Structure of Course & Syllabi

of

B. Tech. (Information Technology)

I and II Semester

(Effective from 2022-ODD Semester)

(As per National Education Policy-2020)

Department of Information Technology

School of Engineering and Technology,
Hemvati Nandan Bahuguna Garhwal University,
Srinagar Garhwal, Uttarakhand- 246174

Semester- wise List of Subjects

Semester I

S. No.	Category	Course Code	Course Code and Title	L	T	P	Contact Hrs./Week	Credits
1	Basic Science/Multidisciplinary	SET/SH/BT/C101	Mathematics I	3	1	-	4	4
2		SET/SH/BT/C103	Chemistry	3	1	-	4	4
3	Core Basic Engineering Subjects	SET/ME/BT/C104	Engineering Mechanics	3	1	-	4	4
4		SET/ME/BT/C102	Basic Mechanical Engineering	3	1	-	4	4
5		SET/CS/BT/C105	C Programming	3	1		4	4
6	Core/Basic Engineering Subjects Labs	SET/SH/BT/C108	Chemistry Lab	-		1	2	1
7		SET/CS/BT/C109	C Programming Lab			1	2	1
8	Extracurricular Courses/CC	AECC106	Connecting Student with Environment*	2	-	-	2	2
9	Skill Course	SET/CS/SC/C110	Information Technology Lab-I (Skill Enhancement Course)	-	-	1	4	2
Total				17	5	3	30	26

*University will prepare a course with focus on connecting student with environment to make student more environments sensitive.

Semester II

S. No.	Category	Course Code	Course Code and Title	L	T	P	Contact Hrs./Week	Credits
1	Basic Science/Multidisciplinary	SET/SH/BT/C201	Mathematics II	3	1	-	4	4
2		SET/SH/BT/C202	Physics	3	1	-	4	4
3	Core Basic Engineering Subjects	SET/EE/BT/C203	Basic Electrical Engineering	3	1	-	4	4
4		SET/EC/BT/C204	Basic Electronics	3	1	-	4	4
5		SET/IT/BT/C205	Fundamental of Information Technology	3	1		4	4
6	Core/Basic Subjects Based Labs	SET/SH/BT/C207	Physics Lab	-		1	2	1
7		SET/ME/BT/C208	Engineering Graphics and Workshop Practice			1	2	1
8	Life Skills and personality development	AECC206	Life Skills and personality development#	2	-	-	2	2
9	Skill Course	SET/CS/SC/C210	Information Technology Lab-II	-	-	1	4	2
Total				17	5	3	30	26

#University will prepare the course on Life skills and personality development, which will focus on the subjects such as stress management through Yoga, teamwork, cooperation, work ethics and personality development issues.

Detailed Syllabus

I Semester

SET/SH/BT/C101 MATHEMATICS- I		
Course Objective	To provide essential knowledge of basic tools of Differential Calculus, Vector Calculus and Matrix Algebra for engineering students.	
Course Outcome	Implementation of calculus in designing the different structural and mechanical components while matrix algebra is applied in the study of electrical circuits, quantum mechanics and optics.	
Module Name	**Content**	**No. of Hrs.**
Differential Calculus	Limit, continuity and differentiability of single and two variables, mean value theorems, indeterminate forms; partial derivatives, total derivative, Euler's formula, Taylor series (in one and two variables), maxima and minima, Extrema of function of several variables, Lagrange's method.	**15**
Vector Calculus	Interpretation of vectors and scalars, directional derivatives, line, surface and volume integrals, gradient, divergence and curl of a vector and their physical interpretation, Gauss's divergence, Green's and Stoke's theorem.	**12**
Matrices	Vector space, basis, matrices, determinants, Elementary row and column transformation, linear dependence and independence, rank of matrix, consistency of system of linear equation and solution of linear system of equations. Characteristic equation, Cayley-Hamilton theorem, eigen values and eigen vectors, diagonalization, complex matrices.	**15**
	Total No. of Hrs.	**42**
Textbooks	1. R. K. Jain and S. R. K. Iyengar "Advanced Engineering Mathematics", Narosa Publications, 2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 3. H K Das, "Advanced Engineering Mathematics", S Chand, 4. Erwin Kreyszig, "Advanced Engineering Mathematics".	

SET/SH/BT/C103 CHEMISTRY		
Course Objective	1. Apply the electrochemical principles in batteries, understand the fundamentals of corrosion. 2. Analysis of water for its various parameters and its significance in industrial and domestic Applications. 3. Analyze microscopic chemistry in terms of atomic, molecular orbitals and Intermolecular forces 4. Analysis of major chemical reactions that are used in the synthesis of molecules. 5. Understand the chemistry of various fuels and their combustion.	
Course Outcome	1. Describe and understand the operation of electrochemical systems for the production of electric energy, i.e. batteries. 2. Explain the mode by which potable water is produced through the processes of screening, micro Straining, aeration, coagulation and flocculation, sedimentation, flotation, filtration and disinfection. 3. Recognize that molecular orbital theory is a method used by chemists to determine the energy of the electron in a molecule as well as its geometry. 4. Demonstrate an ability to design, implement, and evaluate the results of experimentation using standard scientific methodologies such as hypothesis formulation and testing. 5. Understand and analyze the combustion mechanisms of various fuels	
Module Name	**Content**	**No. of Hrs.**

