

Curriculum and Syllabus

Bachelor of Technology (Computer Science and Engineering)

(As per National Education Policy-2020)

(Effective from August 2026)



Department of Computer Science and Engineering
School of Engineering and Technology,
H. N. B. Garhwal University, Srinagar Garhwal, Uttarakhand- 246174

ADMISSION PROCEDURE AND ELIGIBILITY

The minimum qualification for admission to the B. Tech. First year shall be higher secondary school certificate examination (10+2) scheme with Physics, Chemistry and Mathematics or any other subject notified by the UGC/AICTE conducted by Central Board of Secondary Education (CBSE) or any other equivalent examination from recognized board or university. The candidate shall be eligible for admission to B. Tech. Degree Course based on JEE Main score. In general, the admission to B. Tech. degree course shall be governed by the rules of, Ministry of Education (MOE), Government of India (GOI) and Hemvati Nandan Bahuguna Garhwal University (A Central University), Srinagar Garhwal, Uttarakhand.

B. Tech (Computer Science and Engineering)	Physics, Mathematics and Chemistry/Computer Science/Electronics/Information Technology/Biology/Informatics Practices/Biotechnology	Direct Entry- For B. Tech. I semester: Candidate shall have passed 10+2 examination from any recognized Board/University with Physics and Mathematics as a compulsory subject along with Chemistry/Computer Science/Electronics/Information Technology/ Biology/Informatics Practices/ Biotechnology obtained at least 45% marks (40% in case of candidate belonging to reserved category) in the above subjects taken together. Candidates seeking admission to B.Tech. Course (All branches) in HNB Garhwal University have to appear for JEE Main. They are required to opt for Physics, Mathematics and Chemistry/Computer Science/Electronics /Information Technology/ Biology/Informatics Practices/ Biotechnology for the admission in HNBGU. Candidates who will not appear in Physics, Mathematics and Chemistry/Computer Science/Electronics/Information Technology/ Biology/Informatics Practices/Biotechnology will not be considered for admission in B.Tech. [Criterion for preparation of Merit list: JEE Main merit list.
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Admission to **B. Tech. 2nd year**, will be made in two modes:

- (i) Students who have passed a three-year Diploma in Engineering recognised by the AICTE/State University or B.Sc. in the relevant/respective discipline will be eligible for admission as per admission procedure adopted by the university time to time.
- (ii) Students who have obtained an equivalent Vocational/Technical Program/Under Graduate Certificate with NHEQF Level 5/ UCF-Level 4.5 will be eligible for admission to 3rd Semester in B. Tech. in the respective discipline of Engineering degree program against the vacant seats. However, the candidate shall be eligible for admission on the basis of the entrance examination conducted or any other procedure adopted by Hemvati Nandan Bahuguna Garhwal University for admission to B. Tech. Degree course time to time.

Admission to B. Tech. 3rd year shall be held if the candidate passed B. Tech. 2nd year along with NHEQF Level 6 /UCF-Level 5 equivalent to Undergraduate Diploma in the respective discipline. The admission to B. Tech. (Fifth Semester) degree program will be held against the vacant seats. However, the candidate shall be eligible for admission on the basis of the entrance examination conducted or any other procedure adopted by Hemvati Nandan Bahuguna Garhwal University for admission to B. Tech. Degree course time to time.

Admission to B. Tech. Fourth year shall be held if the candidate passed B. Tech. 3rd year along with Advanced Diploma/ Bachelor degree in Vocational Education in relevant discipline with NHEQF Level 7/UCF-Level 5.5. The admission to B. Tech. (Seventh Semester) degree program will be held against the vacant seats. However, the candidate shall be eligible for admission on the basis of the entrance examination conducted or any other procedure adopted by Hemvati Nandan Bahuguna Garhwal University for admission to B. Tech. Degree course time to time. With regard to the qualification earned from foreign country, an equivalence certificate from the university /Association of Indian Universities is mandatory for admission to B. Tech. Programs. In case of any dispute about the equivalence in qualification earned from foreign countries, the decision of university in this regard shall be final and binding on all concerned.

