COURSE CURRICULUM

for

B.TECH. DEGREE

in

COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

(Applicable from the academic session 2024-2025)

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, West Bengal (Formerly Known as -WBUT)

Jemua Road, Durgapur, West Bengal, India, 713206

The first year syllabus is unanimously accepted and approved in the first BoS meeting held in the Department of a) Physics, b) Chemistry, c) Mathematics, d) English, e) Electrical Engineering, f) Electronics and Communication Engineering, g) Computer Science and Engineering, h) Mechanical Engineering.

Head of the Department
Computer Science & Engineering (DS)
Dr. B. C. Roy Engineering College
Durgapur

Dr. Chandan Bandyopadhyay

Signature of the BoS Chairman, CSE (DS)

Course Name: Mathematics-II
Course Code: BSC-M 201
(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 –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. **Course Content:**
   Course Name: Mathematics-II
   Course Code: BSC-M 201
   Hours per Week: 3L:0T:0P
   Credits: 3

Module	Topics	45L
1.	**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	10L

	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).	
2.	**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
3.	**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
4.	**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
5.	**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. References:

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
BSC-M 201.1	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
BSC-M 201.2	Understand to explain the uses and applications of complex variables in applied sciences and engineering problems.	Explain	Understand
BSC-M 201.3	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
BSC-M 201.4	Analyze the basic properties of complex integration and having the ability to organize such integrals.	Organize	Analyze
BSC-M 201.5	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
BSC-M 201.6	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)

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	1	2	2	1	1	-	-	-	-	-	-	1
CO2	1	2	3	1	1	-	-	-	-	-	-	1
CO3	1	2	1	1	1	-	-	-	-	-	-	1
CO4	1	2	2	1	1	-	-	-	-	-	-	1
CO5	1	2	2	2	3	-	-	-	-	-	-	1
CO6	1	2	1	1	-	-	-	-	-	-	-	1

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	1	2	3	2
CO2	2	1	2	2
CO3	2	2	2	3
CO4	2	3	2	2
CO5	2	2	3	2
CO6	2	2	2	2

***** End of Syllabus*****

Course Name: PHYSICS
Course Code: BSC-PH 201
(Semester– II)
Course Broad Category: Basic Science

……

1. Course Prerequisite:

Class-XII level knowledge of Physics and Mathematics.

2. Course Learning Objectives:

i. 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

ii. 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 –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: PHYSICS
Course Code: BSC-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 Fraunhoffer diffraction, Fraunhoffer 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 Loop.	2L 5L
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	7L

Module	Topics	45L
	electromagnetic wave. Velocity of electromagnetic wave.	
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. References:

Text & References Books:

- Vector Analysis: Murray Spiegel (Author), Seymour Lipschutz, Dennis Spellman
- Waves & oscillation, A. P. French
- Waves and Oscillations, N. K. Bajaj, Tata McGraw-Hill
- Physics of waves, W. C. Elmore & M. A. Heald
- Optics , Hecht, Pearson Education
- Optics, A. K. Ghatak, McGraw Hill Education India Private Limited
- A textbook on light, Ghosh, Mazumdar
- Fundamental of Optics, Jankins and White, McGraw-Hill
- Introduction to Electrodynamics, D. J. Griffith
- Electrodynamics, Gupta, Kumar & Singh
- Electricity and Magnetism: D. Chattopadhyay & P. C. Rakshit
- Quantum Physics, R. Eisberg and R. Resnick, John Wiley and Sons
- Quantum Mechanics, Leonard I. Schiff, Tata McGraw Hill Education Pvt. Ltd.
- Engineering Physics, Satya Prakash
- 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.