Advanced Theory of Chemical Bonding	Valence bond and molecular orbital theory. Structure of NH3, H2O, SO3, PCl5, XeO2 molecules. Types of linkages, Hybridization, Hydrogen bonding, Metallic bonding.	4
Equilibrium on Reactivity	Bronsted and Lewis Acids, pH, pka, pkb scale, buffer solution.	4
Polymers	Structures of the following polymers, viz, Natural and synthetic rubbers, Polyamide and Polyester fibres, polymethylmethacrylate, poly acrylonitrile and polystyrene. A brief account of conducting polymers (polypyrrole& polytiphene) & their applications.	3
Complex Compounds	Introduction, Valence bond and crystal field theory.	4
Chemical Kinetics & Catalysis	Order of reactions, Parallel and reversible reactions. Catalysis- homogeneous and heterogeneous catalysis. Characteristics of catalytic reactions, catalytic promoters and poisons, auto catalysis and negative catalysis. Activation energy of catalysis, intermediate compound formation theory and adsorption theory.	3
Atmospheric Chemistry& Air Pollution	Environment and ecology, environmental segments, structure and composition of atmosphere, radiation balance of earth and Green House Effect, formation and depletion of Ozone layer, chemical and photochemical reactions of various species in atmosphere, air pollution- sources, reactions and sinks for pollutants, acid rains and smog formation. Pollution control methods.	5
Corrosion & Lubricants	Introduction, causes of corrosion, theories of corrosion- direct chemical attack, electrochemical theory of corrosion, factors influencing corrosion, corrosion inhibitors, passivity, types of corrosions, protection from corrosion and protective coatings. Theory, classification and mechanism of lubrication.	5
Water and Waste Water Chemistry	Introduction, hardness of water, characteristics imparted by impurities, analysis of contaminants, treatment of water by Zeolite, L-S process, boiler feed water, waste water treatment.	6
Fuels & Combustion	Classification of fuels, non-conventional energy, biogas, biomass and solar energy, calorific value – gross and net, characteristics of good fuel, determination of calorific value, solid fuels, analysis of coal, liquid fuels.	5
Stereochemistry of organic-compounds	Mechanism of chemical reaction, Beckman, Hoffman, Reimer Tiemann, Cunnizzaro, Diels- Alder and Skraup synthesis.	3
	Total No. of Hours	**42**
Textbooks	1. Jain, Jain, "Engineering Chemistry" 2. Sharma, Kumar, "Engineering Chemistry"	
References	1. R. T. Morrison and R N Boyd, "Organic Chemistry", 6th Edition, Prentice Hall, New Delhi, 2. J. D. Lee, "Concise Inorganic Chemistry", Chapman & Hall 3. W. L. Jolly, "Modern Inorganic Chemistry", McGraw-Hill 4. P.W. Atkins, "Physical Chemistry", 6th Edition, Oxford University Press 5. Barrow, "Physical Chemistry" 6. Manahan, "Environmental Chemistry" 7. D. L. Pavia, GM. Lampman, GS. Kriz and J.R Vyvyan, I, "Spectroscopy", Cengage Learning India Pvt. Ltd, New Delhi, 2007 8. R.M. Silverstein, F.X. Webster and D.J. Kiemle, "Spectrometric Identification of Organic Compounds", 7th edition, John-Wiley and Sons, New York, 2005 9. William Kemp, "Organic Spectroscopy", 3rd edition, Palgrave, New York, 2005 10. C.N. Banwell and E. M. McCash, "Fundamentals of Molecular Spectroscopy", McGraw- Hill, International, UK, 1995 11. F. Carey, "Organic Chemistry", 5th Edition, McGraw Hill Publishers, Boston, 2003	