The reservation in admission, cancellation of admission and fee refund will be as per AICTE / MOE /GOI/ UGC/ HNBGU norms and notification issued in this regard from time to time.

❖ Eligibility for Under Graduate Certificate

(a) The Under Graduate Certificate course will be offered by all departments of SOET HNB Garhwal University. (b) All the candidates who have successfully passed one-year (two semester) of B. Tech. Programme will be eligible for Under Graduate Certificate. The candidate who wants to exit with Under Graduate Certificate he/she has to do skill-based training of two months. This skill-based training will be of 4 credits based on the job/course specific internship/apprentice-ship equivalent to **NHEQF level 5 / UCF- level 4.5**. The evaluation of the 04 credit will be based on examination/ presentation before the external expert.

(c) A student shall report the concerned Head on or before the date notified by the Department /School, if he/she is interested to exit with Under Graduate Certificate.

❖ Eligibility for Under Graduate Diploma

(a) The Under Graduate Diploma will be offered by all departments of SOET HNB Garhwal University. (b) All the candidates who have successfully passed two-year (Four semester) of B. Tech. Programme will be eligible for Under Graduate Diploma. The candidate who wants to exit with Under Graduate Diploma shall have to do training of skill-based courses of two months. This skill-based training will be of 4 credits based on the job/course specific internship/apprentice-ship equivalent to **NHEQF level 6 / UCF- level 5**. The evaluation of the 04 credit will be based on examination/ presentation before the external expert.

- (c) A student shall report the concerned Head on or before the date notified by the Department/School, if he/she is interested to exit with Under Graduate Diploma.

❖ **Eligibility for Advance Diploma/ Bachelor of Vocational Education**

- (a) The Advance Diploma/ Bachelor of Vocational Education will be offered by all departments of SOET HNB Garhwal University.
- (b) All the candidates who have successfully passed Three-year (Six semester) of B. Tech. Programme will be eligible.

Advance Diploma/ Bachelor of Vocational Education: The candidate who wants to exit with Advance Diploma/ Bachelor of Vocational Education shall have to do training of skill-based courses of two months. This skill-based training will be of 4 credits based on the job/course specific internship/apprentice-ship equivalent to **NHEQF level 7/ UCF level 5.5**. The evaluation of the 04 credit will be based on examination/ presentation before the external expert.

- (c) A student shall report the concerned Head on or before the date notified by the Department/School/University if he/she is interested to exit with Advance Diploma/ Bachelor of Vocational Education.

❖ **Eligibility for B. Tech. Degree**

After the Successful completion of the four-year B.Tech course, a student will be eligible to get B. Tech. Degree in the concerned branch of Engineering.

Note: The definition of NHEQF levels / UCF levels can be obtained from web-link

https://www.ugc.gov.in/pdfnews/2142241_NHEQF-Draft.pdf

Curriculum

Semester- wise List of Subjects (As per NEP 2020)

Semester I

S. No.	Category	Course Code	Course Code and Title	L	T	P	Contact Hrs./Week	Credits
1	Basic Science	SET/BS/BT/C101	Mathematics I	3	-	-	3	3
2		SET/BS/BT/C102	Chemistry	3	-	-	3	3
3		SET/BS/BT/C103	Chemistry Lab	-	-	1	2	1
4		SET/BS/BT/C104	Engineering Mechanics	2	-	-	2	2
5	Humanities & Social Science		Mental Health & Wellbeing	3	-	-	3	3
6	Engineering Science	SET/ME/BT/C105	Basic Mechanical Engineering	3	-	-	3	3
7		SET/ME/BT/C106	Engineering Graphics and Workshop Practice	-	-	1	4	2
8		SET/CS/BT/C107	Problem Solving and Programming in C	3	-	-	3	3
9		SET/CS/BT/C108	Problem Solving and Programming in C Lab	-	-	1	3	1
10	Engineering Science (Skill)	SET/CS/BT/C109	Internet Technology Lab	-	-	1	3	2
11	Mandatory Course*		Understanding & Connecting with the Environment	-	-	-	-	-
Total				17	-	4	29	23

L= Lectures, T=Tutorials, P= Practical, * Common syllabus for all UG Courses of the University.

