



DR. B. C. ROY ENGINEERING COLLEGE

An Autonomous Institution

Approved by: All India Council for Technical Education (AICTE)

*Affiliated to: Maulana Abul Kalam Azad University of Technology (MAKAUT),
West Bengal (Formerly Known as -WBUT)*

Jemua Road, Durgapur, West Bengal, India, 713206

BACHELOR OF TECHNOLOGY [B. Tech.]

Common Syllabus of 1st Year [Group-B]

[CSE / IT / DS / CSD]

(Applicable from the academic session 2024-2025)

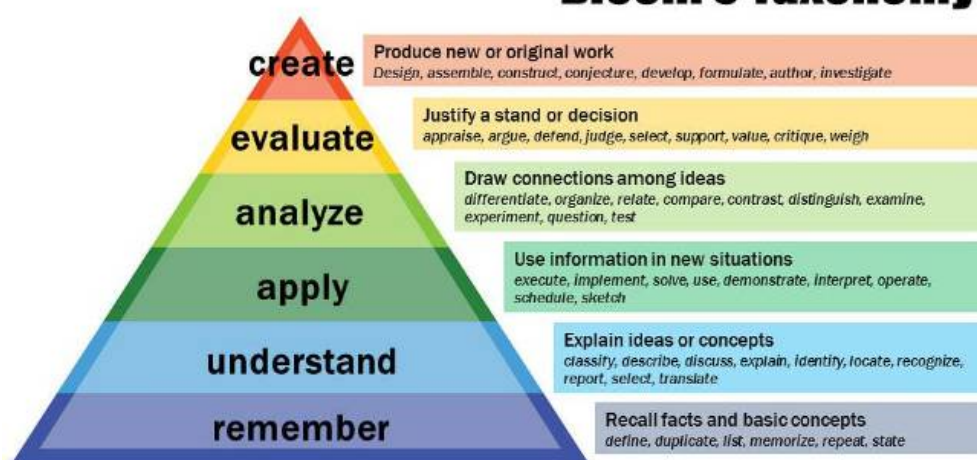


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BLOOM'S TAXONOMY

Bloom's taxonomy is a framework for categorizing educational goals, developed by a committee of educators chaired by Benjamin Bloom in 1956. It was first introduced in the publication *Taxonomy of Educational Objectives: The Classification of Educational Goals*. The taxonomy divides learning objectives into three broad domains: cognitive (knowledge-based), affective (emotion-based), and psychomotor (action-based), each with a hierarchy of skills and abilities. These domains are used by educators to structure curricula, assessments, and teaching methods to foster different types of learning.

Bloom's Taxonomy



Revised Bloom's Taxonomy Action Verbs

Definitions	I.Remembering	II.Understanding	III.Applying	IV.Analyzing	V.Evaluating	VI.Creating
Bloom's Definition	Exhibit memory of previously learned material by recalling facts, terms, basic concepts and answers	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting giving descriptions and stating main ideas	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way	Examine & break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations	Present & defend opinions by making judgements about information, validity of ideas or quality of work based on a set of criteria	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions
Verb's	- Choose - Define - Find - How - Label - List - Match - Name - Omit - Recall - Relate - Select - Show - Spell - Tell - What - When - Where - Which - Who - Why	- Classify - Compare - Contrast - Demonstrate - Explain - Extend - Illustrate - Infer - Interpret - Outline - Relate - Rephrase - Show - Summarize - Translate	- Apply - Build - Choose - Construct - Develop - Experiment with - Identify - Interview - Make use of - Model - Organize - Plan - Select - Solve - Utilize	- Analyze - Assume - Categorize - Classify - Compare - Conclusion - Contrast - Discover - Dissect - Distinguish - Divide - Examine - Function - Inference - Inspect - List - Motive - Relationships - Simplify - Survey - Take part in - Test for - Theme	- Agree - Appraise - Asses - Award - Choose - Compare - Conclude - Criteria - Criticize - Decide - Deduct - Defend - Determine - Disprove - Estimate - Evaluate - Explain - Importance - Influence - Interpret - Judge - Justify - Mark - Measure - Opinion - Perceive - Prioritize - Prove - Rate - Recommend - Rule on - Select - Support - Value	- Adapt - Build - Change - Choose - Combine - Compile - Compose - Construct - Create - Delete - Design - Develop - Discuss - Elaborate - Estimate - Formulate - Happen - Imagine - Improve - Invent - Make up - Maximize - Minimize - Modify - Original - Originate - Plan - Predict - Propose - Solution - Solve - Suppose - Test - Theory

Program Outcomes (Revised)

1. **PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. **PO8: Individual and Collaborative Teamwork:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
9. **PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
10. **PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **PO11: Life-Long Learning:** Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

COURSE STRUCTURE: Group-B

1stYr (1st Semester)

Theory							
Sl No	Paper Name	Paper Code	Marks	L	T	P	Credit
1	Chemistry	CH-101	100	3	0	0	3
2	Mathematics-I	M-101	100	3	0	0	3
3	Engineering Mechanics	ME-101	100	3	0	0	3
4	Basic Electronics Engineering	EC-101	100	3	0	0	3
5	Introduction to Computer Hardware and Software	CS-101	100	3	0	0	3
	Total Theory		500	15	0	0	15
Practical							
1	Chemistry Lab	CH-191	100	0	0	2	1
2	Basic Electronics Engineering Lab	EC-191	100	0	0	2	1
3	Introduction to Computer Hardware and Software Lab	CS-191	100	0	0	4	2
4	Engineering Graphics	ME-191	100	0	0	4	2
	Total Practical		400	0	0	12	6
	Total in 1st Semester		900	15	0	12	21
Mandatory Courses							
1	Environmental Science	ENV-101	100	1	0	0	0

B. Tech. 1stYr (2nd Semester)

Theory							
Sl. No.	Paper Name	Paper Code	Marks	L	T	P	Credit
1	Mathematics-II	M-202	100	3	0	0	3
2	Physics	PH-201	100	3	0	0	3
3	Basic Electrical Engineering	EE-201	100	3	0	0	3
4	English Language and Technical Communication	ENG-201	100	3	0	0	3
5	Programming for Problem Solving	CS-202	100	3	0	0	3
	Total Theory		500	15	0	0	15
Practical							
1	Physics Lab	PH-291	100	0	0	2	1
2	Basic Electrical Engineering Lab	EE-291	100	0	0	2	1
3	Workshop Practices	ME-292	100	0	0	4	2
4	Language Lab	ENG-291	100	0	0	2	1
5	Programming for Problem Solving Lab	CS-292	100	0	0	4	2
	Total Practical		500	0	0	14	7
	Total of 2nd Semester		1000	15	0	14	22
Extra Curricular Activity							
1	NSS		100				0

Total Credit in 1st Year: 43

1st SEMESTER SYLLABUS

Group-B

Course Name: Mathematics-I

Course Code: M-101

(Semester- I)

Course Broad Category: Basic Science

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1. Course Prerequisite:

Concept of Mathematics in 10+2 standard.

2. Course Learning Objectives:

The objective of this courses to familiarize the prospective engineers with techniques in calculus multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling more advance level of mathematics and applications that they would find useful in their disciplines.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies, Guest Lectures.

Evaluation System –

CIA-1 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

CIA-2 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

- **End Semester Examination (ESE): Total: 60 Marks**
- **The minimum passing marks to be secured is 40 (40%) out of allotted total 100 marks (CIA: 40 marks and ESE: 60 marks).**

4. Course Content:

Course Name: Mathematics-I

Course Code: M-101

Hours per Week: 3L: 0T: 0P

Credits: 3

Module	Topics	45L
1.	Sequence and Series: Sequences: Limit of a Sequence, Boundedness, Convergence, Divergence and Oscillation of a Sequence. Infinite Series: Necessary Condition for Convergence, Tests for Convergence and Divergence, Comparison Test: Only for Series with Positive Terms, Cauchy's Integral Test, D'Alembert's Ratio Test, Cauchy's Root Test, Raabe's Test (Higher Ratio Test), Logarithmic Test, Alternating Series Leibnitz's Theorem, Absolute Convergence and Conditional Convergence, Power Series.	8L
2.	Differential Calculus (Single Variables): Functions of single variable: Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Taylor's Series and Maclaurin's Series Expansions with Different forms of Remainders (Only statements and applications in all cases).	6L
3.	Differential Calculus (Several Variables): Functions of Several Variables: Limit and Continuity, Partial Differentiation, Total Derivative. Partial Differentiation of Composite Functions: Change of Variables, Differentiation of an Implicit Function, Euler's Theorem for Two variables (statement only), Jacobian, Taylor's Theorem for Function of Two Variables (statement only), Maxima and Minima of Functions of Two Variables: With and Without Constraints, Lagrange's Method of Undetermined Multipliers.	10L
4.	Integral Calculus: Improper Integrals: Different types of Improper Integrals and their Convergence, Beta and Gamma function and their properties. Double Integrals and Triple Integrals - Application of Double Integrals and Triple Integrals, Change of Order of Integration.	9L
5.	Linear Algebra: Real Matrices: Symmetric, Skew-Symmetric, and Orthogonal Matrices (examples and uses), Inverse of a Matrix, Rank of a Matrix, Diagonalization of a Matrix. Complex Matrices: Hermitian, Skew-Hermitian, Unitary Matrices (examples and uses). Determinants, Solutions of Linear System of Equations-- Existence, Uniqueness. Cramer's Rule, Gauss-Jordan Elimination., Gauss Elimination Method, LU-decomposition Method from Gaussian Elimination. Basics of Group Theory. Vector Spaces, Basis, Dimension and Nullity. Linear Dependence and Independence. Matrix Eigenvalue Problem - Determining Eigenvalues and Eigenvectors, Cayley-Hamilton Theorem (statement only and uses), Some Applications of Eigenvalue Problems, Linear Transformations.	12L



5. Suggested Learning Resources::

Text Book:

- B. S. Grewal-- Higher Engineering Mathematics; **Publisher.** Khanna **Publishers.**
- Ramana B. V. --- Higher Engineering Mathematics; **Publisher.** McGraw Hill Education.

Reference Books:

- G. B. Thomas & R.L. Finney--- Calculus and Analytic Geometry; **Publisher.** Penguin Random House Australia.
- E. Kreyszig--- Advanced Engineering Mathematics (9th Edition); **Publisher.** Wiley.
- Veerarajan T.--- Engineering Mathematics for 1st year (TMG); **Publisher.** McGraw Hill Education.
- D. Poole---- Linear Algebra: A Modern Introduction; **Publisher.** Cengage Learning India Private Limited.
- Bali & Goel--- Text Book of Engineering Mathematics; **Publisher.** Laxmi **Publications**
- H. K. Das---Higher Engineering Mathematics; **Publisher.** Visionias.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
M 101.1	Remember to identify different tools in algebra and calculus which would enable them to devise engineering solutions to encounter in their profession life.	Identify	Remember
M 101.2	Understand the concept to explain applications of functions of single and several variables in applied sciences and engineering problems.	Explain	Understand
M 101.3	Apply to implement the concept of partial derivatives in finding the maxima and minima of a function of several variables in the area of real-life problems.	Implement	Apply
M 101.4	Analyze the ideas of mentioned mathematical tools to organize complex real-life problems.	Organize	Analyze
M 101.5	Evaluating the gradation of described mathematical tools in linear algebra to assess the right approach to solve multidisciplinary engineering problems.	Assess	Evaluate
M 101.6	Construct logical and analytical skills to create a new idea appreciated by academics, research & emerging trends in industry.	Construct	Create

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	2	-	1
2	2	3	-	1	-	1
3	2	3	3	2	-	1
4	3	-	-	2	-	1
5	2	-	-	1	3	1

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M 101.1	2	2	2	2	1	-	-	-	-	-	1
M 101.2	3	2	1	1	-	-	-	-	-	-	1
M 101.3	3	2	2	1	1	-	-	-	-	-	1
M 101.4	2	3	1	2	2	-	-	-	-	-	2
M 101.5	3	2	1	2	2	-	-	-	-	-	1
M 101.6	2	1	1	1	-	-	-	-	-	-	1

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			
CO6			



Course Name: CHEMISTRY

Course Code: CH-101

(Semester- I)

Course Broad Category: BASIC SCIENCE

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1. Course Prerequisite:

Class-XII level knowledge of Chemistry, Mathematics, and Environmental Science.

2. Course Learning Objectives:

- i. This course impart basic knowledge of chemistry, general awareness of environmental pollution aspects, their impact and the basic ideas about material science (structure property relationships) among the engineering students for the better foundation of technical education.
- ii. To provide basic fundamentals among the upcoming young engineers and to carry out advanced research work in chemistry and allied domains.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies and Guest Lectures.