SET/ME/BT/C104	ENGINEERING MECHANICS	
Course Objective	1. To understand distributed force systems, centroid/ center of gravity and method of finding centroids of composite figures and bodies. 2. To understand the moment of inertia and method of finding moment of inertia of areas and bodies. 3. To understand types of frames and analyze for the forces in the members of the truss by method of joints and method of sections. 4. To understand dynamics of a particle. 5. To interpret the simple given dynamic problems and solve them for positions, velocities and accelerations, etc., 6. To understand the kinetics of the rigid bodies and solve simple problems using work-energy method. • To understand virtual work method and solve simple problems.	
Course Outcome	1. Identify the significance of centroid/ center of gravity and find centroids of composite figures and bodies. 2. Understand the moment of inertia and method of finding moment of inertia of areas and bodies. 3. Identify the type of frame and analyze for the forces in the members of the truss (frame) by method of joints and method of sections. 4. Understand dynamics of a particle. 5. Interpret the simple given dynamic problems and solve them for positions, velocities and accelerations, etc., 6. Understand the kinetics of the rigid bodies and solve simple problems using work-energy method. • Understand virtual work method and solve simple problems.	
Module Name	**Content**	**No. of Hrs.**
Force System	Introduction: Force system, dimensions and units in mechanics, laws of mechanics, vector algebra, addition and subtraction of forces, cross and dot products of vectors, moment of a force about a point and axis, couple and couple moment, transfer of a force to a parallel position, resultant of a force system using vector method, Problems involving vector application Equilibrium: Static and dynamic equilibrium, static in determinacy, general equations of equilibrium, Varingnon's theorem, Lami's theorem, equilibrium of bodies under a force system, Problems.	8
Trusses And Frames	Truss and Frames: Truss, classification of truss, assumptions in truss analysis, perfect truss, analysis of perfect plane truss using method of joints and method of sections, Problems.	8
Centre Of Gravity And Moment Of Inertia	Centroid, Centre of mass and Centre of gravity, Determination of centroid, centre of mass and centre of gravity by integration method of regular and composite figures and solid objects, Problems, Moment of Inertia: Area moment of inertia, mass moment of inertia, parallel axis and perpendicular axis theorems, radius of gyration, polar moment of inertia, product of inertia, principle axis, problem based on composite figures and solid objects.	10
Friction and Virtual Work	Friction-characteristics of dry friction, problems involving friction of ladder, wedges and connected bodies. Definition of virtual work, principle of virtual work for a system of connected bodies	7
Kinematics And Dynamics	Kinematics: Concept of rigid body, velocity and acceleration, relative velocity, translation and rotation of rigid bodies, equations of motion for translation and rotation, problems. Particle Dynamics: Energy methods and momentum methods, Newton's laws, work energy equation for a system of particles, linear and angular momentum equations, projectile motion, problem.	12
	Total No. of Hours	**45**
Textbooks	1. R S Khurmi, "Engineering Mechanics". 2. P K Nag "Engineering Thermodynamics".	
References	1. Van Wylen G.J. &Sonnlog R.E.: Fundamentals of classical thermodynamics, John Wiley &Sons,Inc. NY. 2. Wark Kenneth: Thermodynamics (2nd edition), Mc Graw Hill book Co. NY. 3. Holman, J.P.: Thermodynamics, MC Graw Hill book Co. NY. 4. Yadav R.: Thermodynamics and Heat Engines, Vol I & II (Sl Edition) Central Publishing House Allahabad. 5. Yadav R.: Steam & Gas Turbines. 6. Kshitish Chandra Pal: Heat Power, Orient Longman Limited, 17, Chittranjan Avenue, Calcutta.	

	7. S. Rao, B.B. Parulekar, 'Energy Technology', Khanna Pub., New Delhi. 8. G. H. Ryder: "Strength of Materials". 9. F. L. Singer: "Strength of Materials". 10. Timoshenko: "Strength of Materials". 11. Beer, Johnson, Statics.

SET/ME/BT/C102 BASIC MECHANICAL ENGINEERING		
Course Objective	1. To use mechanical principles to solve real-world engineering issues. 2. To identify appropriate structural system for studying a given problem and isolate it from its environment. 3. Develop a simple mathematical model for an engineering problem and perform a static analysis. 4. To carry out kinematics and Kinetics analysis for practices and system of particles.	
Course Outcome	1. Students will be able to apply and demonstrate the concept of mechanics to practical engineering problems. 2. Students will be able to determine the properties of planes and solids. 3. Students will be able to apply the basic concept of dynamics to practical problems.	
Module Name	**Content**	**No. of Hrs.**
Fundamental concept of thermodynamics	Definition of thermodynamics, System, Surrounding and Universe, Phase, Concept of continuum, Macroscopic & microscopic point of view. Thermodynamic equilibrium, Property, State, Path, Process, Cyclic and non-cyclic processes, Reversible and irreversible processes, Quasi static process, Energy and its forms, Enthalpy, Zeroth law, first law, second law and third law of thermodynamics, Steady flow energy equation, Limitations of first law of thermodynamics, Essence of second law, Thermal reservoir, Heat engines. COP of heat pump and refrigerator, Carnot cycle, Carnot theorem, Clausius inequality, Concept of entropy.	8
Properties of gases and steam	Boyle's law, Charles's law, Gay-Lussac's law, Avogadro's law, Combined gas law, Gas constant, Relation between c_p and c_v, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Polytropic process. Steam formation, Enthalpy, Specific volume, Internal energy and dryness fraction of steams, steam calorimeters.	5
Thermodynamic Cycle	Rankine cycle, Actual vapour cycle processes, Comparison of Rankine and Carnot cycles, Air standard cycles - Otto, Diesel, dual and Brayton cycles, Vapour compression refrigeration cycles.	8
Introduction to Mechanics of Solid:	Normal and shear Stress, strain, Hookes' law, Poisson's ratio, elastic constants and their relationship, stress-strain diagram for ductile and brittle materials, factor of safety. Basic Numerical problems, temperature stresses, shear stress, complementary shear stress, shear strain.	8
Compound Stresses and Strains	State of stress at a point, oblique stress, simple tension, pure shear, general two dimensional stress system, principal planes, principal stresses and strains, maximum shear stress.	8
Bending Stress and Torsion	Pure bending, moment of inertia, section modulus, bending stresses, combined bending and direct stress, beam of uniform strength, middle third and middle quarter rules for rectangular and circular sections, Circular shafts, torsional shear stress, strain energy in torsion, shafts under varying torque, compound shafts, combined bending and twisting.	8
	Total No. of Hours	**45**
Textbooks	1. R S Khurmi, "Engineering Mechanics". 2. P K Nag "Engineering Thermodynamics".	
References	1. Van Wylen G.J. &Sonnlog R.E.: Fundamentals of classical thermodynamics, John Wiley &Sons,Inc. NY. 2. WarkWenneth : Thermodynamics (2nd edition), Mc Graw Hill book Co. NY. 3. Holman, J.P.: Thermodynamics, MC Graw Hill book Co. NY. 4. Yadav R.: Thermodynamics and Heat Engines, Vol I & II (Sl Edition) Central Publishing House Allahabad. 5. Yadav R.: Steam & Gas Turbines. 6. Kshitish Chandra Pal: Heat Power, Orient Longman Limited, 17, Chittranjan Avenue, Calcutta. 7. S. Rao, B.B. Parulekar, 'Energy Technology', Khanna Pub., New Delhi. 8. G. H. Ryder: "Strength of Materials". 9. F. L. Singer: "Strength of Materials".	