Semester II

S. No.	Category	Course Code	Course Code and Title	L	T	P	Contact Hrs./Week	Credits
1	Basic Science	SET/BS/BT/C201	Mathematics II	3	-	-	3	3
2		SET/BS/BT/C202	Physics	3	-	-	3	3
3		SET/BS/BT/C203	Physics Lab	-	-	1	2	1
4		SET/BS/BT/C204	Information Science	2	-	-	2	2
5	Humanities & Social Science		Communication Skill	3	-	-	3	3
6			Disaster Management	3	-	-	3	3
7	Engineering Science	SET/IE/BT/C205	Basic Electrical Engineering	3	-	-	3	3
8		SET/EC/BT/C206	Basic Electronics	3	-	-	3	3
9	Engineering Science (Skill)	SET/CS/BT/C207	Basics Python Lab	-	-	1	3	2
10	Mandatory Course*		A Life Skills and personality Development*	-	-	-	-	-
Total				20	-	2	25	23

L= Lectures, T=Tutorials, P= Practical

***** Common syllabus for all UG Courses of the University.

Entry/Exit Option with Under Graduate Certificate in Computer Science and Engineering, may be allowed after completion of the 1st year, and as per requirements defined in the admission procedure and eligibility of the school.

Detailed Syllabi

Semester I

SET/BS/BT/C101		MATHEMATICS- I
Course Objective	1. To impart a deep understanding of the fundamental concepts and techniques of differential calculus, vector calculus, and matrices. 2. To develop the ability to apply these mathematical principles to solve real-world problems in engineering, physics, and other sciences. 3. To enhance analytical and critical thinking skills through the study of calculus and linear algebra. 4. To prepare students for advanced studies and research in mathematics and related fields. 5. To foster a comprehensive understanding of the theoretical and practical aspects of calculus and matrix theory.	
Course Outcome	1. Students will be able to understand and apply the concepts of limit, continuity, and differentiability for single and multivariable functions. 2. Students will gain proficiency in using vector calculus to solve problems involving gradients, divergences, curls, and applying Gauss's, Green's, and Stokes' theorems. 3. Students will be able to perform matrix operations, understand vector spaces, and apply theorems related to matrices such as the Cayley-Hamilton theorem. 4. Students will develop the skills to solve linear systems, determine the rank of matrices, and find eigenvalues and eigenvectors. 5. Students will be able to apply differential and vector calculus and matrix theory to optimize functions and solve practical problems in various disciplines.	
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/BS/BT/C102 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. Analyse 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. V. 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 analyse 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 NH ₃ , H ₂ O, SO ₃ , PCl ₅ , XeO ₂ 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 & polythiophene) & 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/BS/BT/C103		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 K ₂ Cr ₂ O ₇ solution using K ₃ Fe(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/BS/BT/C104		ENGINEERING MECHANICS
Course Objective	1. To understand distributed force systems, centroid/ centre 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 analyse 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/ centre 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 analyse 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, Varignon'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. & Sonntag 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 (SI 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".	

SET/ME/BT/C105		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. & Sonntag R.E.: Fundamentals of classical thermodynamics, John Wiley & Sons, Inc. NY. 2. Wark Wenneth : 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 (SI Edition) Central Publishing House Allahabad. 5. Yadav R.: Steam & Gas Turbines. 6. Kshitish Chandra Pal: Heat Power, Orient Longman Limited, 17, Chitranjan 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/C106		Engineering Graphics and Workshop Practice	
Course Objective	1. To introduce students to the fundamental principles of engineering graphics and familiarize them with technical drawing instruments and standards. 2. To develop the ability to create and interpret technical drawings, including projections of points, lines, planes, and solids. 3. To impart practical skills in carpentry, fitting, blacksmithing, welding, and machining through hands-on laboratory experiences. 4. To enhance students' understanding of orthographic projection and its application in creating detailed drawings of machine components. 5. To provide a comprehensive understanding of the operations and applications of various workshop machines such as lathe, shaper, milling, and drilling machines.		