6. Course Outcomes (CO):

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

Course Outcomes	Details/Statement	Action Verb	Knowledge Level
BSC-PH 201.1	Know basic concepts of vector algebra and vector calculus.	Explain	Understand
BSC-PH 201.2	Understand the concepts of oscillation	Identify, Select	Understand
BSC-PH 201.3	Elaborate the concept of optics and introduction to polarization.	Implement	Apply
BSC-PH 201.4	Impart basic knowledge of the dielectric and magnetic properties of materials.	Design	Create
BSC-PH 201.5	***Rationalize the electromagnetic induction and Maxwell's equation.***	Identify, Implement	Apply
BSC-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	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	2	1	1	1	-	-	-	-	-	-	-	2
CO2	2	1	1	1	-	-	-	-	-	-	-	2
CO3	2	1	1	1	-	-	-	-	-	-	-	2
CO4	2	1	1	1	-	-	-	-	-	-	-	2
CO5	2	1	1	1	-	-	-	-	-	-	-	2
CO6	2	1	1	1	-	-	-	-	-	-	-	2

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	2
CO2	2	2	2	2
CO3	2	2	3	2
CO4	2	2	2	3
CO5	2	1	2	1
CO6	2	2	2	3

***** End of Syllabus*****

Course Name: BASIC ELECTRICAL ENGINEERING
Course Code: ESC 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 –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: Basic Electrical Engineering
Course Code: ESC-EE-201
Hours per Week: 3L: 0T: 0P
Credits: 3

Module	**Topics**	**40L**
1.	Electrical circuit elements (R, L and C), Dependent voltage and	10L

Module	Topics	40L
	current sources, independent voltage and current sources, Star-Deltaconversion. Kirchhoff current and voltagelaws, Analysis of simple circuits with dc excitation. Superposition theorem, Nodal analysis, Mesh analysis, Thevenin theorem, Norton theorem and Maximum power transfer theorem, Time-domainanalysis offirst-order and second order RL, RC and RLC circuits.	
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. References:

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
ESC-EE-201.1	Illustrate &analyse the characteristics of the electric and magneticcircuits	Analyse, Identify	Understand
ESC-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
ESC-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
ESC-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
ESC-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**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	-	-	-	-	2	-	-	-	-	-
CO2	1	2	3		2	-	2	-	-	-	-	1
CO3	1	2	3	2	2	-	2	-	-	-	-	1
CO4	1	2	3	3	2	-	2	-	-	-	-	2
CO5	1	2	2	2	-	-	2	-	-	-	-	-

9. **Mapping to Program Specific Outcome (PSO)**

	PSO1	**PSO2**	**PSO3**	**PSO4**
CO1	2	2	1	1
CO2	2	2	2	2
CO3	1	2	1	1
CO4	2	2	1	2
CO5	2	1	1	1

***** End of Syllabus*****

Course Name: English Language and Technical Communication
Course Code: HS-MC 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 –

A. Mid-Term Exam (20 Marks)- Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: English Language and Technical Communication
Course Code: HS-MC 201
Hours per Week: 3L: 0T: 0P
Credits: 3

Module	**Topics**	**36L**
1.	Introduction to communication: types, features and criteria for effectiveness.	2L
2.	Definition, Types, Criteria for Effectiveness, Practice Said/Unsaid(Explicit / Implicit) Short stories used as resource	4L

Module	Topics	36L
	(Ruskin Bond/Maupassant/R.K.Laxman etc)	
3.	Professional Communication, Definition, Types, Features of types, Media, Barriers, Effectiveness Criteria, Practice Sessions Short stories used as resource for discussion/debate (Ruskin Bond/Maupassant/R.K.Laxman etc)	10L
4.	Types, Purposes, Barriers, Effectiveness Criteria, Note Taking, Note Making, Jargon, Technical Content Reading, Visual Information Reading, Comprehension Short stories used as resource (Ruskin Bond/Maupassant/R.K.Laxman etc)	10L
5.	Syntactical Grammar, Comprehension, Business Correspondence, Academic Writing, Proposals, Reports, Posters, SOP, SoP, Essay/ Precis Short stories used as resource – for Grammar/Comprehension/ Precis /Creative content (Ruskin Bond/Maupassant/R. K. Laxman	10L

5. References:

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
CO 1	Acquire basic proficiency in English, including reading, listening comprehension, writing, and speaking skills, and demonstrate a basic understanding of English.	Application	Understand
CO 2	Communicate confidently in English, using appropriate grammar, vocabulary, and syntax, and demonstrate effective speaking and presentation skills in different contexts.	Application	Apply, create
CO 3	Communicate appropriately in professional and social situations, using appropriate language.	Application	Apply
CO 4	Improve teamwork, leadership skills, and problem-solving skills through group activities.	Understand	Apply
CO 5	Organize and write business correspondence properly and correctly, using appropriate knowledge of language.	Understand,	Apply
CO 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
6	3	3	3	2	2	2