Evaluation System –

CIA-1 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

CIA-2 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

➤ **End Semester Examination (ESE): Total: 60 Marks**

➤ **The minimum passing marks to be secured is 40 (40%) out of allotted total 100 marks (CIA: 40 marks and ESE: 60 marks).**



4. Course Content:

Course Name: Chemistry

Course Code: CH-101

Hours per Week: 3L: 0T: 0P

Credits: 3

Module	Topics	42L
1.	<u>Chemical Bonding:</u> Molecular orbitals of homonuclear and heteronuclear diatomic molecules. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Organometallic compounds and their Industrial Applications. Band structure of solid sand the role of doping on band structure.	8L
	<u>Thermodynamics & Electrochemistry:</u> Introduction, thermodynamic functions: enthalpy, entropy and free energy. Estimations of entropy and free energies. Gibbs Helmholtz equation. Electrochemistry- conductance, Sp. Conductance, equivalent conductance, Ostwald dilution law, conductometric titration. Free energy and EMF. Cellpotentials, The Nernst equation and applications. Latium Ion Battery, H ₂ /O ₂ fuel Cells. Water chemistry. Corrosion.	7L
2.	<u>Organic Reactions & Mechanism:</u> Introduction to reactions involving substitution,, addition, elimination, oxidation, reduction, Condensation.	6L
	<u>Polymer: Properties & Applications:</u> Concepts, classifications and industrial applications. Polymer molecular weight (number avg. weight avg. viscosity avg.: Theory and mathematical expression only), Poly dispersity index (PDI). Polymerization processes (addition and condensation polymerization), degree of polymerization, Copolymerization, stereo-regularity of polymer, crystallinity (concept of T _m) and amorphicity (Concept of T _g) of polymer. Preparation, structure and use of some common polymers: plastic (PE:HDPE, LDPE, PVC, Bakelite, PP), rubber (natural rubber, SBR, NBR) and Vulcanization. Fibre (nylon 6.6, Nylon 6, Polyester). Conducting and semi-conducting polymers.	5L
3.	<u>Industrial Chemistry:</u> Solid Fuel: Coal, Classification of coal, constituents of coal, carbonization of coal (HTC and LTC), Coalanalysis: Proximate and ultimate analysis. Liquid fuel: Petroleum, classification of petroleum, Refining, Petroleum distillation, Thermal cracking, Octane number, Cetane number, Gaseousfuels: Naturalgas, watergas, coalgas, biogas. Cement and its classification, Chemical composition, Physical properties, Setting and hardening, Properties. <i>Iron and steel manufacturing, Hardening and annealing, Alloy Steel</i>	6L
	<u>Spectroscopic Techniques & Applications:</u> Basic concepts of UV, IR, NMR spectroscopy and their applications. MRI and its structural elucidation.	3L



Module	Topics	42L
4.	<u>Nanochemistry & Composite Materials:</u> Nanotechnology: Introduction, Synthesis, Properties, Nanomaterials, Nanostructure, Nanochemistry and environmental application like water purification. Composite materials: Introduction, Constituents, Fibre reinforced composites, Particle reinforced composites, Failure.	3L
	<u>Green Chemistry:</u> Introduction, Principles of green chemistry, Use of alternative feed stock, Use of Alternative Solvents, Design of safer chemicals, Bio-fuel for sustainable development using green chemistry. Atom economy.	3L

5. Suggested Learning Resources::

Text Book:

1. Engineering Chemistry, Jain and Jain, Dhanpat Rai & Co Pvt Ltd
2. A Text book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co Pvt Ltd
3. Engineering Chemistry, Gourkrishna Das Mohapatra, Vikas Publishing House
4. Engineering Chemistry, K. L. Chugh, Kalyani Publishers.
5. Engineering Chemistry, Wiley

Reference Books:

1. General & Inorganic Chemistry, R. P. Sarkar, New Central Book Agency P Ltd
2. I.L. Finar, Organic Chemistry, Addison Wesley Longman, Inc
3. Organic Chemistry, Morrison & Boyd, Prentice Hall of India
4. Physical Chemistry, K.L. Kapoor, McMillan
5. P. C. Rakshit, Physical Chemistry, Sarat Book House (7th Edition)
6. Green Chemistry Theory and Practice By Paul T. Anastas, John Charles Warner Oxford University Press

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CH 101.1	Correlate Structure and Properties of Solids and Coordination Compounds.	Identify, Select	Analyse
CH 101.2	Rationalise bulk properties and processes using thermodynamic and electrochemical concept	Explain	Understand
CH 101.3	Interaction of radiation with matter and structural elucidation.	Recognize	Understand
CH 101.4	Analysis of polymeric property and application of industrial materials.	Identify, Implement	Apply
CH 101.5	Importance of green chemistry and nanomaterial towards structural application and sustainable development.	Design	Apply
CH 101.6	Organic reaction mechanism and structural determination.	Implement	Apply

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	3	-	-	-	-
2	-	-	-	3	-	3
3	-	-	3	2	-	-
4	-	-	-	-	3	-

8. Mapping of the Course outcomes to Program Outcomes (PO)

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11
CH 101.1	2	1	1	-	-	-	-	-	-	-	2
CH 101.2	1	2	1	-	-	-	-	-	-	-	2
CH 101.3	1	1	1	-	-	-	-	-	-	-	2
CH 101.4	1	2	1	-	-	-	-	-	-	-	2
CH 101.5	1	2	1	-	-	-	-	-	-	-	2
CH 101.6	1	1	2	-	-	-	-	-	-	-	2

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1			-	-
CO2			-	-
CO3			-	-
CO4			-	-
CO5			-	-
CO6			-	-



Course Name: BASIC ELECTRONICS ENGINEERING

Course Code: EC-101

(Semester– I)

Course Broad Category: ENGINEERING SCIENCE

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1. Course Prerequisite:

Class-XII level knowledge of Physics and Mathematics

2. Course Learning Objectives:

- i. This course introduces the concepts about solid-state electronic components and their applications.
- ii. Students will also learn to design and analyze basic analog electronic and digital logic circuits.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

CIA-1 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

CIA-2 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

- **End Semester Examination (ESE): Total: 60 Marks**
- **The minimum passing marks to be secured is 40 (40%) out of allotted total 100 marks (CIA: 40 marks and ESE: 60 marks).**

4. Course Content:

Course Name: BASIC ELECTRONICS ENGINEERING

Course Code: EC-101

Hours per Week: 3L: 0T: 0P

Credits: 3

Module	Topics	36L
1.	Semiconductor Diodes: Semiconductor materials- intrinsic and extrinsic types • Ideal Diode, practical diode: open circuit, forward and reverse bias condition, V-I characteristics, knee voltage, junction breakdown: Avalanche and Zener • Peak Inverse Voltage (PIV), small signal model, Zener diode and its application • Half-wave, Full-wave (centre tapped) and bridge Rectifier: efficiency, ripple factor, PIV etc, Clipper: positive, negative and biased, Clamper: positive and negative, biased	11L
2.	Bipolar Junction Transistors (BJTs): Physical structure and operation • Operating region of BJT • D.C. analysis • Biasing the BJT: fixed bias, emitter feedback bias, collector feedback bias and voltage divider bias • load line, Bias stability, Basic BJT amplifier configuration: common emitter, common base and common collector • relation between α , β and γ , Transistor as a switch: cut-off and saturation modes.	10L
3.	MOS Field Effect Transistor (MOSFET): Enhancement-type MOSFET: structure and physical operation, • Depletion, accumulation and inversion region, • threshold potential, Pass-characteristics • Drain and Transfer characteristics, • Cut-off, linear and saturation region, punch-through breakdown • drain resistance, trans-conductance, • channel length modulation, • Depletion-type MOSFET • CMOS Inverter, transient response, delay definition.	5L
4.	Operation Amplifier (Op-amps): Ideal Op-amp Characteristics: Common Mode Rejection Ratio (CMRR), input/output offset voltage and current, slew rate, PSRR etc • Op-amp circuits: comparator, unity gain buffer, inverting amplifier, non-inverting amplifier, adder, subtractor, integrator, differentiator etc.	5L



Module	Topics	36L
5.	Digital Electronics: Binary, octal and hexadecimal number systems, number conversion. Binary arithmetic: Addition, subtraction, multiplication and division, basic and universal Logic gates, Truth tables. Function Representation in SOP, POS form; Min-term, Max-term, Canonical Form, Boolean algebra, demorgan's theorem, k-map optimization, logic design.	5L

5. Suggested Learning Resources::

Text Book:

- Electronic Principles, by Sanjay Sharma, S.K.Kataria & Sons
- Integrated Electronics by Millman & Halkias

Reference Books:

- Electronics Devices & Circuits by Salivahanan
- Electronics Circuits by Schilling & Belove

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC 101.1	Understand and Explain the characteristics of P-N junction diode	Explain	Understand
EC 101.2	Identify and analyze the characteristics of Bipolar Junction Transistor	Identify	Analyze
EC 101.3	Identify the characteristics of MOSFET and apply for digital circuit design	Identify, Design	Apply
EC 101.4	Apply diode, BJT and MOSFET to design various electronic circuits	Design	Apply
EC 101.5	Understand and Implement op-amp circuit for different mathematical operations	Implement	Understand
EC 101.6	Design and analyze digital logic circuits	Design	Analyze

7. Mapping of Course Outcomes (CO) to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	2	-	-
2	-	3	-	2	-	-
3	-	-	3	2	-	-
4	-	-	-	2	3	-
5	-	-	-	2	-	3



8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
EC 101.1	3	1	1	1	-	-	-	-	-	2	-	1
EC 101.2	3	1	1	1	-	-	-	-	-	2	-	1
EC 101.3	3	1	1	1	-	-	-	-	-	2	-	1
EC 101.4	3	1	1	1	-	-	-	-	-	2	-	1
EC 101.5	3	1	1	1	-	-	-	-	-	2	-	1
EC 101.6	2	1	1	1	-	-	-	-	-	2	-	1

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			



Course Name: ENGINEERING MECHANICS

Course Code: ME-101

(Semester- I)

Course Broad Category: Engineering Science

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1. Course Prerequisite:

Class XI and XII level knowledge of Mechanics, Mathematics (Vector Algebra and Coordinate Geometry, Differential and Integral Calculus)

2. Course Learning Objectives:

- iii. This course introduces Statics and Dynamics of Engineering Mechanics with elaborate concepts on equilibrium of forces and motion under forces.
- iv. Students will also get introduced to the subject of Mechanics of Deformable Bodies.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and real world problem discussion.

Evaluation System –

CIA-1 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

CIA-2 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

- **End Semester Examination (ESE): Total: 60 Marks**
- **The minimum passing marks to be secured is 40 (40%) out of allotted total 100 marks (CIA: 40 marks and ESE: 60 marks).**



4. Course Content:

Course Name: Engineering Mechanics

Course Code: ME-101

Hours per Week: 3L: 0T: 0P

Credits: 3

Module	Topics	42L	CO
1.	Introduction to Statics: Importance of Mechanics in engineering; Fundamental idealization: Particle and Rigid body concept; Types of forces (collinear, concurrent, parallel, concentrated and distributed); Vector and scalar quantities; Transmissibility of a force (sliding vector); Lami's Theorem. Introduction to Vector Algebra: Parallelogram law; Addition and subtraction of vectors; Free vector, Bound Vector; Representation of Forces and Moments in terms of i, j, k; Cross product and Dot product and their applications. Two and Three Dimensional Force Systems: Moment and Couple; Varignon's theorem; Resolution of a coplanar force by its equivalent Force-couple system. Concept of Equilibrium in Two and Three dimensions; Free body concept; Equations of Equilibrium.	12L	CO1 and CO2
2.	Concept of Friction: Laws of Coulomb friction; Angle of Repose; Coefficient of friction; Types of friction. Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular arc, quadrilaterals, circular sector, triangular lamina, composite areas. Moment of Inertia: M.I of plane figure with respect to an axis in its plane; M.I of plane figure with respect to an axis perpendicular to the plane of the figure, Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. circular plate, ring, cylinder, sphere, rod.	12L	CO3 and CO4
3.	Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non uniformly accelerated rectilinear motion; construction of x-t, v-t and a-t graphs. Plane Curvilinear Motion of Particles: Rectangular components (Projectile motion); Normal and Tangential components (Circular motion). Kinetics of Particles and Rigid bodies: Newton's second law; Equation of motion; D. Alembert's principle and free body diagram; Principle of work and energy; Principle of conservation of energy; Principle of Linear Impulse and Momentum; Power and efficiency with simple examples.	16L	CO5
4.	Concept of Simple Stresses and Strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shear strain; Hooke's law;	5L	CO6



Module	Topics	42L	CO
	Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Proportional limit; Elastic limit; Yielding; Ultimate stress; Modulus of elasticity; Working stress; Factor of safety; Definition of malleability, ductility, toughness and resilience; Basic concept of thermal stress and strain.		

