Curriculum and Syllabus

Bachelor of Technology

(Computer Science and Engineering)

(As per National Education Policy-2020)

(Effective from Aug 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 CUET 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 CUET (UG). 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: CUET (UG) merit list: **After the CUET (UG) merit list is exhausted; the vacant seats may be filled up by the candidates from the merit list of the university level counselling on the basis of JEE Main's Score merit.**

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 regards 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 have to do skill-based training of two months. This skill based training will be of 4 credit 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 credit 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 credit 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.

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

General Instructions

Mandatory Induction Program

3 weeks duration
❖ Physical activity ❖ Creative Arts ❖ Universal Human Values ❖ Literary ❖ Proficiency Modules ❖ Lectures by Eminent People ❖ Visits to local Areas ❖ Familiarization to Dept./Branch & Innovations

Induction program for students is to be offered right at the start of the first year. Appendix –I sheet has attached for details.

Code for Courses:

Code for a course consists of two alphabets followed by three digits and an optional alphabet.

- First three alphabets represent the school name (SET: School of Engineering and Technology).
- Next two alphabets in the code represent the subject area of the course, e.g., SH: Applied Science and Humanities, EC: Electronics and Communication Engineering, IE: Instrumentation Engineering, EE: Electrical Engineering, ME: Mechanical Engineering, CS: Computer Science and Engineering, IT: Information Technology.
- Next two alphabets in the code represent the name of program, e.g., BT: B. Tech., MT: M. Tech.
- Then there will be subject code with 4 letters out of which first will tell the nature of subject (C: Core/ E: Elective/ S: Skill/ M: Mandatory/ L: Life Skills and Personality Development) and next three letters will tell the number according to the semester (for example 801 will tell its 8th semester subject). First digit represents the semester. Next two digits represent the sequence number of course in the list of courses of a semester.
- The code of the common syllabus for UG courses of the university will be elaborated as VAC: Value Added Course, AMDSC: Additional Multi-Disciplinary Skill Course.

2. Elective Courses:

Elective courses are provided in V, VI, VII and VIII semesters to provide student with flexibility to choose courses of their interest from a list of offered electives. These Electives are the courses offered by the same department or other departments for the students.

3. **MOOC Courses:** "MOOCs" means Massive Open Online Courses (MOOCs) are such online courses which are developed and made available on the SWAYAM platform of Government of India. MOOCs guidelines on online learning issued by the MHRD vide orders dated 11th March 2016 and subsequent addendums issued by the MHRD.

   Any student can be permitted to opt for only up to 20% of the total courses being offered in a particular program in a semester through the online learning courses provided through SWAYAM platform. Any student can opt, with the permission of the department, the course of the SWAYAM platform, which is available/ offered in the same term (even or odd).

4. For the slow learners, a remedial class of 1 hr., on each working day will be conducted.
5. Entry/Exit options after 1st year, 2nd year, and 3rd year, respectively may be allowed as per the admission procedure and eligibility of the School of Engineering and Technology (SOET).

All the courses and course titles are subject to change at any stage as per directions of Authorities of the University.

Mandatory Induction Program
B.Tech (Computer Science and Engineering)

3 weeks duration
❖ Physical activity ❖ Creative Arts ❖ Universal Human Values ❖ Literary ❖ Proficiency Modules ❖ Lectures by Eminent People ❖ Visits to local Areas ❖ Familiarization to Dept./Branch & Innovations

***Induction program for students to be offered right at the start of the first year.**

Induction Program:

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

❖ Physical Activity:

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

❖ Creative Arts:

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

❖ Universal Human Values:

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc.

Need for character building has been underlined earlier. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program. Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

❖ Literary:

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

❖ Proficiency Modules:

This period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

❖ Lectures by Eminent People:

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

❖ Visits to Local Area:

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

❖ Familiarization to Dept. /Branch & Innovations:

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

PROGRAM OUTCOMES (POS) - ENGINEERING & TECHNOLOGY

Engineering Graduates will be able to:

PO1. Engineering knowledge:	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2. Problem analysis:	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3. Design / development of solutions:	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4. Conduct investigations of complex problems:	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5. Modern tool usage:	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6. The engineer and society:	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7. Environment and sustainability:	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8. Ethics:	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9. Individual and team work:	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10. Communication:	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11. Project management and finance:	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12. Life-long learning:	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES- B. Tech. (CSE)

At the end of the program

PSO1: Graduates will have adequate knowledge of computer engineering domain to become employable in Industry.

PSO2: Graduate will have strong fundamentals and problem solving skills to analyze, design and develop economically feasible solutions for technical and social problems.

PSO3: Graduate will be aware of recent research trends, higher education and entrepreneurial opportunities, and will work ethically towards society.

PSO4: Graduate will be aware about the latest technology in software and hard ware.

PSO5: Graduate will be exposed to industrial training giving hands on experience.

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/SH/BT/C101	Mathematics I	3	-	-	3	3
2		SET/SH/BT/C103	Chemistry	3	-	1	5	4
3	Humanities & Social Science		Communication Skill	3	-	-	3	3
4			Disaster Management	3	-	-	3	3
5	Engineering Science		Basic Electrical Engineering	3	-	1	5	4
6			Basic Electronics	3	-	-	3	3
7	Engineering Science (Skill)		Internet Technology Lab	-	-	1	4	2
8	Mandatory Course*		Understanding & Connecting Students with the Environment	-	-	-	-	-
Total				18	4	3	26	22

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/SH/BT/C201	Mathematics II	3	-	-	3	3
2		SET/SH/BT/C202	Physics	3	-	1	5	4
3	Humanities & Social Science		Mental Health & Wellbeing	3	-	-	3	3
4	Engineering Science		Basic Mechanical Engineering	3	-	-	3	3
5			Engineering Mechanics	3	-	-	3	3
6			Programming in C	3	-	1	5	5
7	Engineering Science (Skill)		Engineering Graphics and Workshop Practice	-	-	1	2	1
8	Mandatory Course*		A Life Skills and personality Development*	-	-	-	-	-
Total				18	-	3	24	22

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/SH/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/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. 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 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/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 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/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, 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.	

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**

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**

Semester II

SET/SH/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 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 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 ($E < Vo$), 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/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. 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 (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/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, 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".

SET/CS/BT/C105 Problem Solving and Programming in C		
Course Objective	1. To introduce the fundamental concepts of programming using the C language. 2. To develop problem-solving skills and logical thinking through the creation and execution of C programs. 3. To teach the use of control statements, functions, pointers, arrays, and data structures in C. 4. To provide hands-on experience with file input/output operations in C. 5. To prepare students for more advanced programming courses and practical applications in various fields.	
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 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/ME/BT/C208	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	1. Students will be proficient in using drawing instruments and applying current Indian Standard Code of Practice for Engineering Drawing. 2. Students will be able to accurately project points, lines, and planes in different coordinates and understand the concepts of true lengths and traces. 3. Students will develop the skills to project polyhedral and solids of revolution, including projections with axes inclined to reference planes. 4. Students will gain the ability to convert pictorial views into orthographic projections and create detailed technical drawings of machine components. 5. 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	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.	

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**

SET/SH/BT/C207	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.