hours
1	Frames of reference	Laws of Mechanics, Inertial frames of reference, Galilean transformation equations, Hypothesis of Galilean invariance, Conservation of Momentum, Non inertial frames and fictitious forces, Rotating frames of reference, Centrifugal force and Coriolis force, Foucault's pendulum	5
2	Conservation of Energy	Conservation laws, Conservative forces, Conservation of energy for a particle: Energy function, Potential energy curve, Non conservative forces	3
3	Linear and Angular Momentum	Conservation of linear momentum, Center of mass, Centre of mass frame of reference, Collision of two particles, Deflection of a moving particle by a particle at rest, Rockets, Angular momentum and torque, Motion under central force, Areal velocity, Conservation of angular momentum with examples	7
4	Potentials and Fields	Central force, Inverse square law force, Potential energy of a system of masses, Gravitational field and potential, Escape velocity, Kepler's laws, Newton's deductions from Kepler's laws	7
5	Lagrangian formulation	Constraints, Generalized co-ordinates, Principle of virtual work, D'Alembert's principle, Lagrange's equations.	6
6	Special Theory of Relativity	Electromagnetism and Galilean transformation, Michelson Morley experiment, Ether hypothesis, Postulates of Special Theory of Relativity, Lorentz transformation equations, Velocity transformation, Length contraction, Time dilation, Simultaneity, Mass in relativity, Mass and energy, Space time diagram, Geometrical interpretation of Lorentz transformation, Principle of covariance, Four-vectors in Mechanics	8
		Total	36

Text Books/ Reference Books

1. Mechanics by J C Upadhyaya 2003 edition
2. Classical Mechanics by G.Aruldas 2008
3. Classical Mechanics by Takwala and Puranic
4. Classical Mechanics by Goldstein
5. Elements of Mechanics – K Rama Reddy, S Raghavan & D V N Sarma- Universities Press

Subject Code: BAP161204
Subject: Basic Electronics

L-T-P: 2-2-0

Credit 3

Module	Topics	Course Content	Hours
1.	Junctions Diodes	p-n junctions, biased junction , V-A characteristics, Zener diode, tunnel diode, LED and LCD, Solar cell. Diode as circuit element, load line concept. Rectifiers: Half wave and full wave rectifiers, efficiency and ripple factor, filter circuits, Voltage regulation (Zener and IC).	8
2.	Transistors	Characteristics of a transistor in CB, CE and CC mode, graphical analysis of the CE configuration, Thevenin's Theorem, Norton Theorem, Constant Voltage and current generator, idea of equivalent circuits, low frequency equivalent circuits, h-parameters, bias stability, thermal runaway BJT, FET's and MOSFETS: Structure and working, α and β of BJT, characteristics, common emitter amplifier, Field effect transistor, JFET volt ampere curves, biasing JFET, ac operation of JFET, source follower, depletion and enhancement mode, MOSFET, biasing a MOSFET, FET as a variable voltage resister, digital MOSFET circuits, FET amplifier.	10
3.	Amplifiers	Small signal amplifiers: General principles of operation, classification, distortion, RC coupled amplifier, gain frequency response, input and output impedance, Multistage amplifiers, transformer coupled amplifiers, Equivalent circuits at low, medium and high frequencies; emitter follower, low frequency common-source and common-drain amplifier, Noise in electronic circuits. Feed back in amplifiers; Negative feed back and stability	9
4.	Oscillators	Brauhhausen Criteria for oscillations; Tuned Collector, Hartley and Colpitts oscillators, phase shift oscillators. Operational Amplifier, inverting non inverting amplifier, OP-Amp as adder, subtractor, comparator, integrator and differentiator Modulation and detection: AM and FM (Mathematical treatment included), poser in AM and generation of AM. Detector, radio transmitter, radio wave propagation. Ionosphere. Radio receivers. Radio communication, Optical Fiber Communication.	9
		Total	36