5. Suggested Learning Resources::

Text Book:

1. Engineering Mechanics by S. S. Bhavikatti, New Age International Publishers, 9th Edition, 2023.
2. Engineering Mechanics by S. Rajasekaran & G. Sankarasubramanian, Vikas Publishing House Pvt Ltd., Noida.

Reference Books:

1. Engineering Mechanics: Statics & Dynamics by I. H. Shames, 4th ed. – PHI.
2. Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11th ed. – Pearson.
3. Engineering Mechanics by R.S. Khurmi, S. Chand Publications, Delhi.
4. A Text Book of Engineering Mechanics by Bansal R. K.(2010), Laxmi Publications.
5. Elements of Strength of Materials by Timoshenko & Young, 5th ed. – E.W.P.
6. Engineering Mechanics by M.P. Poonia & D.S. Bedi, Khanna Publishing House, 2019.
7. Mechanics for Engineering by Beer, F.P. and Johnston.
8. Fundamental Concepts In Engineering Mechanics by Suman Chakraborty, Everest PublishingHouse
9. Engineering Mechanics by Timoshenko, Young and Rao, Revised 4th ed. – TMH.
10. Engineering Mechanics by Basudeb Bhattacharyya– Oxford University Press.
11. Fundamentals of Engineering Mechanics by Debabrata Nag & Abhijit Chanda – ChhayaPrakashani
12. Engineering Mechanics [Vol-I & II] by Meriam & Kraige, 5th ed. – Wiley India.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
ME 101.1	Explain the fundamental principles of mechanics, including the importance of mechanics in engineering and the concepts of particles and rigid bodies.	Explain	Understand
ME 101.2	Determine analytically the forces and moments acting on statically determinate structure.	Identify, Select	Understand
ME 101.3	Understand the presence and effects of friction in statics and dynamics.	Implement	Understand
ME 101.4	Compute the centroid of lamina and centre of gravity of solids, area moment of inertia, mass moment inertia of solids.	Compute	Evaluate



ME 101.5	Apply the fundamental concept of kinematics and kinetics to determine displacement, velocity and acceleration of particle and rigid body during linear/ angular/ general plane motions and the extension of Newton's law of motion to work energy principle and Impulse momentum principle.	Apply	Apply
ME 101.6	Understand the deformation and mechanical behaviour of bodies under various load conditions.	Recognize	Understand

7. Mapping of course outcomes to module / course content (hrs)

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	6	6				
2			6	6		
3					16	
4						5

8. Mapping of the Course outcomes to Program Outcomes (PO)

COs	CO-PO Correlation Level											BT
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	
ME 101.2	2	2	1	2	1	1	1	-	2	1	1	U(L2)
ME 101.3	2	2	2	2	2	2	1	-	1	1	1	U(L2)
ME 101.4	2	2	1	2	2	-	1	-	2	2	1	P(L3)
ME 101.5	2	2	1	1	1	1	1	-	1	1	1	P(L3)
ME 101.6	2	2	1	1	1	1	1	-	1	1	1	A(L4)
ME 101.2	2	2	2	2	2	1	2	-	2	2	1	U(L2)
AVERAGE	2	1.6	2	1.6	1.6	1.2	1.2	-	1.3	1.1	1	



9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2
CO1	1	-
CO2	1	-
CO3	1	-
CO4	1	-
CO5	1	-
CO6	1	-

BCREC: Estd.-2000; "Dedicated to Quality Education"



Course Name: Introduction to Computer Hardware and Software

Course Code: CS-101

(Semester– I)

Course Broad Category: Engineering Science

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1. Course Prerequisite:

Basic knowledge of computers and general mathematical operations.

2. Course Learning Objectives:

- i. To introduce students to the fundamental concepts of computer hardware and software.
- ii. To equip students with knowledge and practical skills essential for understanding modern computing systems and networks.
- iii. To provide an overview of emerging computing technologies and their applications in various domains.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

CIA-1 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

CIA-2 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

- **End Semester Examination (ESE): Total: 60 Marks**
- **The minimum passing marks to be secured is 40 (40%) out of allotted total 100 marks (CIA: 40 marks and ESE: 60 marks).**

4. Course Content:

Course Name: Introduction to Computer Hardware and Software Course

Course Code: CS-101

Hours per Week: 3L: 0T: 0P

Credits: 3

Module	Topics	Lectures
Unit 1: Computer Basics	Definition and Characteristics of Computers, Evolution of Computers, Generations of Computers, Classification of Computers, Applications of Computers, Computer System, its Components, and their Functions.	4L
Unit 2: Number Systems and Data Representation	Basic Concepts of Number Systems, Binary, Octal, Decimal, and Hexadecimal Number Systems, Conversion Between Different Number Systems (Base 2 to Base 10), Shortcut Methods for Conversion among Binary, Octal, and Hexadecimal, Arithmetic Operations in Different Number Systems, Signed and Unsigned Number Systems, Data Representation: Bits, Bytes, and Words, ASCII and Unicode Character Sets, Boolean Algebra and Logic Gates	10L
Unit 3: Memory	Introduction to Computer Memory, Understanding Data Representation in Computer Memory, Speed, Capacity, and Memory Hierarchy, Primary Memory and its Types, Secondary Memory and Classification of Secondary Memory, Various Secondary Storage Devices and Their Utilities.	4L
Unit 4: Computer Software and its Types	Classification of Computer Software, System Software and Application Software, Utility Software, Operating System (OS): Role and Types (CLI-based OS, GUI-based OS), Mobile OS and Network OS.	4L
Unit 5: Data Communication, Computer Network, and Internet Basics	Fundamental Concepts of Data Communication, Transmission Media, Multiplexing and Switching, Computer Networks (LAN, WAN, MAN, PAN), Network Topologies (Bus, Star, Ring, Mesh, and Hybrid), Network Devices: Router, Switch, Hub, Bridge, Gateway, Basics of the Internet and Protocols (TCP/IP, HTTP, FTP, etc.), Email and Client-Server Architecture.	6L
Unit 6: Basics of Programming	Problem-Solving: From Algorithms (Pseudo code and Flowcharts) to Program, Concept of Variables and Constants, Operators, Naming Rules for Variables. Decision Making and Iteration, Concept of Compilers and Interpreters.	6L
Unit 7: Emerging Processing and Computing Technologies	Multi-core processor, Graphics Processing Unit (GPU), Tensor Processing Unit (TPU), Neural Processing Unit (NPU), Quantum Processor, Artificial Intelligence and Machine Learning (AI/ML), Cloud Computing, Cybersecurity, Internet of Things (IoT), Augmented Reality (AR) and Virtual Reality (VR), Big Data and Data Analytics.	4L

5. Suggested Learning Resources::

Text & Suggested Learning Resources: Books:

- Introduction to Computer Science; Pearson publication
- Fundamentals Of Computers by V. Rajaraman, PHI Learning
- Fundamentals of Computers by E Balagurusamy, McGraw Hill Education (India)

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CS 101.1	Define, describe, and classify computers, their evolution, and their components. Explain the role of computer systems and their applications in real-world scenarios.	Define, describe, classify & Explain	Remember, Understand
CS 101.2	Apply arithmetic operations and conversion techniques between binary, octal, decimal, and hexadecimal number systems. Analyze Boolean algebra expressions and evaluate logic gate operations to solve problems in data representation.	Apply, Analyze, Evaluate & Solve	Apply, Analyze
CS 101.3	Analyze different memory types (primary and secondary) and their characteristics such as speed, capacity, and usage. Compare and evaluate the performance impact of memory hierarchy on computer systems.	Analyze, Compare & Evaluate	Analyze, Evaluate
CS 101.4	Classify various types of software (system software, application software, utility software) and describe their roles in the functioning of computer systems. Examine operating systems, mobile OS, and network OS and assess their impact on the environment and user experience.	Classify, Describe, Examine & Assess	Understand, Classify, Examine
CS 101.5	Apply principles of data communication and network design, including the use of routers, switches, and other networking devices. Analyze network topologies, internet protocols (TCP/IP, HTTP, FTP), and demonstrate the use of networking tools to establish basic computer networks.	Apply, Analyze, & Demonstrate	Apply, Analyze, Demonstrate
CS 101.6	Explore emerging technologies such as multi-core processors, GPUs, and quantum processors. Evaluate the applications of Artificial Intelligence, Cloud Computing, IoT, AR/VR, and Big Data in modern computing. Students will demonstrate the ability to adapt to new technologies and collaborate in interdisciplinary teams.	Explore, Evaluate, Demonstrate, Adapt & Collaborate	Evaluate, Explore, Collaborate



7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-
4	-	-	-	3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3
7	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CS 101.1	3	2	1		2	1	-	-	-	2	-
CS 101.2	3	3	2	2	2	-	-	-	-	1	-
CS 101.3	3	2	2	1	2	-	-	-	-	1	-
CS 101.4	2	2	2	1	3	-	-	-	-	1	-
CS 101.5	2	3	2	1	2	1	1	-	-	2	-
CS 101.6	3	2	3	2	3	-	-	1		2	-

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			
CO6			

Course Name: Environmental Science
Course Code: ENV-181
(Semester- I)
Course Broad Category: Mandatory Course

1. Course Prerequisite:

Class-XII level knowledge of Environmental Science, Chemistry and Mathematics.

2. Course Learning Objectives:

- This course impart basic knowledge of environment, general awareness of environmental pollution aspects, their impact and the basic ideas about material science (structure property relationships) among the engineering students for the better foundation of technical education.
- To provide basic fundamentals among the upcoming young engineers and to carry out advanced research work in environmental science and allied domains.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies and Guest Lectures.

Evaluation System–

A. Report Writing: 50 Marks

B. Student Seminar at End Semester: 50 Marks

4. Course Content:

Course Name: Environmental Science

Course Code: ENV-181

Hours per Week: 1L:0T:0P

Credits: 0

Module	Topics	42L
1.	Basic Concepts of Environment: Basic ideas of environment and its component, Renewable and nonrenewable resources and reserves. <u>Air pollution and control:</u> Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere and their temperature variations. Lapse rate: Ambient lapse rate, adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). Green House Effects: Definition, impact of greenhouse gases Green house effects: Definition, impact of green house gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Acid rain: causes, effects and control. Earth's heat budget, carbon capture, carbon footprint Definition of pollutants and contaminants, Primary and secondary pollutants, criteria pollutant. Sources and effect of different air	8L

Module	Topics	42L
	pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. Photochemical Smog. Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP, cyclone separator, bag house, catalytic converter, scrubber Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification	
2.	Water Pollution and Control Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides. River/Lake/groundwater pollution: River: DO, 5day BOD test, Unseeded and Seeded BOD test, BOD reaction rate constants, COD. Aquifers, hydraulic gradient, ground water flow (Definition only)	4L
6.	Noise Pollution Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighborhood noise]. Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L_{10} (18hr Index), effective perceived noise level. Noise pollution control.	2L
4.	Land Pollution Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes, electronic waste Recovery and disposal method- Open dumping, Land filling, incineration, composting. Recycling, Reduce, Reuse, Refuse.	2L

5. Suggested Learning Resources::

Text Book:

1. Gour Krishna Das Mahapatra, Basic Environmental Engineering and Elementary Biology, Vikas Publishing House P. Ltd.

Reference Books:

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. De, A. K., "Environmental Chemistry", New Age International.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
ENV 101.1	To understand the natural environment and its relationships with human activities.	Identify, Select	Understand
ENV 101.2	To apply the fundamental knowledge of science and engineering to assess environmental and health risk.	Apply, Explain	Evaluate



ENV 101.3	To develop guidelines and procedures for health and safety issues obeying the environmental energy aspects.	Recognize	Create
ENV 101.4	To acquire skills for scientific problem-solving related to air, water, land and noise pollution.	Identify, Implement	Analyze
ENV 101.5	To acquire knowledge about various Waste Management aspects.	Design	Analyze

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5
1	3	3	2	3	2
2	-	1	2	3	1
3	-	1	-	3	1
4	-	1	-	3	1

8. Mapping of the Course outcomes to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
ENV 101.1	1	1	1	-	-	2	-	-	-	-	2
ENV 101.2	1	1	1	-	-	2	-	-	-	-	2
ENV 101.3	1	1	1	-	-	2	-	-	-	-	2
ENV 101.4	1	1	1	-	-	2	-	-	-	-	2
ENV 101.5	1	1	1	-	-	2	-	-	-	-	2

10. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			

Course Name: CHEMISTRY LAB

Course Code: CH-191

(Semester – I)

Course Broad Category: BASIC SCIENCE

1. Course Prerequisite:

Class-XII level knowledge of Chemistry Practical.