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	1	1	1	1	3	1	3
CO2	3	2	2	1	1	1	1	1	3	3	2	3
CO3	1	2	2	1	1	1	1	3	3	3	1	2
CO4	3	3	3	3	1	2	1	2	3	3	3	3
CO5	2	3	3	2	2	2	2	2	3	3	3	3
CO6	3	3	3	2	1	1	1	1	2	3	2	3

9. Mapping to Program Specific Outcome (PSO)

	PSO1	**PSO2**	**PSO3**	**PSO4**
CO1	2	2	1	2
CO2	2	2	2	2
CO3	2	2	1	2
CO4	2	2	2	1
CO5	1	2	2	2
CO6	2	1	2	2

***** End of Syllabus*****

Course Name: Programming for Problem Solving
Course Code: ESC-CS 202
(Semester– II)
Course Broad Category: Engineering Science

……

1. Course Prerequisite:

- Basic knowledge of computers and general mathematical operations.
- And/ Or Introduction to Hardware and Software (ESC-CS 101)

2. Course Learning Objectives:

i. **Fundamentals of C Programming & Algorithmic Thinking** – Understand the basics of programming, C language syntax, compilation process, and develop algorithmic problem-solving skills using flowcharts and pseudocode.
ii. **Control Structures, Functions & Data Handling** – Implement decision-making constructs (if-else, switch), loops (for, while), functions (including recursion), pointers, arrays (1D, 2D), and string manipulation.
iii. **Advanced Concepts & Preprocessing** – Utilize structures, unions, file handling, and C preprocessor directives (macros, file inclusion) for efficient programming and modular code development.
iv. **Application in Problem-Solving** – Apply programming concepts to solve real-world problems like factorial computation, Fibonacci series, GCD, exponentiation, and file-based operations.

3. Teaching methodology and evaluation system for the course:

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

Evaluation System –

A. Mid-Term Exam (20 Marks) - Summative Assessment (CIA-1)
B. Internal Assessment (20 Marks)- Formative Continuous Assessment [Continuous Assessment 1 (CIA-2)]
C. End-Semester Exam (60 Marks)- Summative Assessment.

4. Course Content:

Course Name: Programming for Problem Solving
Course Code: ESC-CS 202
Hours per Week: 3L: 0T: 0P
Credits: 3

Module	Topics	Lectures
1	**Introduction to C Programming:** Introduction to programming language. Introduction to C language. Life cycle of C-program. Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples (Sequential, Selectional and Iterational algorithm). From algorithms to programs; source code, variables (with data types), constant, Syntax and Logical Errors in compilation, Header file and standard library file and executable code.	6
2	**Arithmetic expressions and precedence:** Operators (Assignment, Arithmetic [Type casting], Relational, Logical, Increment / Decrement, Address of Operator, sizeof operator, Unaray, Binary, Ternary, Bitwise operator.	6
3	**Conditional Branching and Loops:** Writing and evaluation of conditionals and consequent branching [if, if-else, nested if, else if, switch, Iteration [while, do-while, for] and nested for loop.	8
4	**Pointers and Arrays**: Introduction to pointer, Arrays (1-D, 2-D), Character arrays (Strings).	7
5	**Function and C Preprocessor:** Functions (including using built in libraries), Parameter passing in functions, call by value, call by address, Passing arrays to functions, Recursion and Implementation Recursive functions (Factorial, GCD, Fibonacci Series, X^n, Tower of Hanoi, etc.), C Preprocessor [Macro Expansion, Macros with Arguments, File inclusion, Macros versus Function], Different String library functions and its use, Implement string library functions (strlen(), strcpy(), strcmp(), strrev(), etc.)	10
6	**Structure and Union**: Structures, Defining structures and Array of Structures, Union.	5
7	**File handling:** File open operation using its different mode, close operation, and basic programs related to file.	3

5. References:

Text & References 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)
- Reema Thareja, Programming in C, Oxford