	10. Timoshenko: "Strength of Materials". 11. Beer, Johnson, Statics".

SET/CS/BT/C105	C PROGRAMMING	
Course Objective	The course is designed to provide complete knowledge of programming in C language. Students will be able to develop logics which will help them to create programs and applications in C. Also, by learning the basic programming concepts in C, help them to learn any other programming language in future.	
Course Outcome	1. Develop programs in C programming language. 2. Analyze the problem and find appropriate solution 3. Evaluate the correctness of the developed solution. **4.** Develop basic and advanced level applications using C programming language.	
Module Name	**Content**	**No. of Hrs.**
Introduction	Introduction, The C character set, Constants, Variables, Identifiers, Keywords, Data types, Declarations, The First C Program, Compilation and Execution.	6
Operators and Expressions	Arithmetic, Relational, Equality, Logical, Unary, Conditional, Bitwise, Assignment, Comma and Sizeof operator. Type Conversion and Typecasting.	6
Control Statements	if, if-else, while, do-while, for loop, nested loops, switch, break, continue and goto statements.	5
Functions & Pointers	Defining and accessing functions, Function prototype, Passing arguments, Recursion, Use of library functions. Introduction to pointers, Declarations, Passing to a function, Operations on pointers, Dynamic memory allocation, Array of pointers.	11
Arrays	Single and Multi-dimensional arrays, Row major and Column major form of an array, Character strings and arrays.	4
Storage classes	Automatic, Register, Static and External storage class.	4
Structures and Unions	Basics of structures, Structures and functions, Arrays of Structures, Pointers to structures, Self-referential structures, Unions.	4
File Input/output	Opening a File, Reading from a file, closing the file, Writing to a file.	4
Total No. of Hours		**44**
Textbooks	1. E. Balagurusamy, "Programming in ANSI C"	
References	1. Byron S. Gottfried, "Programming With C" 2. YashwantKanitker, "LET US C" 3. B. W. Kernighan and D. M. Ritchie, "The C Programming Language" 4. B. W. Kernighan, "The Practice of Programming", Addison-Wesley, 1999. 5. C. L. Tondo and S. E. Gimpel, "The C Answer Book", (2/e), Prentice Hall, 1988.	

SET/SH/BT/C108	CHEMISTRY LAB	
Module Name	**Content**	**No. of Hrs.**
1. To determine the percentage of available chlorine in the supplied sample of bleaching powder. 2. To determine the ferrous content in the supplied sample of iron ore by titrimetric analysis against standard K2Cr2O7 solution using K3Fe(CN)6 as external indicator. 3. To determine the chloride content in supplied water sample using Mohr's method. 4. To determine the constituents and amount of alkalinity of the supplied water sample. 5. To determine the temporary and permanent hardness of water sample by complexometry. 6. To find chemical oxygen demand of a waste water sample using Potassium Dichromate. 7. To determine iron concentration in the sample of water by Spectrophotometric method. 8. To determine the molecular weight of a polystyrene sample by using viscometric method. 9. To determine pH of a solution by using digital pH meter and titration of such a solution pH metrically. 10. Analysis of a coal sample by proximate analysis method.		3 x 10
Total No. of Hours		**30**

SET/CS/BT/C109	C PROGRAMMING LAB
Course Objective:	1. To make the student learn a programming language. 2. To learn problem solving techniques. 3. To teach the student to write programs in C and to solve the problems.
Course Outcome:	1. After Completion of this course the student would be able to 2. Read, understand and trace the execution of programs written in C language. 3. Write the C code for a given algorithm. 4. Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor. 5. Write programs that perform operations using derived data types.