2. Course Learning Objectives:

- i. Expose students to various experimental skills and tools
- ii. To gain practical knowledge by applying experimental methods to correlate with the theory. Apply the analytical techniques and graphical analysis to the experimental data.

3. Teaching methodology and evaluation system for the course:

Teaching methodology: Instruction: This method recognizes that students have different learning styles, abilities, and backgrounds, and aims to create a learning environment that accommodates these differences.

Evaluation System–

A. **Internal Assessment (PCIA): (60 Marks)**- Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]

B. **End-Semester Examination: (40 Marks)**- Summative Assessment.

- **The minimum passing marks to be secured is 50 (50%) out of allotted total 100 marks (PCIA: 60 marks and ESE: 40 marks).**

4. Course Content:

Course Name: CHEMISTRY LAB

Course Code: CH-191

Hours per Week: 0L: 0T: 2P

Credits: 1

Module	Topics	10P
1.	Instrumental Analysis: 1. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution. 2. pH-metric titration for determination of strength of a given HCl solution against a standard NaOH solution	2P

Module	Topics	10P
2.	Estimation through Titrimetric Methods: - To determine chloride ion in a given water sample by Argentometric method. - Removal and estimation of hardness of water by Complexometric titration.	2P
3.	Determination of Specific Property of a Solution: - Determination of viscosity of Sugar Solution. - Determination of surface tension of a sugar solution by drop count method. - Determination of partition coefficient of a substance between two immiscible liquids.	3P
4.	Verification of Law & Equations: - Verification of Lambert Beer's Law using visible colorimeter Determination of Stefan's radiation constant. - Study the adsorption of oxalic acid from solution on activated charcoal and examine the validity of Freundlich isotherm. - Determination of dissolved oxygen present in a water sample	3P

Minimum of eight experiments to be performed taking at least one from each module mentioned above.

Textbooks

- Experiments in Applied Chemistry By Dr. Sunita Ratan.
- Quantitative Chemical Analysis By Arthur Vogel.

Reference Books

- Practical Chemistry by Dr. R. C. Bhattacharya.
- Practical Chemistry By S. Chand .

5. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CH 191.1	Implement Instrumental analytical procedure for the enrichment of modern technical skill.	Evaluate	Analyze
CH 191.2	Rationalize inter molecular phenomena using thermodynamic considerations.	Identify, Select	Evaluate
CH 191.3	Understand titrimetric methods of water analysis required for environmental context	Implement	Apply
CH 191.4	Concept of radiation matter interaction and its application.	Design	Create
CH 191.5	Evaluate different surface phenomena by adsorption technique.	Identify, Implement	Apply
CH 191.6	Estimate essential parameter like oxygen in water by titrimetric method.	Recognize	Understand

6. Mapping of course outcomes to module/course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	-	3	-	-	-
3	-	2	-	-	1	-
4	-	-	-	1	1	1

7. Mapping of the Course outcomes to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CH 191.1	2	1				1					2
CH 191.2	2	1				1					2
CH 191.3	2	1				1					2
CH 191.4	2	1				1					2
CH 191.5	2	1				1					2
CH 191.6	2	1				1					2

8. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
C01			-
C02			-
C03			-
C04			-
C05			-
C06			-

BCREC: Estd.-2000; "Dedicated to Quality Education"

Course Name: BASIC ELECTRONICS ENGINEERING LAB
Course Code: EC-191
(Semester – I)
Course Broad Category: ENGINEERING SCIENCE

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1. Course Prerequisite:

Class-XII level knowledge of Physics Practical.

2. Course Learning Objectives:

- i. Expose students to experimental skills on electronic circuit design and analysis
- ii. To gain practical knowledge by applying experimental methods to correlate with the basic electronic theory.
- iii. To apply the analytical techniques and graphical analysis to the experimental data.

3. Teaching methodology and evaluation system for the course:

Teaching methodology: Instruction: This method recognizes that students have different learning styles, abilities, and backgrounds, and aims to create a learning environment that accommodates these differences.

Evaluation System –

A. Internal Assessment (PCIA): (60 Marks)- Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]

B. End-Semester Examination: (40 Marks)- Summative Assessment.

- **The minimum passing marks to be secured is 50 (50%) out of allotted total 100 marks (PCIA: 60 marks and ESE: 40 marks).**

4. Course Content:

Course Name: BASICELECTRONICS ENGINEERING LAB

Course Code: EC-191

Hours per Week: 0L: 0T: 2P

Credits: 1

Module	Topics	13P
1.	Familiarization with electronic component and measuring instruments: 1. Familiarization with Electronic components such as Resistors, Capacitors, Diodes, Transistors etc. 2. Familiarization with measuring equipment like Multimeter, Trainer-kit, CRO, Signal Generator etc.	2P
2.	Experiment on Diode and Diode Circuits: 1. Study on V-I characteristics of Junction Diode.	5P

Module	Topics	13P
	2. Realization of positive and negative Clippers circuit using Diode. 3. Realization of Clamper circuit using Diode 4. Realization of Bridge Rectifier using Diode 5. Realization of Voltage regulator using Zener Diode.	
3.	Experiment on BJT and MOSFET: 1. Study of V-I Characteristics of Bipolar Junction Transistors (BJT). 2. Study on V-I Characteristics of MOS-Field Effect Transistors (MOSFET).	2P
4.	Experiments on OP-AMP circuit: 1. Realization of Inverting and non-inverting Op-amp amplifier 2. Realization of Op-amp Adder	2P
5.	Experiment on Digital Logic: 1. Truth table verification of basic and universal logic gates 2. Logic verification and design of XOR using NAND-Gate	2P

5. Suggested Learning Resources:

Textbooks

- Electronic Principles, by Sanjay Sharma, S.K.Kataria & Sons
- Integrated Electronics by Millman & Halkias

Reference Books

- Electronics Devices & Circuits by Salivahanan
- Electronics Circuits by Schilling & Belove

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EC 191.1	Understand different electronic components and measuring equipments	Explain	Understand
EC 191.2	Select and Examine the characteristics of P-N Junction Diode, BJT and MOSFET	Identify, Select	Examine
EC 191.3	Apply and execute diode clipper, clamper and rectifier circuit	execute	Apply
EC 191.4	Apply and implement Zener-diode Circuit	Implement	Apply
EC 191.5	Implement and examine op-amp circuit	Implement	examine
EC 191.6	Implement and analyze digital circuit using logic gate	Implement	Analyze

7. Mapping of Course Outcomes (CO) to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	2	3	2	-	-
3	-	3	-	-	-	-
4	-	-	-	-	3	-
5	-	-	-	-	-	3

8. Mapping of the Course Outcomes (CO) to Program Outcomes (PO)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
EC 191.1	2	2	1	2	2	-	-	-	-	-	-	2
EC 191.2	3	3	1	2	2	-	-	-	-	-	-	2
EC 191.3	3	3	1	2	2	-	-	-	-	-	-	2
EC 191.4	3	3	1	2	2	-	-	-	-	-	-	2
EC 191.5	3	3	1	2	2	-	-	-	-	-	-	2
EC 191.6	3	3	1	2	2	-	-	-	-	-	-	2

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
C01			
C02			
C03			
C04			
C05			

BCREC: Estd.-2000; "Dedicated to Quality Education"

Course Name: Introduction to Computer Hardware and Software Lab

Course Code: CS-101

(Semester– I)

Course Broad Category: Engineering Science

1. Course Prerequisite:

Basic knowledge of computers and general mathematical operations.

2. Course Learning Objectives:

- To introduce students to the fundamental concepts of computer hardware and software.
- To equip students with knowledge and practical skills essential for understanding modern computing systems and networks.
- To provide an overview of emerging computing technologies and their applications in various domains.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

A. Internal Assessment (PCIA): (60 Marks)- Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]

B. End-Semester Examination: (40 Marks)- Summative Assessment.

- **The minimum passing marks to be secured is 50 (50%) out of allotted total 100 marks (PCIA: 60 marks and ESE: 40 marks).**

4. Course Content:

Course Name: Introduction to Computer Hardware and Software Lab

Course Code: CS-101

Hours per Week: 0L: 0T: 4P

Credits: 2

Unit	Content
Unit 1: Experiments on Dismantling PCs (1P)	- Dismantling the System Unit: Recognize all major components inside a PC, describe the function of each component, and define the relationship of internal components. - Networking Hardware: Familiarize with the basic hardware required for networking.
Unit 2: Basics of CLI and GUI (3P)	- **a) Command Line Interface (CLI)**: - Learn the main set of commands, shortcut keys, switches, path, current directory, and parent directory. - Understand the power and flexibility of CLIs, especially for

	network and system administrators. - Perform tasks such as: 1. Making a list of all files in a photo folder and saving it in a text document. 2. Copying all files changed in the last week to a flash drive. 3. Deleting all files ending in ".doc". 4. Renaming every file ending in ".txt" to ".doc". 5. Other similar tasks. - **b) Graphical User Interface (GUI) and Google Drive**: - Perform similar tasks using a GUI and compare them with CLI operations. - Execute tasks using Google Drive.
Unit 3: Report Formatting using MS Word and Google Docs (2P)	- **a) Basic Document Creation**: - Learn all shortcut keys. - Design and create a Bio-Data or a technical report, including mathematical functions. - **b) Project Report Formatting**: - Given a project report in PDF format, transfer it to word processor software (MS Word or Google Docs). - Format the document to include: - Title page - Specified paragraph and page formatting (page size, orientation, line spacing, font type, font size, indent, bullets, paragraph formatting) - Acknowledgement page - Table of contents page - List of figures page - List of tables page - Bibliography and Suggested Learning Resources: - Distinct headers for each chapter - Page numbering in Roman numerals for initial pages and standard numbering from the first chapter - Check for spelling errors and make corrections.
Unit 4: Content Presentation using Presentation Software (MS PowerPoint and Google Slides) (2P)	- **a) Creating Presentations**: - Prepare presentations on topics such as "Impact of Social Media on Youth" and "Emerging Trends in Mobile Technology". - Include slide animations, slide transitions, sound recordings, slide timings, and customer feedback videos. - Export the presentation as a video or save it as a slideshow. - Prepare handouts for the audience. - **b) Wild-Life Presentation**: - Make a presentation on "Wild-Life" and apply the

	following: - Add audio and video effects. - Apply various color schemes. - Apply various animation schemes. - Apply slide show settings. - **c) Using Google Slides**: - Perform similar tasks using Google Slides.
Unit 5: MS Excel and Google Sheets (3P)	- **a) Basic Operations in MS Excel and Google Sheets**: - Create a worksheet containing roll numbers and marks in 2 subjects for 50 students. - Calculate results and grades: - A student is declared as PASS if they score 40 or more in both subjects, otherwise FAIL. - All FAILED students are given Grade IV. - For PASSED students, the grade is assigned as follows: - Average $\geq 60 \rightarrow$ Grade I - <60 but $\geq 50 \rightarrow$ Grade II - <50 but $\geq 40 \rightarrow$ Grade III - **b) Similar Tasks Using Google Sheets**: - Perform the same tasks using Google Sheets.
Unit 6: Data Capture using Google Forms (1P)	- **a) Creating a Quiz**: - Design and create a quiz using Google Forms. - **b) Data Forms**: - Create data forms for: - Event registration - Event feedback - Customer feedback/satisfaction on a product or service - Order requests
Unit 7: Fundamentals of C Programming (4P) (Optional for Group A)	- **a) Understanding C Programs**: - Learn the structure of a C program, the necessity of preprocessor directives, and how to compile and execute simple C programs. - **b) Debugging C Programs**: - Debug one or two C programs line by line. - Understand and explain the effect of the execution of individual lines at the memory level.