Course Outcome	- Students will be proficient in using drawing instruments and applying current Indian Standard Code of Practice for Engineering Drawing. - Students will be able to accurately project points, lines, and planes in different coordinates and understand the concepts of true lengths and traces. - Students will develop the skills to project polyhedral and solids of revolution, including projections with axes inclined to reference planes. - Students will gain the ability to convert pictorial views into orthographic projections and create detailed technical drawings of machine components. - Students will acquire hands-on experience in various workshop practices, including carpentry, fitting, blacksmithing, welding, and machining, enabling them to perform basic manufacturing and assembly tasks.	
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	- Bhatt N. D, Elementary Engineering Drawing, Charotar Publishing House, Anand, 2002. - Elements Of Workshop Technology Vol-1 by Hazra Chaudhary	
References	- Narayana K L & Kannaiah P, Engineering Graphics, Tata McGraw Hill, New Delhi, 1992. - Luzadder W J, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi, 2001. - Thomas E French & Charkes J V, Engineering Drawing & Graphing Technology, McGraw Hill Book Co, New York, 1993. - Venugopal K, Engineering Drawing & Graphics, New Age International Pvt. Ltd., New Delhi, 1994. - Workshop Technology, Raghubanshi.	

SET/CS/BT/C107 Problem Solving and Programming in C		
Course Objective	- To introduce the fundamental concepts of programming using the C language. - To develop problem-solving skills and logical thinking through the creation and execution of C programs. - To teach the use of control statements, functions, pointers, arrays, and data structures in C. - To provide hands-on experience with file input/output operations in C. - To prepare students for more advanced programming courses and practical applications in various fields.	
Course Outcome	- Develop programs in C programming language. - Analyze the problem and find appropriate solution - Evaluate the correctness of the developed solution. - 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 Size of 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. Yashwant Kanitker, “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/CS/BT/C109 Internet Technology Lab (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:	1. After Completion of this course the student would be able to know about the office automation techniques and implement on day to day activities 2. Working with computer networking equipment and email.. 3. Implement Programs to design web development	
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), Data Science, Artificial Intelligence, Block-Chain Technology, Client-Server Architecture, P2P Networks	10
	Besides these additional experiments can be included to give hands on experience to students.	
	Total Hours	30

Semester II

SET/BS/BT/C201 MATHEMATICS-II		
Course Objective:	1. To provide an in-depth understanding of multiple integrals and their applications in various fields. 2. To introduce the concepts and applications of Fourier series and integral transforms. 3. To familiarize students with the principles and techniques of probability and statistics. 4. To develop analytical skills for solving complex problems involving integration and statistical analysis. 5. To prepare students for advanced studies and research in mathematics, engineering, and physical sciences.	
Course Outcome:	1. Students will be able to evaluate double and triple integrals and apply them to compute area, volume, centre of gravity, and moments of inertia. 2. Students will understand and apply the concepts of Fourier series to represent periodic functions and solve related problems. 3. Students will gain proficiency in using Laplace transforms to solve linear differential equations and understand their applications in various contexts. 4. Students will learn the fundamental concepts of probability and statistics, including different types of distributions and their properties. 5. Students will be able to perform statistical analyses, including correlation, regression, and conditional probability, and apply Bayes theorem in problem-solving.	
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 2π , 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/BS/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 general physical 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 electromagnetic radiation 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, Nicol Prism, Circularly and Elliptically Polarized Light, Fresnel Theory, Optical Activity, Specific Rotation; 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, deBroglie hypothesis, Photoelectric effect, Wave Function and its Normalization, Born Interpretation, Schrodinger equation, Particle in a Box, Potential Step ($E < V_0$), Tunnelling 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, semiconductors 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, "Engineering Physics" 2. Callister W.D., "Materials Science and Engineering: An introduction", 6th Edition, John Wiley & Sons Inc., New York 2002.	
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. Ajoy Ghatak- Optics	