Content	No. of Hrs.
This lab shall have minimum 25 programs in C. There shall be minimum two programs per module as taught in theory. Programming shall follow logic/algorithm and flowchart wherever applicable. Exercises shall also enhance analytical and debugging abilities.	2x16
Total No. of Hours	**32**

AECC106	ENVIRONMENTAL SCIENCE
As per University Proposal and Approval	

SET/CS/SC/C110 Information Technology Lab-I (Skill Enhancement Course)		
Course Objective:	1. To make the student learn a programming language. 2. To learn Microsoft office techniques. 3. To learn computer network and trending techniques	
Course Outcome:	Through completion of the Certificate course in Information Technology program, students will: **1.** Develop information technology solutions by evaluating user requirements in the systems development environment. **2.** Apply knowledge of IT requirements for technology solutions in cutting edges applications. **3.** Analyze a problem and identify and define the computing requirements for the appropriate solutions. **4.** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools.	
Module Name	**Content**	**No. of Hrs**
Module I	Working with Microsoft office (word, excel, power point, access)	10
Module II	Use of Search Engine and World Wide Web, Creation of email id and working with email, Use of FTP service	10
Module III	Basics of Cloud computing, Internet of things (IoT) and Data Science	10
	(Besides these additional experiments can be included to give hands on experience to students. Students can be provided opportunity to work on any Information System to give them better understanding of Information System)	
	Total Hours	**30**

II Semester

SET/SH/BT/C201	MATHEMATICS-II	
Course Objective:	To introduce different types of integrations, transformations and distributions for graduate students.	
Course Outcome:	Applying the Fourier series in signal processing and implementation of various transformations to solve complex engineering problems.	
Module Name	**Content**	**No. of Hrs.**
Multiple Integral	Evaluation of definite integral; double and triple integrals; change of order of integration. Change of variables, application to area, volume, centre of gravity, moment of inertia and product of inertia. Gamma and Beta functions, Dirichlet's integral and its application.	**12**
Fourier Series	Periodic functions, Fourier series of functions with period 2n, change of interval, half range sine and cosine series	**6**
Integral Transform	Laplace transforms, existence theorem, Laplace transform derivatives, inverse Laplace transform, application to solve linear differential equations, unit step function, Dirac delta function, Laplace transforms of periodic functions. Application of Laplace transforms. Definitions of Fourier transform and its simple applications	**14**
Probability and Statistics	Random variables. Uniform, normal, exponential, Poisson and binomial distributions. Mean, median, mode and standard deviation, Correlation and regression, Conditional probability and Bayes theorem	**12**
	Total No. of Hrs.	**44**
Textbooks	1. R. K. Jain and S. R. K. Iyengar "Advanced Engineering Mathematics", Narosa Publications, 2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 3. H K Das, "Advanced Engineering Mathematics", S Chand, 4. Erwin Kreyszig, "Advanced Engineering Mathematics".	

SET/SH/BT/C202	PHYSICS	
Course Objective	1. To introduce the student to the basic of wave optics, lasers, and demonstrate their applications in technology. 2. To make students aware about quantum physics phenomena. 3. Give the beginning student an appreciation of recent developments in materials science &engineering within the framework of this class. 4. To review physics in the context of materials science & engineering. 5. Give an introduction to the relation between processing, structure, and physical properties. 6. To make the students aware about Electromagnetic wave fundamentals.	
Course Outcome	1. Demonstrate interference, diffraction and polarization of light and explain the working principle of Lasers. 2. Student will understand quantum mechanical aspects of physics. 3. Enable to explain the phenomenon of crystal structure and crystallographic, qualitatively description of X-ray diffraction and its generalphysical properties, as well as possible applications. 4. Students will understand the phenomenon of defects in solids and their physical properties, band theory of solids and classification of energy bands, electric and magnetic properties of solids and able to explain qualitative idea of superconductivity in materials. 5. This will enable the students to learn physical concepts associated with electromagneticradiation and devices. 6. Use Maxwell's equations to describe propagation of EM waves in a medium.	
Module Name	**Content**	**No. of Hrs.**
Optics	Interference: Coherent Sources, Conditions of Interference, Fresnel's Biprism Experiment, Interference in Thin Films, Newton's Rings; Single and n-Slit Diffraction, Diffraction Grating, Raleigh's Criterion of Resolution, Resolving Power of Telescope, Phenomenon of Double Refraction, Ordinary and Extra-ordinary Rays, NicolPrism,CircularlyandEllipticallyPolarizedLight,FresnelTheory, Optical Activity, SpecificRotation; Laser: Principle of Laser Action, Einstein's Coefficients, Construction and Working of He-Ne and Ruby Laser, Applications of Laser.	15
Origin of Quantum Mechanics and its Applications	Black body radiation, Planck's Radiation Law, Wave Particle Duality, de-Broglie hypothesis, Photoelectric effect, Wave Function and its Normalization, Born Interpretation, Schrodinger equation, Particle in a Box, Potential Step (E < Vo), Tunneling effect (Qualitative idea).	10
Basics Material Science	Introduction to crystal structure of materials, Miller indices for crystallographic planes and directions. Diffraction of X-Rays, Bragg's Law, Determination of crystal structure using X-rays Diffraction and its applications. Defects in solids: point, line and planar defects and their effect on properties of materials. Band theory of solids, conductors, semi-conductors and insulators, metals. Fermi Level. Magnetism: dipole moments, paramagnetism, Curie's law, magnetization and hysteresis, Ferromagnetism and Anti- Ferromagnetism. Ferro electricity and Piezoelectricity. Superconductivity in materials.	15
Electromagnetics	Ampere's Law and Displacement Current, Maxwell's Equations in Integral and Differential Forms, Electromagnetic Wave Propagation in Free Space and Conducting Media, Poynting Theorem.	8
Total No. of Hours		**48**