5. Suggested Learning Resources::

Text & Suggested Learning Resources: Books:

- Introduction to Computer Science; Pearson publication
- Fundamentals Of Computers by V. Rajaraman, PHI Learning
- Fundamentals of Computers by E. Balagurusamy, McGraw Hill Education (India)

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details	Action Verb	Knowledge Level
CS 101.1	Identify and describe the major components of a computer system and understand their interrelationships..	Identify, Describe	Knowledge, Comprehension
CS 101.2	Demonstrate proficiency in using both CLI and GUI to perform various tasks.	Demonstrate, Perform	Application, Analysis
CS 101.3	Design, format, and create professional documents and presentations, including project and technical reports, using MS Word, Google Docs, MS PowerPoint, and Google Slides.	Design, Format, Create, Integrate	Application, Synthesis, Evaluation
CS 101.4	Perform basic operations in MS Excel and Google Sheets for data analysis and grade calculation.	Perform, Calculate	Application, Analysis
CS 101.5	Perform basic operations in MS Excel and Google Sheets for data analysis and grade calculation.	Perform, Calculate	Application, Analysis
CS 101.6	Understand and debug simple C programs, demonstrating the knowledge of program structure, preprocessor directives, and memory-level execution.	Understand, Debug	Knowledge, Application, Comprehension

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-
4	-	-	3	-	-	-
5	-	-	-	3	-	-
6	-	-	-	-	3	-
7	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CS 101.1	3	3	2	2	3	-	-	-	-	1	-
CS 101.2	2	2	2	1	3	1	-	-	-	1	-
CS 101.3	3	3	3	2	3	-	-	-	1	2	-
CS 101.4	3	3	3	2	3	-	-	-	1	2	-
CS 101.5	2	2	2	2	3	1	1	-	-	2	1
CS 101.6	1	2	2	1	2	-	-	1	3	3	2

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			
CO6			

Course Name: ENGINEERING GRAPHICS

Course Code: ME-191

(Semester- I)

Course Broad Category: Engineering Science

1. Course Prerequisite: Understanding of basic geometric concepts, such as points, lines, angles, and planes.

2. Course Learning Objectives:

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modeling

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies, Guest Lectures and Field Visits.

Theoretical Instruction, Hands-on Practice, Assessment & Feedback, Interactive Learning Methods, Documentation & Reporting.

Evaluation System –

A. Internal Assessment (PCIA): (60 Marks)- Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]

B. End-Semester Examination: (40 Marks)- Summative Assessment.

- **The minimum passing marks to be secured is 50 (50%) out of allotted total 100 marks (PCIA: 60 marks and ESE: 40 marks).**

4. Course Content:

Course Name: Engineering Graphics

Course Code: ME-191

Hours per Week: 0L: 0T: 4P

Credits: 2

Module	Topics	Practical (P)
1	INTRODUCTION TO ENGINEERING DRAWING Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Different types of line and their use, Dimensioning.	4
2	SCALES Plain scale, Diagonal scale and Vernier Scales.	4

3	GEOMETRICAL CONSTRUCTION AND CURVES Construction of polygons, Conic sections including the Rectangular Hyperbola(General method only); Cycloid, Epicycloid, Hypocycloid, Involute, Archimedean Spiral.	4
4	PROJECTION OF POINTS, LINES, SURFACES Principles of Orthographic Projections-Conventions - 1st and 3rd angle projection, Projections of Points and lines inclined to both planes; Projections of planes (Rectangle, pentagon, Hexagon etc.)inclined Planes -Auxiliary Planes.	8
5	PROJECTION OF REGULAR SOLIDS Projection of simple regular solids, viz. prisms, cubes, cylinders, pyramids, cones, tetrahedrons, spheres, hemi-spheres etc.	4
6	SECTIONS AND SECTIONAL VIEWS OF RIGHT ANGULAR SOLIDS Section of solids; section by perpendicular planes; sectional views; true shapes of sections.	4
7	DEVELOPMENT OF SURFACES Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone.	4
8	ISOMETRIC PROJECTIONS Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.	4
9	OVER VIEW OF COMPUTER GRAPHICS Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];	4

5. Suggested Learning Resources::

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House
2. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
6. Corresponding set of CAD Software Theory and User Manuals
7. Pal & Bhattacharya (2006), Engineering Drawing, 6/e, Viva Books Private Limited,

6. Course Outcomes (CO):

At the end of the course, the students will be able to-

COs	Description	Action Verb	Knowledge level
ME 191.1	UNDERSTAND the basic concept of lines and dimension for engineering drawing.	UNDERSTAND	Understand
ME 191.2	INTERPRET and construct scales (plain, vernier & diagonal) and curves (ellipse, parabola, hyperbola, cycloids, involute, spiral).	INTERPRET	Understand
ME 191.3	CONSTRUCT orthographic projections of points, lines, planes, solids.	CONSTRUCT	Apply
ME 191.4	ILLUSTRATE surface development and section of solids.	ILLUSTRATE	Apply
ME 191.5	APPLY the concept of isometric projection.	APPLY	Apply
ME 191.6	UNDERSTAND the basic concept of Auto CAD in engineering drawing.	UNDERSTAND	Understand

7. Mapping of the Course Outcomes (CO) to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
ME 191.1	3	1	1	-	-	-	-	-	-	-	-
ME 191.2	3	1	1	-	1	1	-	1	1	1	-
ME 191.3	3	1	1	-	1	1	-	1	1	1	-
ME 191.4	3	1	1	-	-	-	-	-	-	-	-

ME 191.5	3	1	1	-	1	1	-	1	1	1	-
ME 191.6	3	1	-	-	1	1	-	-	-	-	-
Avg	3	1	1	-	1	1	-	1	1	1	-

8. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			

Following is the list of drawing instruments that required for Engineering Drawing:

1. Drawing Board
2. Mini drafter/Set-squares(45°–45°&60°–90°), T-square
3. Protractor(180°, 360°)
4. Scales(Plain, Diagonal)
5. Compass(Small and Large)
6. Divider(Small and Large)

2nd SEMESTER SYLLABUS

BCREC: Estd.-2000; "Dedicated to Quality Education"

Course Name: Mathematics-II

Course Code: M-202

(Semester- II)

Course Broad Category: Basic Science

.....
1. Course Prerequisite:

Concept of Mathematics in 10+2 standard and First Semester.

2. Course Learning Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in ordinary differential equations and complex variables. It also aims to familiarize the prospective engineers to get the knowledge to apply the concept of transform calculus in various engineering field. It aims to equip the students to deal with advanced level applied mathematics and applications that would be essential for their disciplines.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies, Guest Lectures.

Evaluation System –

CIA-1 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

CIA-2 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

- **End Semester Examination (ESE): Total: 60 Marks**
- **The minimum passing marks to be secured is 40 (40%) out of allotted total 100 marks (CIA: 40 marks and ESE: 60 marks).**

4. Course Content:

Course Name: Mathematics-II

Course Code: M-202

Hours per Week: 3L:0T:0P

Credits: 3

Module	Topics	45L
7.	Ordinary differential equations (ODE)- First order: Exact equations, Necessary and sufficient condition of exactness of a first order and first-degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation, Euler's equations. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x. General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation).	10L
8.	Ordinary differential equations (ODE)- Higher order: General linear ODE of order two with constant coefficients, Method of variation of parameters, Cauchy-Euler equations, Solution of simultaneous linear differential equations. Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.	10L
9.	Transform calculus: Laplace Transform, General Properties of Laplace Transform, Inverse Laplace Transform, Convolution, Application of Laplace Transform to Differential Equations with Constant Coefficients. Fourier Integral Theorem, Fourier Transform, Convolution, Fourier Sine and Cosine Transforms, Parseval's Identity for Fourier Transforms.	9L
10.	Complex Analysis-I: Functions of Complex variable, Limit and Continuity, Differentiation of complex functions, Cauchy-Riemann equations, Analytic functions, Harmonic functions, determination of harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithmic) and their properties; Conformal mappings, Mobius transformations and their properties.	8L
11.	Complex Analysis-II: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy's integral formula (without proof), Cauchy's integral formula for Derivative, Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, Zeros of analytic functions, Singularities, Laurent's series; Residues, Cauchy residue theorem (without proof), Evaluation of definite integral involving sine and cosine. Evaluation of certain improper integrals.	8L

5. Suggested Learning Resources::

Text Book:

- B.S. Grewal-- Higher Engineering Mathematics; Khanna **Publishers**.
- Ramana B. V. --- Higher Engineering Mathematics, McGraw Hill Education.

Reference Books:

- Brown J.W and Churchill R.V: Complex Variables and Applications, McGraw-Hill.
- Brown J.W and Churchill R.V: Complex Variables and Applications, McGraw-Hill.
- Kreyzig E.: Advanced Engineering Mathematics, John Wiley and Sons.
- Potter M.C, Goldberg J.L and Aboufadel E.F.: Advanced Engineering Mathematics, OUP.
- James G.: Advanced Modern Engineering Mathematics, Pearson Education.
- Spiegel M. R., Lipschutz S., John J.S., and Spellman D.: Complex Variables, TMH.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
M 202.1	Remember to recognize various methods of ordinary differential equations which would enable to solve different engineering problems to encounter in their profession life.	Recognize	Remember
M 202.2	Understand to explain the uses and applications of complex variables in applied sciences and engineering problems.	Explain	Understand
M 202.3	Apply the concept of conformal mapping, its relation to analytic functions, their properties, and the Cauchy-Riemann equations to illustrate problems in applied mathematics.	Illustrate	Apply
M 202.4	Analyze the basic properties of complex integration and having the ability to organize such integrals.	Organize	Analyze
M 202.5	Evaluate the Laplace transforms and inverse Laplace transforms to determine the solutions of differential and integral equations in engineering fields like network analysis and control systems.	Determine	Evaluate
M 202.6	Construct logical and analytical skills to create a new idea appreciated by academics, research & emerging trends in industry.	Construct	Create

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	1
2	3	-	-	-	-	1
3	-	-	-	-	3	1
4	-	3	2	-	-	1
5	-	-	-	3	-	1
6	-	-	-	-	-	-

8. Mapping of the Course outcomes to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M 202.1	3	2	2	1	1	-	-	-	-	-	1
M 202.2	2	1	1	1		-	-	-	-	-	1
M 202.3	2	1	1	1		-	-	-	-	-	1
M 202.4	2	1	2	1	1	-	-	-	-	-	1
M 202.5	3	2	2	2	3	-	-	-	-	-	1
M 202.6	2	2	3	1	2	-	-	-	-	-	1

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			
CO6			

Course Name: PHYSICS

Course Code: PH-201

(Semester– II)

Course Broad Category: Basic Science

.....
1. Course Prerequisite:

Class-XII level knowledge of Physics and Mathematics.

2. Course Learning Objectives:

- v. Aim of this course is to introduce the students to fundamentals of graduate level physics, which form the basis of all applied science and engineering
- vi. To compile all the knowledge acquired from the course and to apply in industry, academia, and research keeping in the mind about ethical awareness and impact in the field of pollution, social and safety.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

CIA-1 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

CIA-2 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

- **End Semester Examination (ESE): Total: 60 Marks**
- **The minimum passing marks to be secured is 40 (40%) out of allotted total 100 marks (CIA: 40 marks and ESE: 60 marks).**

4. Course Content:

Course Name: PHYSICS

Course Code: PH-201

Hours per Week: 3L: 0T: 0P

Credits: 3

Module	Topics	45L
1.	Vector Algebra and Vector Calculus: Concepts of Vector Algebra, Vector calculus. Gradient, Divergence and Curl. Physical meaning of gradient, divergence and curl. Solenoidal vector (Definition only), Irrotational vector (Definition only), Conservative and non-conservative forces. Vector integration: Line Integral, Surface Integral, Volume Integral. Gauss Divergence Theorem, Stoke's Theorem.	7L
2	Oscillations: Introduction to S.H.M., Lissajous Figure, Damped Oscillations: Differential Equation and its solution, Different conditions of damping of harmonic oscillations, Logarithmic Decrement, Relaxation Time, Forced oscillations: Differential equation (Qualitative analysis only), Resonance: Amplitude and Velocity Resonance, Quality Factor, Sharpness of Resonance. Formation of Progressive wave and wave equation.	7L
3	Optics: Basic Concept of interference of light (No derivation), Types of interference, Diffraction of light, Difference between Interference and Diffraction, Difference between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction at a single slit, Conditions for maxima and minima, Plane Transmission grating, Dispersive and Resolving power of grating. Polarization: Polarization by Reflection and refraction-Brewster's law, Polarization by double refraction, Nicol Prism, Polaroids and its uses. Retardation Plate, Circular and elliptical polarization.	5L 5 L
4	Dielectric and Magnetic Properties of Materials: Dielectric material, Polar and Non-polar Dielectric, Dielectric constant, Polarization($\vec{P}$), Electrical Susceptibility(χ_e). Relation between Dielectric Constant(K) and Electrical Susceptibility (χ_e) Polarizability (α_e), Applications of Dielectric. Magnetic Induction Vector or Magnetic Flux Density($\vec{B}$), Magnetic Field Intensity($\vec{H}$), Magnetization ($\vec{M}$), Magnetic Permeability(μ), Magnetic Susceptibility (χ), Relation between Magnetic Flux Density($\vec{B}$), Magnetic Field Intensity($\vec{H}$) and Magnetization($\vec{M}$), Classification of Magnetic Materials, Hysteresis	2L 5L