6. Course Outcomes (CO):

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

Course Outcomes	Details	Action Verb	Knowledge

			Level
ESC-CS201.CO1	**Explain** the basics of C programming, including program structure, compilation process, syntax errors, and the concept of algorithms with flowcharts and pseudocode.	Understand	L-2
ESC-CS201.CO2	**Demonstrate** the ability to use different types of operators (arithmetic, relational, logical, bitwise, etc.) and **evaluate** expressions while understanding operator precedence and type casting.	Apply	L-3
ESC-CS201.CO3	**Develop** C programs using conditional statements (if, if-else, switch) and loop constructs (for, while, do-while), including nested loops for solving iterative problems efficiently.	Apply	L-3
ESC-CS201.CO4	**Illustrate** the use of pointers and arrays (1-D and 2-D) in programming, including string handling using character arrays and pointer-based memory access.	Analyze	L-4
ESC-CS201.CO5	**Design** and **implement** modular programs using functions, parameter passing techniques, recursion, and C preprocessor directives such as macros, file inclusion, and string manipulation functions.	Create	L-6
ESC-CS201.CO6	**Construct** programs using structures, unions, and file handling concepts, enabling efficient data management and persistent storage in C programs.	Create	L-6

7. Mapping of course outcomes to module / course content

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

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

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	1
CO2	3	3	3	2	-	-	-	-	-	-	-	1
CO3	3	3	3	3	2	-	-	-	-	-	-	2
CO4	3	3	3	3	2	-	-	-	-	-	-	2
CO5	3	3	3	3	3	2	-	-	2	-	-	2
CO6	3	3	3	3	3	2	-	-	-	-	-	3
AVG.	3	3	3	3	3	2	-	-	2	-	-	2

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	1
CO2	2	2	2	2
CO3	2	1	2	2
CO4	1	2	2	2
CO5	2	2	2	2
CO6	2	2	2	1

***** End of Syllabus*****

Course Name: PHYSICS LAB
Course Code: BSC-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 (60 Marks)-** Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]
B. **End-Semester Exam (40 Marks)-** Summative Assessment.

4. Course Content:

Course Name: PHYSICS LAB
Course Code: BSC-PH 291
Hours per Week: 0L: 0T: 2P
Credits: 1

Module	Topics	10P
1.	**Experiments in General Properties of matter:** 1. Determination of Young's modulus of material of a bar by Flexure Method. 2. Determination of modulus of rigidity of the material of a rod by static method. 3. Determination of rigidity modulus of the material of a wire	3P

Module	Topics	10P
	by dynamic method. 4. Determination of coefficient of viscosity by 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. References:

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.
- Classical mechanics, Narayan Rana, Pramod Joag, McGraw Hill Education.
- Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education.
- Optics, Ghatak, McGraw Hill Education India Private Limited.
- Refresher Course in B.Sc. Physics –Vol1 and Vol 2 –C.L.Arora.

6. Course Outcomes (CO):

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

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

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	2	1	1	1	-	-	-	-	-	-	-	2
CO2	2	1	1	1	-	-	-	-	-	-	-	2
CO3	2	1	1	1	-	-	-	-	-	-	-	2
CO4	2	1	1	1	-	-	-	-	-	-	-	2
CO5	2	1	1	1	-	-	-	-	-	-	-	2
CO6	2	1	1	1	-	-	-	-	-	-	-	2

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	1
CO2	2	2	2	2
CO3	1	2	2	2
CO4	2	2	2	2
CO5	2	1	2	2
CO6	2	2	1	2

***** End of Syllabus*****

Course Name: Basic Electrical Engineering Lab
Course Code: ESC 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. Analyze the response of R-L-C series circuit
iii. Determine parameters of transformer equivalent circuit and analyze the operational behaviour of DC machine and three phase induction motor
iv. Study the working principles of synchronous generators
v. Introduce the components of low voltage electrical installations

3. Teaching methodology and evaluation system for the course:

Teaching methodology –Practical

Evaluation System

A. Internal Assessment (60 Marks)- Formative Continuous Assessment [Continuous Assessment; Note Book (30 Marks), Viva Voce (20 Marks), Attendance (10 Marks)]
B. End-Semester Exam (40 Marks)- Summative Assessment.