Textbooks	1. Gaur, Gupta, "EngineeringPhysics" 2. CallisterW.D.,"MaterialsScienceandEngineering:Anintroduction",6thEdition,John Wiley & Sons Inc., New York2002.
References	1. J. R. Taylor, C.D. Zafiratos and M. A. Dubson, Modern Physics for Scientists and Engineers,2nd Pearson 2. Arthur Beiser, Concepts of Modern Physics, 6th Ed., TMH,(2009) 3. D.J. Griffith :Electrodynamics 4. Charles Kittel, Introduction to Solid State Physics, 5. S.O. Pillai, Solid State Physics, 6. AjoyGhatak- Optics

SET/EE/BT/C203 BASIC ELECTRICAL ENGINEERING		
Course Objective	1. To impart basic knowledge of electrical quantities and provide working knowledge for the analysis of DC and AC circuits. 2. To understand the construction and working principle of DC and AC machines. 3. To understand the construction and working principle of various instruments. 4. To understand the construction and working principle of 3- phase supply system.	
Course Outcome	1. Understand the basic electric and magnetic circuits. 2. Analyze DC and AC circuits. 3. Interpret the construction and working of different types of electrical machines and instruments. 4. Analyze basic electrical components and circuits.	
Module Name	**Content**	**No. of Hrs.**
DC Networks	Concepts of linear, nonlinear, active, passive, unilateral and bilateral elements; Ideal and practical voltage & current sources, conversion from one from the other; Kirchhoff's laws, statements; Mesh Analysis; Nodal Analysis; Delta-Star & Star-Delta conversion; Superposition principle; Thevenin's theorem, statement, advantages in case of complex networks; explanation & illustration with examples; Norton's theorem, Maximum power transfer theorem, Reciprocity Theorem and its application.	10
Single Phase AC Circuits	Generation of single phase AC voltage and determination of average (mean) and RMS (effective) values of voltage and current with special reference to sinusoidal waveforms; Form factor and peak factor for various waves; Representation of sinusoidal time varying quantities as phasors; concepts of reactance, impedance and their representation in complex forms using j operator; Steady state analysis of series R-L-C circuit & its phasor diagram; Concept of power & power factor; Concept of admittance, susceptance in parallel circuits; Analysis of series parallel circuits & phasor diagrams; Resonance in series and parallel circuits.	10
Three Phase Circuits	Generation of 3-phase balanced sinusoidal voltage; star & delta connections; line & phase quantities (current & voltage); Solution of 3-phase star/delta circuits with balanced supply voltage and balanced load; phasor diagram; 3-phase, 4-wire circuits; Measurement of three phase power by two wattmeter method; phasor diagram with balanced load and determination of load power factor from wattmeter readings.	6
Transformers and Rotating Machines	Transformers: Constructional features and principle of operation, concept of ideal transformer under no load & loaded conditions and its equivalent circuit; Practical transformer rating & its equivalent circuit; Autotransformer – principle of operation & relative advantages & disadvantages; Rotating Machine: construction features (stator, rotor & air gap), conditions for production of steady electromagnetic torque; Three phase Induction motor: constructional features and operation; DC Machines: construction features, EMF and Torque expression, Classification of DC motors and generators; Stepper motor.	12
Measuring Instruments	DC PMMC instruments – constructional feature and principle of operation; Moving iron meters construction and principle of operation; Dynamometer type wattmeter; Induction type energy meter construction & principle of operation.	6
	Total No. of Hours	**44**
Textbooks	1. I.J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.	
References	1. A. E. Fitgerald, D.E., Higginbotham and AGrabel, "Basic Electrical Engineering", Mc Graw Hill. 2. Rizzoni, Principles and Applications of Electrical Engineering, TMH. 3. V. Del Toro. "Principles of electrical Engineering, "Prentice hall. 4. W.H. Hayt& J.E. Kemmerly," Engineering circuit Analysis, "Mc Graw Hill. 5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.	