Text Books/ Reference Books

1. Principles of electronics by V K Mehta, S Chand & Co., 5th edition 2001
2. Elements of electronics by Bagde and S P Singh
3. Functional electronics by Ramanan
4. Monochrome and Colour TV by Gulati
5. Basic and applied electronics by M Arul Thalpathi, Comptek Publishers, 2005
6. Basic Electronics by B. Ghosh

Subject Code: BAP161205**Subject: Basic Thermal Physics**

L-T-P: 2-2-0

Credit 3

Module	Topics	Course Content	Hours
1	Transmission of heat	Conduction in solids: Thermal conduction - thermal conductivity of a good conductor - theory and determination - Forbe's method - thermal conductivity of a poor conductor - theory and determination - Lee's disc method - relation between thermal and electrical conductivities - Wiedmann-Franz law - practical applications of conduction of heat. Black body radiation: Stefan-Boltzmann law - determination of Stefan's constant - laboratory method - distribution of energy in the spectrum of a black body - results - Planck's quantum theory of radiation - solar constant - temperature of the Sun - solar spectrum.	10
2.	Low temperature physics	Joule - Kelvin effect - liquefaction of hydrogen - liquefaction of helium-Kammerling-Onne's method - Helium I and II - Lambda point - production of low temperatures - adiabatic demagnetization - practical applications of low temperature - refrigerators and air-conditioning machines - super fluidity - application of super fluidity - elementary ideas and applications - Superconductivity - Type I and II superconductors - Meissner effect - applications of superconductors - superconducting magnets.	10
3.	Thermodynamics I	Zeroth law, I and II law of thermodynamics - Carnot's theorem - thermodynamic scale of temperature - perfect gas scale of temperature - internal combustion engines - Otto engine and Diesel engine - working and efficiency.	6
4.	Thermodynamics II	First latent-heat equation (Clausius-Clapeyron equation) - effect of pressure on melting point and boiling point - second latent-heat equation - III law of thermodynamics - concepts of entropy - temperature entropy diagram - entropy of perfect gas - Maxwell's thermo dynamical relations - derivation - applications - i) Clausius - Clapeyron equation, ii) specific heat relation	10
		Total	36

Text Books/ Reference Books

1. A treatise on Heat - Saha and Srivastava
2. Advanced Textbook on Heat – P.K.Chakravarty
3. Heat and Thermodynamics- Zemansky and Dittman
4. Thermodynamics, Kinetic Theory and Statistical Thermodynamics – Sears and Salinger.
5. Thermal physics by Zeemanshy

Subject Code: BAP161206**Subject: Physical and Geometrical Optics**

L-T-P : 2-2-0

Credit 3

Module	Topics	Course Content	Hours
1	Geometrical Optics	Fermat's Principle, verification of laws of reflection and refraction	2
2	Matrix methods	Refraction and translation, translation matrix, refraction matrix, system matrix, position of the imageplane, magnification, system matrix for thick lens, system matrix for thin lens	4
3	Interference	Division of wave front: Superposition of two sinusoidal waves, Interference, coherence ,conditions for interference, the inference patterns, intensity distribution .Fresnel's two mirror arrangement, Fresnal Biprism, Determination of λ and $d\lambda$ of Sodium Light Division of Amplitude: Interference by a plane film illuminated by a plane wave, cosine law, non-reflecting films (the subsections excluded), interference by a film with two nonparallel reflecting surfaces, colours of thin films, Newton's rings, The Michelson interferometer, white light fringes	12
4	Diffraction	Fraunhofer Diffraction: Preliminaries, single slit diffraction pattern, diffraction by circular aperture, limit of resolution, two slit Fraunhofer diffraction pattern, N slit diffraction pattern, plane diffraction grating, resolving power. Fresnel Diffraction: Prelimanaries, Fresnal half period zones, explanation of rectilinear propagation of light, zone plate, diffraction at straight edge	10
5	Polarization	Hygiene's explanation of double refraction, positive and negative uniaxial crystals, quarter and half wave plates, types of polarized light, production and analysis of plane, circularly and elliptically polarized light, optical activity, Polarimeter	8
		Total	36