4. Course Content:

Course Name: Basic Electrical Engineering Lab
Course Code: ESC-EE-191
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.	Determination of steady state response of R-L and R-C and R-L-C circuit and calculation of impedance and power factor.
5.	Determination of resonance frequency and quality factor of series and parallel R-L- C circuit
6.	Calibration of Ammeter and Wattmeter
7.	Measurement of power in a three phase balanced circuit by two wattmeter method.
8.	Open circuit and short circuit test of a single-phase transformer
9.	Load test of the 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. References:

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
ESC-EE-291.1	Understand the basic demonstration and application of electrical instruments and machines	Analyse, Identify	Understand
ESC-EE-291.2	Analyze the response of R-L-C series circuit	Identify, Select	Analyze
ESC-EE-291.3	determine parameters of transformer equivalent circuit and analyze the operational behaviour of DC machine and three phase induction motor	Identify, Select	Apply
ESC-EE-291.4	Study the working principles of synchronous generators and power converters	Identify, Select	Understand
ESC-EE-291.5	Introduce the components of low voltage electrical installations	Identify, Implement	Understand

7. Mapping of course outcomes to experiments

EXP No	CO1	CO2	CO3	CO4	CO5
EXP1	3	3	3	3	0
EXP2	0	2	2	0	0
EXP3	2		2	0	0
EXP4	0	0	2	2	0
EXP6	2	2	0	0	0
EXP7	2	2	0	0	0
EXP 8	0	2	2	2	0
EXP 9	2	2	0	0	2
EXP 10	2	0	2	0	0
EXP 11	2	2	2	0	0
EXP 12	3	3	3	3	0

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	1	1	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	-	-	-	2

CO4	3	2	1	-	-	-	-	-	-	-	-	2
CO5	3	2	2	2	-	-	1	-	-	-	-	2

9. Mapping to Program Specific Outcome (PSO)

	PSO1	**PSO2**	**PSO3**	**PSO4**
CO1	1	2	3	2
CO2	3	3	2	3
CO3	3	3	3	3
CO4	2	2	2	3
CO5	2	3	3	3

***** End of Syllabus*****

Course Name: WORKSHOP PRACTICES
Course Code: ESC-ME 292
(Semester- II)
Course Broad Category: Engineering Science

……

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 –
Section 1: Practical Continuous Internal Assessment (PCIA) - **60 Marks**
Includes practical performance, reports, and viva voce after each experiment. Throughout the Semester
Section 2: Practical End Semester Examination (PESE) - **40 Marks**
Final comprehensive practical examination covering the entire syllabus. At the end of the semester

4. Course Content:

Course Name: Workshop Practices
Course Code: ESC-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. References:

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
- Kalpakjian 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
ESC-ME 292.1	Discuss workshop safety rules and manufacturing methods namely, moulding, casting, forming, joining, machining.	Discuss	Understand
ESC-ME 292.2	Acquire skill set of machining on Lathe, milling and shaping as per given dimensions.	Acquire	Apply
ESC-ME 292.3	Build wooden pattern and sand mould using pattern and moulding tools.	Build	Apply
ESC-ME 292.4	Fabricate components of given dimensions using Arc and Gas welding	Fabricate	Apply
ESC-ME 292.5	Make jobs as per given dimensions in fitting and forging shops.	Make	Apply
ESC-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)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	1	-	1	-	1
CO2	2	3	2	-	-	-	-	-	-	1	-	1
CO3	2	3	2	-	-	-	-	-	1	1	-	1
CO4	2	3	2	-	-	-	-	-	1	1	-	1
CO5	2	3	2	-	-	-	-	-	1	1	-	1
CO6	2	3	1	-	-	-	-	-	1	1	-	1

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	3
CO2	2	2	3	2
CO3	2	3	3	3
CO4	2	2	2	3
CO5	2	3	3	3
CO6	3	2	3	3

***** End of Syllabus*****

Course Name: Language Lab
Course Code: HS-MC 191
(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 Activities

Evaluation System –

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

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

4. Course Content:

Course Name: Language Lab
Course Code: HS-MC 291
Hours per Week: 2P
Credits: 1

Module	Topics	30 L
1.	**Listening** (Telephonic Communication, Motivational Speeches)	4
2.	**Speaking**	6

Module	Topics	30 L
	(Self Introduction, Role Playing, JAM, Extempore, News reading)	
3.	**Presentation** (Poster + Audio Visual + short skits)	12
4.	**Body Language** (Debate, Group Discussion, Public speaking)	6
5.	**Professional Etiquette** (Conducting a programme, Presentation)	2