Module	Topics	45L
	Loop.	
5	Electromagnetic Induction and Maxwell's Equation: Faraday's law of electromagnetic induction, Biot-Savart Law, Ampere's Circuital Law and displacement current, Maxwell's equations - Differential and Integral forms. Electromagnetic wave equations in terms of Electric and Magnetic field, Poynting Vector, Transverse nature of electromagnetic wave. Velocity of electromagnetic wave.	7L
6	Quantum Physics: Inadequacy of classical mechanics, Blackbody radiation, Planck's Law of Radiation Demonstration of Wien's Radiation Law, Wien's Displacement Law, Rayleigh-Jean's Law and Stefan Boltzmann Law as limit. Photoelectric effect. de-Broglie's hypothesis, Phase Velocity, Group Velocity, Heisenberg's uncertainty principle.	5L 2L

5. Suggested Learning Resources::

Text Books

- Engineering Physics, Sujay Kumar Bhattacharya, McGraw Hill Education (India) Pvt. Ltd.
- Principles of Engineering Physics- 1, S P Kuila, New Central Agency (P) Ltd.
- Principles of Engineering Physics- 2, S P Kuila, New Central Agency (P) Ltd.
- Engineering Physics, Malik & Singh, Tata McGraw Hill Education Pvt. Ltd.
- Engineering Physics, Satya Prakash

Reference Books:

- Vector Analysis: Murray Spiegel (Author), Seymour Lipschutz, Dennis Spellman
- Waves and Oscillations, N. K. Bajaj, Tata McGraw-Hill
- Optics, A. K. Ghatak, McGraw Hill Education India Private Limited
- A textbook on light, Ghosh, Mazumdar
- Electrodynamics, Gupta, Kumar & Singh
- Electricity and Magnetism: D. Chattopadhyay & P. C. Rakshit
- Quantum Physics, R. Eisberg and R. Resnick, John Wiley and Sons

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
PH 201.1	Know basic concepts of vector algebra and vector calculus.	Explain	Understand
PH 201.2	Understand the concepts of oscillation	Identify, Select	Understand
PH 201.3	Elaborate the concept of optics and introduction to polarization.	Implement	Apply
PH 201.4	Impart basic knowledge of the dielectric and magnetic properties of materials.	Design	Create
PH 201.5	Rationalize the electromagnetic induction and Maxwell's equation.	Identify, Implement	Apply
PH 201.6	Familiarize with the basic of Quantum Physics	Recognize	Understand

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-
4	-	-	-	3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PH 201.1	3	2	-	-	-	-	-	1	-	-	2
PH 201.2	3	2	-	-	-	-	-	1	-	-	2
PH 201.3	3	2	-	-	-	-	-	1	-	-	2
PH 201.4	3	2	-	-	-	-	-	1	-	-	2
PH 201.5	3	2	-	-	-	-	-	1	-	-	2
PH 201.6	3	2	-	-	-	-	-	1	-	-	2

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3
C01			-
C02			-
C03			-
C04			-
C05			-
C06			-

BCREC: Estd.-2000; "Dedicated to Quality Education"

Course Name: BASIC ELECTRICAL ENGINEERING

Course Code: EE-201

(Semester- II)

Course Broad Category: Engineering Science

.....

1. Course Prerequisite:

Class-X+2 level knowledge of Physics and Mathematics.

2. Course Learning Objectives:

- i. Foundational understanding of electrical circuits, machines, and systems.
- ii. DC and AC circuit analysis: Kirchhoff's laws, circuit theorems, and transient responses of RL, RC, RLC circuits.
- iii. Single-phase and three-phase systems: Power calculations, resonance, star-delta connections, and power measurement.
- iv. Understanding of following Electrical machines:
 - DC generators, motors, and transformers (construction, operation, and performance).
 - Three-phase induction motors (torque-speed characteristics and control methods).
- v. Practical application: Real-world problem-solving using electrical engineering principles.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions

Evaluation System –

CIA-1 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

CIA-2 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

- **End Semester Examination (ESE): Total: 60 Marks**
- **The minimum passing marks to be secured is 40 (40%) out of allotted total 100 marks (CIA: 40 marks and ESE: 60 marks).**

4. Course Content:

Course Name: Basic Electrical Engineering

Course Code: EE-201

Hours per Week: 3L: 0T: 0P

Credits: 3

Module	Topics	40L
1.	Electrical circuit elements (R, L and C), Dependent voltage and current sources, independent voltage and current sources, Star-Delta conversion. Kirchhoff current and voltage laws, Analysis of simple circuits with dc excitation. Superposition theorem, Nodal analysis, Mesh analysis, Thevenin theorem, Norton theorem and Maximum power transfer theorem, Time-domain analysis of first-order and second order RL, RC and RLC circuits.	10L
2.	Representation of sinusoidal wave forms, peak and rms values, phasor representation and analysis, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, R-L, R-C, R-L-Combinations (series and parallel), resonance. Poly phase system: Phase sequence, three phase balanced circuits, voltage and current relations in star and delta connections, 3 Phase power measurement using two wattmeter method.	10L
3.	Construction, Basic concepts of winding (Lap and wave), DC generator: Principle of operation, EMF equation, characteristics (open circuit, load), DC motors: Principle of operation, Speed-torque Characteristics (shunt and series machine), 3-point starter, speed control (armature voltage and field control).	6L
4.	Magnetic materials, BH characteristics, ideal and practical transformer, Core and shell type construction, EMF equation, no-load and on load operation, phasor diagram and equivalent circuit, losses of a transformer, open and short circuit tests, regulation and efficiency calculation. Auto-transformer and three-phase transformer connections.	6L
5.	Types, Construction, Production of rotating magnetic field, Principle of operation, Equivalent circuit and phasor diagram, rating, Torque-speed characteristics (qualitative only). Starter for induction motor. Brief introduction of speed control of 3-phase induction motor (voltage control, frequency control, rotor resistance control)	8L

5. Suggested Learning Resources::

Text Book:

1. A. Chakrabarti, S. Nath, C.K. Chanda, "Basic Electrical Engineering", McGraw Hill Education, 2023.
2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
3. Ritu Sahdev, "Basic Electrical Engineering", Khanna Book Publishing Co. (P) Ltd., Delhi.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

Reference Books:

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EE 201.1	Illustrate & analyse the characteristics of the electric and magnetic circuits	Analyse, Identify	Understand
EE 201.2	To study the working principles and construction of DC machines, concepts of different windings used in DC machines and their characteristics and testing	Identify, Select	Understand, Apply
EE 201.3	To study the working principles of different AC machines (Transformer, 3-phase induction motor) and their characteristics and testing	Identify, Select	Understand, Apply
EE 201.4	To study different speed control techniques and applications of different electrical motors used in different industrial applications (DC motor, 3 phase induction motor)	Identify, Select	Understand, Apply
EE 201.5	Solve numerical problems of basic electrical circuits (both dc and ac) and different electrical machines.	Identify, Implement	Apply

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5
1	3	2	-	-	3
2	3	2	-	-	3
3	2	3	-	2	3
4	3	-	3	-	3
5	3	-	3	2	3

8. Mapping of the Course outcomes to Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
EE 201.1	1	2	-	-	-	-	-	-	-	-	-
EE 201.2	1	2	3	-	2	-	-	-	-	-	1
EE 201.3	1	2	3	2	2						1
EE 201.4	1	2	3	3	2						2
EE 201.5	1	2	2	2	-	-	-	-	-	-	-

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				

Course Name: English Language and Technical Communication

Course Code: ENG-201

(Semester- II)

Course Broad Category: Humanities

.....
1. Course Prerequisite:

Class- XII level knowledge of English grammar and reading, listening, writing skills.

2. Course Learning Objectives:

- i. This course introduces the concepts of sustainability in civil engineering and explores the role of construction materials in developing green infrastructure.
- ii. Students will also learn to design energy-efficient buildings, implement sustainable site planning, navigate green building certifications, and evaluate the economics and ethics of sustainable construction practices.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Discussions and Case Studies, Guest Lectures and Field Visits.

Evaluation System –

CIA-1 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

CIA-2 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

- **End Semester Examination (ESE): Total: 60 Marks**
- **The minimum passing marks to be secured is 40 (40%) out of allotted total 100 marks (CIA: 40 marks and ESE: 60 marks).**

4. Course Content:

Course Name: English Language and Technical Communication

Course Code: ENG-201

Hours per Week: 3L: 0T: 0P

Credits: 3

	Module	Topics	36L	COs
1.	Introduction to LSRW	Definition of Listening, Speaking, Reading, Writing, Types, Criteria for Effectiveness, Practice Purposes, Barriers, Effectiveness Criteria, Note Taking, Note Making, Jargon, Technical Content Reading, Visual Information Reading, Comprehension	8L	CO1
2.	Introduction to Business Communication	Introduction to Business Communication: types, features, process, flow, channels and criteria for effectiveness. Purposes, Barriers. Verbal, non-verbal communication, formal, informal, body language, paralanguage.	4L	CO3, CO4
3.	Introduction to Corporate communication	Corporate Communication, Definition, Types, Features of types, Handling Media, Barriers, Effectiveness Criteria, Office-dynamics, debate, Group discussion, Email etiquette, Telephone etiquette.	6L	CO5
4.	Grammar	Basic syntactical grammar for professional communication: error detection, articles, tense, preposition, subject-verb agreement, synonyms, antonyms, homonyms, homophones.	5L	CO2
5.	Written Correspondence	Comprehension, Business Correspondence, Technical Writing, Proposals, Technical Reports, Memo, Notice-agenda-Minutes, Email, Posters, Essay/ Precis	8L	CO5
6.	Introduction to Soft Skills	Critical thinking ability, Time management, Team-building skills, Time management, Conflict management.	5L	CO6

5. Suggested Learning Resources::

Text Book:

- Effective Technical Communication. Dr. Bharti Kukreja, Dr. Anupam Jain. Katson Books. First Edition 2019, Reprint 2023.
- Effective Technical Communication. (Late) M. Ashraf Rizvi, Priyadarshi Patnaik. McGraw Hill.
- Communication Skills. Sanjay Kumar, Pushp Lata. Rainbow Book Distributors.

Reference Books:

- Practical English Usage Fully Revised International Edition. Michael Swan. Oxford.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
ENG 201.1	Develop basic idea of LSRW in English professionally.	Develop	L1
ENG 201.2	Improve concept of grammar and vocabulary for professional communication.	Improve/Understand	L2
ENG 201.3	Apply English language skills in professional situations.	Apply	L3
ENG 201.4	Analyze different listening, reading and speaking contents.	Analyze	L4
ENG 201.5	Evaluate the instructions and reciprocate properly.	Evaluate	L5
ENG 201.6	Create an ambience to effectively communicate in general and professional settings.	Create	L6

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	2	2	2	2	2
2	2	3	3	3	3	2
3	3	2	3	2	2	3
4	2	2	2	3	2	3
5	3	3	3	2	3	2
6	3	3	3	2	2	2

8. Mapping of the Course outcomes to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
ENG 201.1	3	1	1	1	1	1	1	1	1	3	1
ENG 201.2	3	2	2	1	1	1	1	1	3	3	2
ENG 201.3	1	2	2	1	1	1	1	3	3	3	1
ENG 201.4	3	3	3	3	1	2	1	2	3	3	3
ENG 201.5	2	3	3	2	2	2	2	2	3	3	3
ENG 201.6	3	3	3	2	1	1	1	1	2	3	2

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			
CO6			

BCREC: Estd.-2000; "Dedicated to Quality Education"

Course Name: Programming for Problem Solving

Course Code: CS-202

(Semester– II)

Course Broad Category: Engineering Science

.....
1. Course Prerequisite:

Basic knowledge of computers and general mathematical operations.