SET/EC/BT/C204 Basic Electronics		
Course Objective	To familiarize the students with electronics field. To introduce semiconductor fundamentals, electronic devices, and elementary electronic circuits. To familiarize students with digital logics and gates.	
Course Outcome	1. Understand the working and current voltage characteristics of semiconductor devices e.g. diodes and transistor. 2. Perform dc analysis of amplifier circuits. 3. Design basic OP AMP circuits. 4. Understand and use basic digital electronic concepts.	
Module Name	**Content**	**No. of Hrs.**
Semiconductor Diodes	Semiconductor materials- intrinsic and extrinsic types, Ideal Diode as a switch, Terminal characteristics, and equivalent circuit of PN diode: p-n junction under open circuit condition, p-n junction under forward bias and reverse bias conditions, p-n junction in breakdown region; Zener diode and basic voltage regulator using Zener diode; Rectifier Circuits, Clipping and Clamping circuits; LED, Photo Diode.	10
Bipolar Junction Transistors	Physical structure, physical operation and current-voltage characteristics of NPN transistor; Use of Voltage-dependent Current source as a Voltage amplifier; Transistor as an amplifier: Characteristics of CE amplifier; Active region operation of transistor; D.C. analysis of Common Emitter Amplifier: load line analysis; Transistor as a switch: cut-off and saturation modes.	10
Field Effect Transistor	Enhancement-type MOSFET: structure and physical operation, current-voltage characteristics; MOSFET as a Switch, MOSFET as a Voltage-dependent Current source and Common Source Amplifier.	8
Operation Amplifier	Ideal Op-amp; Properties of the ideal Operational Amplifier; op-amp application circuits (assuming ideal op amp): inverting amplifier, non - inverting amplifier, weighted summer, integrator, and differentiator.	6
Digital Logic and Gates	Binary, octal, and hexadecimal number systems; Methods of base conversions; Binary, octal, and hexadecimal arithmetic; Representation of signed numbers; Basic logic operations and logic gates; MOSFET Switch Implementation of Logic Gates, e.g., Inverter, NAND, NOR. Basic postulates and fundamental theorems of Boolean algebra.	8
	Total No. of Hours	**42**
Textbooks	1. Agarwal, Anant; Lang, Jeffrey H, "Foundations of Analog and Digital Electronic Circuits", Elsevier Science & Technology Books.	
References	1. V. Del Toro, Principles of Electrical Engineering, PHI. 2. Rizzoni, Principles and Applications of Electrical Engineering, TMH. 3. Malvino, Electronic Principles. 4. R.L.Boylestad&L.Nashelsky, Electronics Devices & Circuit Theory, PHI. 5. Sedra, Smith, "Microelectronic Circuits", Oxford University Press.	

SET/IT/BT/C205	Fundamentals of Information Technology	
Course Objective	1. Take on significant positions In various IT work 2. Collaborate in diverse team environments 3. Contributions in the field of IT 4. Work effectively in the IT field to make a positive contribution to society	
Course Outcome	1. Develop information technology solutions by evaluating user requirements in the systems development environment. 2. Apply knowledge of IT requirements for technology solutions in cutting edges applications. 3. Analyze a problem and identify and define the computing requirements for the appropriate solutions. **4.** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools.	
Module Name	**Content**	**No. of Hrs.**
Introduction	Definition of Electronic Computer, Generations, Classification of Computers, Computer Hardware and Basic Computer Organization: CPU- ALU, CU; RAM/ROM, Various I/O devices, Peripherals, Storage Media	4
Computer Languages	Binary, Hexadecimal Number System; Basic Binary Logic Operations; Binary Addition and Subtraction; Generation of Languages, Assembly Language, High level language; Translators, Interpreters, Compilers, Compilers; Flow Charts, Dataflow Diagram,	6
OS & Office	Software- System and Application Software; Elementary Concepts in Operating System; Textual Vs GUI, Introduction to DOS, MS Windows, UNIX/Linux	4
Computer Networks	Elements of Communication system; Brief Introduction to Computer Networks- Introduction of LAN and WAN. Network Topologies, Client-server Architecture, IoT, Cloud Computing	6
Internet	Internet & World Wide Web, Hypertext Markup Language, DHTML, Python, WWW, Gopher, FTP, Telnet, Web Browsers, Net Surfing, Search Engines, Email; Introduction to Web Development, Static and Dynamic Pages	6
IT Application and Multi media	Basic Awareness of NICNET and ERNET; E Commerce, E governance; Brief Introduction to Different Formats of Image, Audio, Video	6
Information Concepts & Processing	Definitions of Information, Need of information, quality of information, value of information, concept of information, Entropy category and Level of information in Business Organization, Data Concepts and Data Processing, Data Science, Data Representation, Application of IT to E-commerce, Electronic Governance, Multimedia, Entertainment, Introduction to Information System.	8
	Total No. of Hours	**40**
Textbooks	1. Sinha, Sinha, “Computer Fundamentals”, 2. Yadav R. P. , “Information Technology”	
References	1. D S Yadav, “Foundations of IT”, New Age, Delhi 2. Rajaraman, “Introduction to Computers”, PHI 3. Peter Nortans “Introduction to Computers”, TMH. 4. Patterson D.A. & Hennessy J.L., "Computer Organization and Design", Morgan Kaufmann Publishers	