SET/BS/BT/C203 PHYSICS LAB		
Course Objective	1. To introduce students to the experimental verification of fundamental physical theories. 2. To familiarize students with the principles and applications of spectroscopy, lasers, and semiconductor experiments. 3. To provide hands-on experience in conducting laboratory experiments related to key physical concepts. 4. To demonstrate the practical applications of various physical laws and phenomena. 5. To develop students' skills in data analysis, experimental techniques, and scientific reporting.	
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/BS/BT/C204 Information Science		
Module Name	Content	No. of Hrs.
Course Objectives	The course aims to: 1. Introduce students to the fundamental concepts, scope and applications of Information Science. 2. Its relationship with Computer Science, Information Technology and Information Systems. 3. Develop an understanding of data, information, and knowledge including the collection, organization, processing, storage, retrieval and dissemination of information. 4. Develop the ability to understand and apply basic concepts of databases, metadata, information retrieval and information management. 5. Familiarize students with Information Systems and digital information resources, including their applications in education, business, healthcare, e-governance and other domains. 6. Create awareness about information security, privacy, ethics and emerging technologies.	
Course Outcomes	After successful completion of the course student will able to: 1. Explain the fundamental concepts, scope and applications of Information Science 2. Understand and analyze the relationship among data, information, and knowledge. 3. Apply basic principles of databases, metadata and information retrieval. 4. Analyze Information Systems and their applications in different domains. 5. Evaluate information sources and use digital tools for effective data processing and analysis. 6. Demonstrate awareness of information security, privacy and ethics.	
Unit I	Definition, nature, scope and evolution of Information Science; relationship between Information Science, Computer Science and Information Technology; Information as a resource; Characteristics and importance of information; Information life cycle; Types and sources of information; Data, Information, Knowledge and Wisdom (DIKW) hierarchy; Information needs and information users;	07

Unit II	Concepts of data and information; Data representation and organization; Structured, semi-structured and unstructured data; Data collection, validation, processing and storage, Introduction to databases and DBMS; Metadata and information organization; Basic concepts of data analytics and visualization.	07
Unit III	Binary, Hexadecimal Number System; Basic Binary Logic Operations; Binary Addition and Subtraction, Definition of Electronic Computer, Computer Hardware and Basic Computer Organization, Various I/O devices, Peripherals, Storage Media.	07
Unit IV	Concept, components and types of Information Systems; Information retrieval and search systems; Information and communication technologies; Internet, HTML, FTP, Web browsers, search engine, Email, IoT; Cloud Computing; AI, GenAI, LLM. Applications of Information Science in e-Governance, e-Commerce, education, healthcare, business and digital society; Information security, privacy, ethics and responsible use of information.	07

SET/IE/BT/C205 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. Fitzgerald, D.E., Higginbotham and A Grabel, "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/C206		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, currentvoltage characteristics; MOSFET as a Switch, MOSFET as a Voltagedependent 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/CS/SC/C207		Basics Python Lab (Skill Enhancement Course)
Course Objective:	1. To make the student learn about Python programming language. 2. To develop basic programs using primitive data structures.	
Course Outcome:	After Completion of this course the student would be able to know about the basic Python programming.	
Module Name	Content	No. of Hrs
Module I	Install Python and write your first program	5
Module II	Describe the basics of the Python programming language	10
Module III	Use variables to store, retrieve and calculate information, Utilize core programming tools such as functions and loops	15
	Besides these additional experiments can be included to give hands on experience to students.	
	Total Hours	30