2. Course Learning Objectives:

- i. Students will gain an understanding of core programming concepts, including the basic components of a computer system, algorithms, and program execution.
- ii. They will develop problem-solving skills by translating algorithms into code using control structures such as conditionals, loops, and functions.
- iii. Students will also learn to implement and optimize basic data structures like arrays and strings, as well as algorithms for searching and sorting.
- iv. Additionally, they will work with advanced programming features like recursion, structures, pointers, and file handling to solve more complex problems.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

CIA-1 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

CIA-2 (Total: 40 Marks)

- **Class Test (Objective + Subjective): 25 Marks (Duration: 1 hour)**
- **Assignment: 10 Marks**
- **Attendance: 5 Marks**

➤ **End Semester Examination (ESE): Total: 60 Marks**

➤ **The minimum passing marks to be secured is 40 (40%) out of allotted total 100 marks (CIA: 40 marks and ESE: 60 marks).**

4. Course Content:

Course Name: Programming for Problem Solving

Course Code: CS-202

Hours per Week: 3L: 0T: 0P

Credits: 3

Mod ule	Topics	Lectures
1	Introduction to Programming (4 lectures) Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - (1 lecture). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. (1 lecture) From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code - (2 lectures)	8
2	Arithmetic expressions and precedence (2 lectures)	2
3	Conditional Branching and Loops (6 lectures) Writing and evaluation of conditionals and consequent branching (3 lectures) Iteration and loops (3 lectures)	6
4	Arrays (6 lectures) Arrays (1-D, 2-D), Character arrays and Strings	6
5	Basic Algorithms (6 lectures) Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)	6
6	Function (5 lectures) Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference	5
7	Recursion (4 -5 lectures) Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.	5
8	Structure (4 lectures) Structures, Defining structures and Array of Structures	4
9	Pointers (2 lectures) Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)	2
10	File handling (only if time is available, other wise hould be one as part of the lab)	

5. Suggested Learning Resources::

Text & Suggested Learning Resources: Books:

- R. S. Salaria, Computer Concepts and Programming in C, Khanna Publishers
- Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
- Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India (India)

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details	Action Verb	Knowledge Level
CS 202.1	Analyze the problem and formulate algorithms for them.	Analyze	K4
CS 202.2	Translate the algorithms to programs (in language).	Understand	K2
CS 202.3	Understand the correct syntax of logical expression, branch instruction, iteration,	Understand	K2
CS 202.4	Apply array and pointer to solve problem.	Apply	K3
CS 202.5	Understand the use of function, recursion.	Understand	K2
CS 202.6	Build analytical skill.	Create	K6

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-
4	-	-	-	3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS 202.1	3	3	3	3	2	1	1	1	1	1	2	2
CS 202.2	3	3	3	3	-	1	1	1	1	1	2	2
CS 202.3	3	3	3	3	-	-	-	-	1	1	-	2
CS 202.4	3	3	3	3	-	-	-	-	1	1	-	2
CS 202.5	3	3	3	3	-	-	-	-	1	1	-	2
CS 202.6	3	3	3	3	-	-	-	-	1	1	-	2
AVG.	3	3	3	3	2	1	1	1	1	1	2	2

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			
CO6			

Course Name: PHYSICS LAB

Course Code: PH-291

(Semester– II)

Course Broad Category: BASIC SCIENCE

1. Course Prerequisite:

Class-XII level knowledge of Physics Practical.

2. Course Learning Objectives:

- i..Expose students to various experimental skills and tools
- ii. To gain practical knowledge by applying experimental methods to correlate with the theory. Apply the analytical techniques and graphical analysis to the experimental data.

3. Teaching methodology and evaluation system for the course:

Teaching methodology: Instruction: This method recognizes that students have different learning styles, abilities, and backgrounds, and aims to create a learning environment that accommodates these differences.

Evaluation System –

A. Internal Assessment (PCIA): (60 Marks)- Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]

B. End-Semester Examination: (40 Marks)- Summative Assessment.

- **The minimum passing marks to be secured is 50 (50%) out of allotted total 100 marks (PCIA: 60 marks and ESE: 40 marks).**

4. Course Content:

Course Name: PHYSICS LAB

Course Code: PH-291

Hours per Week: 0L: 0T: 2P

Credits: 1

Module	Topics	10P
1.	Experiments in General Properties of matter: - Determination of Young's modulus of material of a bar by Flexure Method. - Determination of modulus of rigidity of the material of a rod by static method. - Determination of rigidity modulus of the material of a wire by dynamic method. Determination of coefficient of viscosity by	3P

Module	Topics	10P
	Poiseuille's capillary flow method	
2.	Experiments in Optics: 1. Determination of dispersive power of the material of a prism. 2. Determination of the wavelength of a given laser / mercury lamp source by diffraction method. 3. Specific rotation of Sugar Solution using polarimeter.	1P
3.	Electricity & Magnetism experiments: 1. Determination of dielectric constant of a given dielectric material. 2. Determination of the thermo-electric power at a certain temperature of the given thermocouple. 3. Study of series resonance of LCR circuit. 4. Determination of specific charge (e/m) of electron by J J Thompson's Method. 5. Determination of unknown resistance using Carey Foster's bridge.	2P
4.	Quantum Physics Experiments: 1. Determination of Planck's constant using photoelectric cell. 2. Determination of Stefan's radiation constant. 3. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment. 4. Determination of Hall co-efficient of semiconductors. 5. Determination of band gap of semiconductors by four probe method. 6. To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells.	4P

Minimum of eight experiments to be performed taking at least one from each module mentioned above.

5. Suggested Learning Resources::

Text books

- Advanced Practical Physics (vol.1 and vol.2) B. Ghosh and K. G. Mazumdar.
- Advanced course in practical physics D. Chattopadhyay and P. C. Rakshit.

Reference Books

- Optics –Eugene Hecht Pearson Education India Private Limited.
- Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited.

- Waves and Oscillations by N.K. Bajaj.
- Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker, Wiley.
- Electricity, Magnetism, and Light, Wayne M. Saslow, Academic Press.
- Optics, Ghatak, McGraw Hill Education India Private Limited.

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
PH 291.1	To Understand the general property of matters like Viscosity, Young's Modulus and Modulus of Rigidity	Explain	Understand
PH 291.2	To Know the concepts of optics	Identify, Select	Understand
PH 291.3	To Measure the electrical parameters.	Implement	Apply
PH 291.4	To Understand Quantum Physics with the help of experiments like Energy band gap of semiconductor, Planck constant and Characteristics of Solar Photovoltaic cell.	Design	Create
PH 291.5	To Analyze Electricity and Magnetism with the help of experiments like Hall Effect of Semiconductors.	Identify, Implement	Apply
PH 291.6	To Measure the Specific charge of electron	Recognize	Understand

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3	-	-	3	-	-	-
4	-	-	-	3	-	-
5	-	-	-	-	3	-
6	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
PH 291.1	3	1	-	-	-	-	-	2	-	-	2
PH 291.2	3	1	-	-	-	-	-	2	-	-	2
PH 291.3	3	1	-	-	-	-	-	2	-	-	2
PH 291.4	3	1	-	-	-	-	-	2	-	-	2
PH 291.5	3	1	-	-	-	-	-	2	-	-	2
PH 291.6	3	1	-	-	-	-	-	2	-	-	2

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1			-
CO2			-
CO3			-
CO4			-
CO5			-
CO6			-

Course Name: Basic Electrical Engineering Laboratory

Course Code: EE-291

(Semester II)

Course Broad Category: Engineering Science

1. Course Prerequisite:

Class-X+2 level knowledge of Physics and Mathematics.

2. Course Learning Objectives:

- i. Understand the basic demonstration and application of electrical instruments and machines.
- ii. Calibrate electrical instruments and verify network theorems.
- iii. Analyse steady state response and evaluate resonance conditions of R-L-C circuit.
- iv. Measure power in three phase unbalanced circuit by two wattmeter method.
- v. Determine efficiency, regulation and parameters of single-phase transformer.
- vi. Analyse the operational behaviour of DC machine and three phase induction motor.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Practical

Evaluation System

A. Internal Assessment (PCIA): (60 Marks)- Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]

B. End-Semester Examination: (40 Marks)- Summative Assessment.

- **The minimum passing marks to be secured is 50 (50%) out of allotted total 100 marks (PCIA: 60 marks and ESE: 40 marks).**

4. Course Content:

Course Name: Basic Electrical Engineering Laboratory

Course Code: EE-291

Hours per Week: 0L: 0T: 2P

Credits: 1

Exp. No	Title
1.	Introduction to Basic Electrical Lab (Do's and Don'ts), Familiarization of measuring Instruments (Voltmeter, Ammeter, Multimeter, Wattmeter), circuit parameters (real life resistors with colour code, capacitors, inductors and autotransformer).

Exp. No	Title
2.	i) Verification of Superposition Theorem. ii) Verification of Norton's Theorem.
3.	I) Verification of Thevenin's Theorem. II) Verification of Maximum power Transfer Theorem.
4.	Calibration of Ammeter and Wattmeter.
5.	Determination of steady state response of R-L, R-C and R-L-C circuit and calculation of impedance and power factor.
6.	Determination of resonance frequency and quality factor of series and parallel R-L-C circuit.
7.	Measurement of power in a three-phase unbalanced circuit by two wattmeter method.
8.	Open circuit and short circuit test of a single-phase transformer.
9.	Load test of a single-phase transformer and determination of efficiency and regulation.
10.	No load characteristics of DC Separately Excited Generator.
11.	Determination of Torque-Speed characteristics of separately excited DC motor.
12.	Determination of Torque-speed characteristics and observation of direction reversal by change of phase sequence of connection of Induction motor.

5. Suggested Learning Resources::

Text Book:

1. A. Chakrabarti, S. Nath, C.K. Chanda, "Basic Electrical Engineering", McGraw Hill Education, 2023.
2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
3. Ritu Sahdev, "Basic Electrical Engineering", Khanna Book Publishing Co. (P) Ltd., Delhi.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

Reference Books:

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
EE 291.1	To understand the basic demonstration and application of electrical instruments.	Identify	Understand
EE 291.2	To calibrate electrical instruments and verify network theorems.	Calibrate, verify	Apply
EE 291.3	To analyse steady state response of R-L, R-C and R-L-C circuit and calculate circuit parameters, and evaluate resonance conditions in series and parallel R-L-C configurations.	Analyse, Evaluate	Analyse
EE 291.4	To measure power in three phase unbalanced circuit by two wattmeter method.	Identify, Measure	Understand
EE 291.5	To determine efficiency, regulation and parameters of single-phase transformer	Identify, Select	Analyse
EE 291.6	To analyse the operational behaviour of DC machine and three phase induction motor.	Analyse, Implement	Analyse

7. Mapping of course outcomes to experiments

EXP. No.	CO1	CO2	CO3	CO4	CO5	CO6
EXP1	3	-	-	-	-	-
EXP2	2	3	-	-	-	-
EXP3	2	3	-	-	-	-
EXP4	2	3	-	-	-	-
EXP5	2	-	3	-	-	-
EXP6	2	-	3	-	-	-
EXP7	2	-	-	3	-	-
EXP 8	3	-	-	-	3	-
EXP 9	3	-	-	-	3	-
EXP 10	2	-	-	-	-	3
EXP 11	2	-	-	-	-	3
EXP 12	-	-	-	-	-	3

8. Mapping of the Course outcomes to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
EE 291.1	3	-	-	-	-	-	-	2	-	-	2
EE 291.2	3	2	2	-	-	-	-	2	-	-	2
EE 291.3	3	2	2	1	-	-	-	2	-	-	2
EE 291.4	3	2	-	-	-	-	-	2	-	-	2
EE 291.5	3	2	3	2	-	-	-	2	-	-	2
EE 291.6	3	2	3	2	-	-	-	2	-	-	2

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	3	-	-
CO3	3	-	-
CO4	3	-	-
CO5	3	-	-
CO6	3	-	-

Course Name: WORKSHOP PRACTICES

Course Code: ME-292

(Semester- II)

Course Broad Category: Engineering Science

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1. Course Prerequisite:

Class-XII level knowledge of Physics and Mathematics.

2. Course Learning Objectives:

a. Understand and Apply Fundamental Workshop Practices:

To comprehend the principles of basic manufacturing processes (moulding, casting, forming, joining, machining), workshop safety rules, and the use of tools and machines across various workshops, while fostering ethical and safety-conscious behavior on the shop floor.

b. Develop Practical Skills in Fabrication and Machining:

To acquire hands-on experience in machining, welding, fitting, forging, carpentry, pattern-making, and sheet metal fabrication, enabling students to manufacture components and assemblies as per specified dimensions and quality standards.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Theoretical Instruction, Demonstration, Hands-on Practice, Guided Group Activities, Assessment & Feedback, Interactive Learning Methods, Documentation & Reporting.