SET/SH/BT/C207	PHYSICS LAB	
Course Objective	To make students aware about experimental verification behind the theory, familiarize the student to the basic of spectroscopy, lasers, and semiconductor lab experiment and demonstrate their applications. Give the brief introduction about the Planck's constant, Hall Effect, Ohm's law, Thomson's experiment, conversion of Galvanometer to Voltmeter and Ammeter and unknown resistance using post office box.	
Course Outcome	1. After Demonstration the student will able to perform the experiment and learn about the practical knowledge of various theory part. 2. Student will enable to find the refractive index of material, wavelength of monochromatic source of light. 3. Enable to find the efficiency of electric kettle, band gap of materials, behaviour of semiconductor, charge density and hysteresis curve in ferromagnetic materials	
Sr. No.	**Experiments**	**No. of Hrs.**
1.	To determine refractive index of glass and liquid using spectrometer.	1x2
2.	To determine the wavelength of spectral lines using plane diffraction grating (Use Hg source).	1x2
3.	To determine the wavelength of sodium light by Newton's Ring method.	1x2
4.	To measure an accessible (Horizontal and vertical) height using sextant.	1x2
5.	Determination of wavelength of He-Ne laser using single slit /N slit diffraction pattern.	1x2
6.	To study the photoelectric effect and determine the value of Planck's constant.	1x2
7.	To determine the heating efficiency of an electric kettle with varying voltage.	1x2
8.	To Determine the wavelength of the semiconductor diode laser.	1x2
9.	Measurement of forward/reverse saturation current in p-n-junction diode at various temperatures and to find the approximate value of energy gap.	1x2
10.	To study the Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material.	1x2
11.	To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility	1x2
12.	Measurement of e/m of electron e/m- Thomson's Experiment	1x2
13.	To verify Ohm's law.	1x2
14.	Conversion of Galvanometer into Voltmeter and Ammeter.	1x2
15.	To determine the unknown resistance by a post office box.	1x2
	Total No. of Hours	**30**

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

SET/ME/BT/C208	Engineering Graphics and Workshop Practice	
Course Objective	The Engineering Graphics course aims at the following educational objectives: Comprehend general projection theory, with emphasis on orthographic projection to represent three-dimensional objects in two-dimensional views (principal, auxiliary, sections).Dimension and annotate two-dimensional engineering drawings. The application of industry standards and best practices applied in engineering graphics. Emphasize freehand sketching to aid in the visualization process and to efficiently communicate ideas graphically.	
Course Outcome	1. Sketch engineering objects, lettering and dimensioning by freehand. 2. Create geometric constructions; drawing parallel and perpendicular lines, and to construct circles, arcs, tangencies, and irregular curves 3. Apply orthographic projection method to obtain: Multiview , auxiliary view and section view of an object	
Module Name	**Content**	**No. of Hrs.**
Introduction to Engineering Graphics & Projection of Points	Drawing instruments and their use, Different types of lines, Lettering & dimensioning Familiarization with current Indian Standard Code of Practice for Engineering Drawing. Scales, Plain scales, Diagonal scales, Vernier scales. First angle and third angle projections Projection of points in different coordinates, Projections of lines inclined to one of the reference planes.	08
Projections of lines and planes	Projections of lines inclined to both the planes, True lengths of the lines and their angles of inclination with the reference planes, Traces of lines. Projection of plane lamina of geometric shapes inclined to one of the reference planes, inclined to both the planes, Traces of planes. Projections on auxiliary planes.	08
Projections of polyhedral and solids	Projections of polyhedral and solids of revolution, projection of solids with axis parallel to one of the planes and parallel or perpendicular to the other plane, Projections with the axis inclined to one of the planes.	08
Orthographic Projection	Concept of orthographic projection, Rules of Drawing orthographic projection, Conversion of pictorial views into orthographic projection, Drawing of orthographic projection of Machine components.	08
Carpentry, Fitting and Black smithy	Minimum two experiments from Carpentry, Fitting and Black smithy. And Development of jobs carried out and soldering, Black Smithy, House Wiring, Foundry (Molding only), Plumbing.	08
Welding & Machining	Practice of minimum two experiments of welding joints. Overview of Lathe, Shaper, Milling and Drilling machine. Perform one job on each machine.	08
	Total No. of Hours	**48**
Textbooks	4. Bhatt N. D, Elementary Engineering Drawing, Charotar Publishing House, Anand, 2002. 5. Elements Of Workshop Technology Vol-1 by Hazra Chaudhary	
References	1. Narayana K L &Kannaiah P, Engineering Graphics, Tata McGraw Hill, New Delhi, 1992. 2. Luzadder W J, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi, 2001. 3. Thomas E French &Charkes J V, Engineering Drawing & Graphing Technology, McGraw Hill Book Co, New York, 1993. 4. Venugopal K, Engineering Drawing & Graphics, New Age International Pvt. Ltd., New Delhi, 1994. 5. Workshop Technology, Raghubanshi.	

AECC206	General English (Life Skill and Personality Development)
As per University Proposal and Approval	

SET/CS/SC/C210 Information Technology Lab-II (Skill Enhancement Course)		
Course Objective:	1. To make the student learn about web development. 2. To learn about static and dynamic web pages.	
Course Outcome:	Through completion of the Certificate course in Information Technology program, students will: **5.** Develop information technology solutions by evaluating user requirements in the systems development environment. **6.** Apply knowledge of IT requirements for technology solutions in cutting edges applications. **7.** Analyze a problem and identify and define the computing requirements for the appropriate solutions. **8.** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools.	
Module Name	**Content**	**No. of Hrs**
Module I	Working with computer networking	10
Module II	Creation of Static Web Pages using HTML/CSS, Creation of Page Using Java Script/PHP	10
Module III	Working with python and data analysis	10
	(Besides these additional experiments can be included to give hands on experience to students. Students can be provided opportunity to work on any Information System to give them better understanding of Information System).	
	Total Hours	**30**