Text Books/ Reference Books

1. Light – K.G. Mazumdar
2. A Text book of Light- B Ghosh and K G Mazumdar.
3. Geometrical and Physical optics – P.K. Chakraborty
4. Optics – A. Ghatak
5. Optics – E Hecht

Subject Code: BAP161214

Subject: Physics Lab III (Electronics)

L-T-P: 0-0-4

Credit 2

Unit	Experiments	Hours
1.	To draw the I-V characteristic of a P-N junction diode. (Plot both the characteristic curves on the same graph paper.)	2
2.	To draw the characteristic of a Zener diode and hence determine their DC and AC resistances. Also determine the breakdown voltage of the Zener diode (Using Breadboard).	3
3.	Sensitivity of a Cathode-Ray Oscilloscope.	2
4.	Determination of impedance of an A.C. circuit and its verification	2
5.	To draw the frequency response curve of RC coupled common emitter amplifier and hence determine 3dB points and band width. (Using Breadboard).	3
6.	Charging and discharging in R.C. and R.C.L. circuits.	2
7.	To study the input and output characteristics of a transistor in CB and CE configurations and determine the alpha and beta of the transistor. (Using Breadboard).	3
8.	To draw the I-V characteristics of a bridge rectifier (4-diode) (i) without using any filter and (ii) using a capacitive filter. (Percentage voltage regulation to be calculated for each case at a specified load current.)	3
9.	LED characteristics.	2
10.	To study the ripple factor of a half-wave and full-wave rectifier using semiconductor diode and L and Π section filter.	2
	Total	24

Text Books/ Reference Books

1. Basic Electronics by B.Ghosh.
2. Principles of basic electronics by B.K.MEHTA
3. Electronics Fundamental & Application by D.Chattopadhyay and P.C.Rakshit.

Subject Code: BAP161217

Subject: Physics Lab IV (Thermal physics and Optics)

L-T-P: 0-0-4 Credit 2

Unit	Experiments	Hours
1	To determine the value of J, the mechanical equivalent of heat by Joule's calorimeter	3
2	To study the variation of resistance of a thermostat with temperature and then to measure an unknown temperature of a liquid.	3
3	To determine the boiling point of the given liquid with the help of a Platinum Resistance thermometer	3
4	To adjust and focus the given spectrometer using Schuster's method and then Determine the refractive index of the material of the prism and compare with the value from I-D curve.	3
5	To study the polarization of light by reflection and to verify the Brewster's and Malu's laws.	3
6	Study of interference of light (bi prism).	3
7	Determination of wave length using plane diffraction grating using Hg - source, also dispersive power.	3
8	Resolving power of a telescope/Resolving power of a grating	3
	Total	24

Text books/Reference Books :

1. Practical Physics, by K.G. Mazumdar and B.Ghosh.
2. Practical Physics by Dr. Samir Kumar Ghosh.
3. Thermal physics by Zeemanshy

Subject Code: BAP161212

Subject: Computer Science Lab II

L-T-P : 0-0-4

Credit 2

Unit	Experiments	Hours
1.	C++ program to find sum of individual digits of a positive integer	2
2	C++ program to generate all the prime numbers 1 and n , n is value supplied by the user	2
3	C++ program to determine if the given string is palindrome or not	2
4	C++ program to find implement the concept of function overloading	2
5	C++ program to implement the concept of operator overloading	2
6	C++ program to find the area of rectangle using class	2
7	C++ program to add and multiply two complex numbers using class	2
8	C++ program to add and multiply two matrices	2
9	Implement different string function	2
10	Implement concept of polymorphism	2
11	Implement friend function	2
12	Implement stacks and queues	2
	Total	24

Text books/Reference Books :

1. Object Oriented Programming with C++ by E. Balaguruswamy.
2. Let us C++, by Yashavant kanetkar
3. Object Oriented Programming and C++ by Rajaraman. Publisher : New Age International.