Evaluation System –

A. Internal Assessment (PCIA): (60 Marks)- Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]

B. End-Semester Examination: (40 Marks)- Summative Assessment.

- **The minimum passing marks to be secured is 50 (50%) out of allotted total 100 marks (PCIA: 60 marks and ESE: 40 marks).**

4. Course Content:

Course Name: Workshop Practices

Course Code: ME 292

Hours per Week: 0L: 0T: 4P

Credits: 2

Module	Topics	44hrs
1.	General: Introduction to workshop practice, Safety precautions, Shop floor ethics, Basic First Aid knowledge. Study of mechanical tools, components and their applications Machine Shop a. Study of Lathe, Shaper and Milling machine and their operations b. To make a threaded pin from a mild steel rod in a lathe c. To make V- slot in a shaping and a rectangular slot in milling machine in a block of cast iron or mild steel	8
2.	Fitting Bench Working Shop a. Study of tools and operations b. Making a Gauge (V-Fit) from MS plate involving drilling/tapping/dieing	8
3.	Black Smithy Shop a. Study of tools and operations b. A simple job of making a square rod from a round bar	4
4.	Welding Shop a. Study of Arc welding & Gas welding b. To join two thick (approx 6mm) MS plates by manual metal arc c. To join two thin mild steel plates or sheets by gas welding	8
5.	Sheet Metal Shop a. Study of tools and Operations b. Fabrication of tool box/ tray with soldering	4
6.	Carpentry Shop a. Study of tools and Operations and carpentry joints. b. To prepare T- lap joint/Cross Lap Joint.	8
7.	Foundry a. Study of tools and operations b. Making a mould using single piece pattern.	4

5. Suggested Learning Resources::

Text Book:

- Hajra Choudhury S. K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

Reference Books:

- "Workshop Technology, Vol. I" by W A J Chapman
- Kalpajian S. and Steven S. Schmid, “Manufacturing Engineering and Technology”, 4th edition, Pearson Education India Edition, 2002.
- Gowri P. Hariharan and A. Suresh Babu,”Manufacturing Technology – I” Pearson Education, 2008.
- Roy A. Lindberg, “Processes and Materials of Manufacture”, 4th edition, Prentice Hall India, 1998.
- Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGrawHill House, 2017.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
ME 292.1	Discuss workshop safety rules and manufacturing methods namely, moulding, casting, forming, joining, machining.	Discuss	Understand
ME 292.2	Acquire skill set of machining on Lathe, milling and shaping as per given dimensions.	Acquire	Apply
ME 292.3	Build wooden pattern and sand mould using pattern and moulding tools.	Build	Apply
ME 292.4	Fabricate components of given dimensions using Arc and Gas welding	Fabricate	Apply
ME 292.5	Make jobs as per given dimensions in fitting and forging shops.	Make	Apply
ME 292.6	Demonstrate sheet metal work.	Demonstrate	Apply

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	3	-	-	-	-
2	-	-	-	-	3	-
3	-	-	-	-	3	-
4	-	-	-	3	-	-
5	-	-	-	-	-	3
6	-	-	3	-	-	-
7	-	-	3	-	-	-

8. Mapping of the Course outcomes to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
ME 292.1	3	2	1	-	-	-	1	1	1	-	1
ME 292.2	2	3	2	-	-	-	1	1	1	-	1
ME 292.3	2	3	2	-	-	-	1	1	1	-	1
ME 292.4	2	3	2	-	-	-	1	1	1	-	1
ME 292.5	2	3	2	-	-	-	1	1	1	-	1
ME 292.6	2	3	1	-	-	-	1	1	1	-	1

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			

Course Name: Language Lab

Course Code: ENG-291

(Semester- II)

Course Broad Category: HUMANITIES

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1. Course Prerequisite:

Class- XII level knowledge of English grammar and reading, listening, writing skills.

2. Course Learning Objectives:

- i. This course introduces the concepts of sustainability in civil engineering and explores the role of construction materials in developing green infrastructure.
- ii. Students will also learn to design energy-efficient buildings, implement sustainable site planning, navigate green building certifications, and evaluate the economics and ethics of sustainable construction practices.

3. Teaching methodology and evaluation system for the course:

Teaching methodology – Lectures and Presentations, Interactive Activities

Evaluation System –

A. Internal Assessment (60 Marks)-

B. End-Semester Exam (40 Marks)- Summative Assessment.

4. Course Content:

Course Name: Language Lab

Course Code: ENG-291

Hours per Week: 2P

Credits: 1

Module	Topics	30 L
1.	Listening (Telephonic Communication, Motivational Speeches)	4
2.	Speaking (Self Introduction, Role Playing, JAM, Extempore, News reading)	6
3.	Presentation (Poster + Audio Visual + short skits)	12
4.	Body Language (Debate, Group Discussion, Public speaking)	6

Module	Topics	30 L
5.	Professional Etiquette (Conducting a programme, Presentation)	2

5. Suggested Learning Resources::

Text Book:

- Effective Technical Communication. Dr. Bharti Kukreja, Dr. Anupam Jain. Katson Books. First Edition 2019, Reprint 2023.
- Effective Technical Communication. (Late) M. Ashraf Rizvi, Priyadarshi Patnaik. McGraw Hill.
- Communication Skills. Sanjay Kumar, Pushp Lata. Rainbow Book Distributors.

Reference Books:

- Practical English Usage Fully Revised International Edition. Michael Swan. Oxford.

6. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
ENG 291.1	Acquire basic proficiency in English, including reading, listening comprehension, writing, and speaking skills, and demonstrate a basic understanding of English.	Application	Understand
ENG 291.2	Communicate confidently in English, using appropriate grammar, vocabulary, and syntax, and demonstrate effective speaking and presentation skills in different contexts.	Application	Apply, create
ENG 291.3	Communicate appropriately in professional and social situations, using appropriate language.	Application	Apply
ENG 291.4	Improve teamwork, leadership skills, and problem-solving skills through group activities.	Understand	Apply
ENG 291.5	Organize and write business correspondence properly and correctly, using appropriate knowledge of language.	Understand,	Apply
ENG 291.6	Develop active listening skills, including effective listening strategies and note-taking.	Understand	Apply

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6
1	3	2	2	2	2	2
2	2	3	3	3	3	2
3	3	2	3	2	2	3
4	2	2	2	3	2	3
5	3	3	3	2	3	2

8. Mapping of the Course outcomes to Program Outcomes (PO)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
ENG 291.1	3	1	1	1	1	1	1	1	1	3	1
ENG 291.2	3	2	2	1	1	1	1	1	3	3	2
ENG 291.3	1	2	2	1	1	1	1	3	3	3	1
ENG 291.4	3	3	3	3	1	2	1	2	3	3	3
ENG 291.5	2	3	3	2	2	2	2	2	3	3	3
ENG 291.6	3	3	3	2	1	1	1	1	2	3	2

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1				
CO2				
CO3				
CO4				
CO5				

Course Name: Programming for Problem Solving Lab

Course Code: CS-292

(Semester –II)

Course Broad Category: Engineering Science

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1. Course Prerequisite:

- Basic knowledge of computers and general mathematical operations.
- And/ Or ESC-CS 191

2. Course Learning Objectives:

- Students will gain an understanding of core programming concepts, including the basic components of a computer system, algorithms, and program execution.
- They will develop problem-solving skills by translating algorithms into code using control structures such as conditionals, loops, and functions.
- Students will also learn to implement and optimize basic data structures like arrays and strings, as well as algorithms for searching and sorting.
- Additionally, they will work with advanced programming features like recursion, structures, pointers, and file handling to solve more complex problems.

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Lectures and Presentations, Interactive Discussions and Case Studies.

Evaluation System –

- Internal Assessment (60 Marks)- Formative Continuous Assessment
- End-Semester Exam (40 Marks)- Summative Assessment.

4. Course Content:

Course Name: Programming for Problem Solving Lab

Course Code: CS-292

Hours per Week: 0L: 0T: 4P

Credits: 2

Unit	Content
1	Problem solving using computers: Familiarization with programming environment
2	Variable types and type conversions: Simple computational problems using arithmetic expressions
3	Branching and logical expressions: Problems involving if- then -else structures
4	Loops, while and for loops: Iterative problems e.g., sum of series
5	1D Arrays: searching, sorting: 1D Array manipulation
6	2D Arrays and Strings: Matrix problems, String operations

7	Functions, call by value: Simple functions
8	Numerical methods (Root finding, numerical differentiation, numerical integration): Programming for solving Numerical methods problems
9	Recursion, structure of recursive calls: Recursive functions
10	Pointers, structures and dynamic memory allocation: Pointers and structures
11	File handling: File operations

5. Suggested Learning Resources::

Text & Suggested Learning Resources: Books:

- R. S. Salaria, Computer Concepts and Programming in C, Khanna Publishers
- Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
- Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India (India)

6. Course Outcomes (CO):

After going through this course the Students will be able to:

Course Outcomes	Details	Action Verb	Knowledge Level
CS 292.1	Familiarize with the programming environment and use computers for problem-solving.	Familiarize, Solve	Knowledge, Application
CS 292.2	Solve simple computational problems using arithmetic expressions, understanding variable types and type conversions.	Solve, Understand	Comprehension, Application
CS 292.3	Implement branching and logical expressions for problems involving if-then-else structures.	Implement, Solve	Application, Analysis
CS 292.4	Solve iterative problems using loops, such as calculating the sum of series.	Solve, Calculate	Application, Analysis
CS 292.5	Manipulate 1D and 2D arrays, perform searching, sorting, matrix problems, and string operations.	Manipulate, Perform	Application, Synthesis
CS 292.6	Understand and implement numerical methods (root finding, numerical differentiation, and numerical integration) to solve problems using programming.	Understand, Implement	Application, Analysis
CS 292.7	Apply pointers, structures, and dynamic memory allocation concepts for efficient data management and implement file operations for real-world applications.	Apply, Implement	Application, Synthesis

7. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5	CO6	CO7
1	3	-	-	-	-	-	
2	-	3	-	-	-	-	
3	-	-	3	-	-	-	
4	-	-	-	3	-	-	
5,6	-	-	-	-	3	-	
7,8	-	-	-	-	-	3	
9,10,11							3

8. Mapping of the Course outcomes to Program Outcomes (PO)

	P O1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS 292.1	2	2	2	2	-	-	-	-	-	-	-	2
CS 292.2	2	2	2	2	-	-	-	-	-	-	-	2
CS 292.3	2	2	2	2	-	-	-	-	-	-	-	2
CS 292.4	2	2	2	2	-	-	-	-	-	-	-	2
CS 292.5	2	2	2	2	-	-	-	-	-	-	-	2
CS 292.6	2	2	2	2	-	-	-	-	-	-	-	2
CS 292.7	2	2	2	2	0	0	0	0	0	0	0	2

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO 2	PSO 3	PSO 4
CO1				
CO2				
CO3				
CO4				
CO5				

Course Name: National Service Scheme (NSS)
(Semester- II)
Course Category: Extra Curricular Activity

1. Course Prerequisite: NA

2. Course Learning Objectives:

- i. The course helps students to understand the community in which they work and identify the needs and problem of the community and their solutions.
- ii. Develop capacity to meet emergencies and natural disasters
- iii. Practice national integration and social harmony

3. Teaching methodology and evaluation system for the course:

Teaching methodology –

Practical learning through different activities in community immersion programmes throughout the semester. One orientation seminar conducted by a guest lecturer.

Evaluation System –

- i. Participation and organizing in community immersion programmes (2 for each student); Each programme contains maximum 25 marks)
- ii. Project report submission on activities done (50 marks)

4. Course Content:

Course Name: National Service Scheme (NSS)

Course Code:

Hours per Week: 0

Credits: 0

Module	Topics	No.
1.	Orientation Seminar	1
2.	Activities generating environmental awareness	2
3.	Activities focusing on health and hygiene improvement of community	2
4.	Activities generating literacy awareness	2
5.	Activities enabling youth and gender empowerment	2

5. Course Outcomes (CO):

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
CO-1	Understand the meaning NSS and its importance in society.	Explain	Understand
CO-2	Identify and implement solutions to environmental hazards	Identify, Implement	Create
CO-3	Implementation of basic activities, method and adaptation done by NSS	Implement	Apply
CO-4	Uphold the concept of volunteerism & leadership among youth and women	Design	Apply
CO-5	Be able to identify organizational structure and responsibilities	Identify, Select	Analysis

6. Mapping of course outcomes to module / course content

Module	CO1	CO2	CO3	CO4	CO5
1	3	-	-	-	-
2	-	3	2	-	-
3	-	-	2	-	-
4	-	-	2	-	2
5	-	-	2	3	2

7. Mapping of the Course outcomes to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	1	-	-	-	2	-	2	1	-	2
CO2	-	1	-	-	-	2	3	2	1	-	2
CO3	-	1	-	-	-	2		2	1	-	2
CO4	-	1	-	-	-	2		2	1	-	2
CO5	-	1	-	-	-	2		2	1	-	2

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3
CO1			
CO2			
CO3			
CO4			
CO5			

*** End of 1st Year Syllabus***