5. References:

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
CO 1	Acquire basic proficiency in English, including reading, listening comprehension, writing, and speaking skills, and demonstrate a basic understanding of English.	Application	Understand
CO 2	Communicate confidently in English, using appropriate grammar, vocabulary, and syntax, and demonstrate effective speaking and presentation skills in different contexts.	Application	Apply, create
CO 3	Communicate appropriately in professional	Applicatio	Apply

	and social situations, using appropriate language.	n	
CO 4	Improve teamwork, leadership skills, and problem-solving skills through group activities.	Understa nd	Apply
CO 5	Organize and write business correspondence properly and correctly, using appropriate knowledge of language.	Understa nd,	Apply
CO 6	Develop active listening skills, including effective listening strategies and note-taking.	Understa nd	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)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	1	1	1	1	3	1	3
CO2	3	2	2	1	1	1	1	1	3	3	2	3
CO3	1	2	2	1	1	1	1	3	3	3	1	2
CO4	3	3	3	3	1	2	1	2	3	3	3	3
CO5	2	3	3	2	2	2	2	2	3	3	3	3
CO6	3	3	3	2	1	1	1	1	2	3	2	3

9. Mapping to Program Specific Outcome (PSO)

	PSO1	PSO2	PSO3	PSO4
CO1	2	2	3	2
CO2	3	3	3	2
CO3	3	2	2	2
CO4	3	3	2	2
CO5	3	3	2	2
CO6	2	2	2	2

***** End of Syllabus*****

Course Name: Programming for Problem Solving Lab
Course Code: ESC-CS 292
(Semester –II)
Course Broad Category: Engineering Science

……

1. Course Prerequisite:

- Basic knowledge of computers and general mathematical operations.
- And/ Or Introduction to Hardware and Software Lab (ESC-CS 191)

2. Course Learning Objectives:

i. **Develop problem-solving skills** by implementing basic C programming concepts, including variable types, type conversions, and arithmetic expressions in a structured programming environment.
ii. **Apply control structures** such as branching statements (if-else, switch-case) and loops (while, do-while, for, nested loops) to solve computational problems efficiently.
iii. **Implement data structures and functions** by working with arrays (1D & 2D), pointers, recursive functions, and string manipulations to enhance program modularity and efficiency.
iv. **Demonstrate file handling and structured data management** by using structures, unions, and file operations to develop small-scale projects like student and library information systems.

3. Teaching methodology and evaluation system for the course:

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

Evaluation System –

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

4. Course Content:

Course Name: Programming for Problem Solving Lab
Course Code: ESC-CS 292
Hours per Week: 0L: 0T: 4P
Credits: 2

Unit	Content
1	Problem solving using computers: Familiarization with programming environment, Variable types and type conversions: Simple computational problems using arithmetic expressions.
2	Branching and logical expressions: Problems involving if-else, nested if-else, else if, switch case, if else implementation using ternary operator.
3	While and do-while loops: Iterative problems e.g., sum of series, sum of digit, reverse number, Armstrong number, palindrome number, etc.

4	For Loops: Problem solving using for loops e.g. prime number, Fibonacci series Nested loops: Problem solving using loops e.g. different patterns, etc.
5	Nested loops Contd.: Problems related to in between range e.g. prime numbers between a range, multiplication table between a range etc.
6	1D Arrays and 2D Arrays: 1D Array implementation and manipulation and different problems e.g., linear searching, Bubble sort, find maximum and minimum value, Reverse, etc. Matrix Transpose, Matrix Addition, etc.,
7	2D Arrays: Matrix Multiplication, Sparse Matrix to low dimension 2D Matrix and its reverse, Upper and lower triangular to 1D array conversion, and its reverse 1D Array to Upper and lower triangular to 2D Matrix conversion, etc.
8	Functions: call by value: Simple functions, call by address.
9	Recursive Function and C Preprocessor: Factorial, GCD, Fibonacci Series, X^n, Tower of Hanoi, etc., File inclusion, Macro expansion and Macros with Arguments.
10	String: implement different string related problem using string library functions, and string function implantation strlen(), strcmp(), strcpy(), strrev(), etc.
11	Structure and Union: implement structure and implement mini project e.g., Students information system, Library information system, implement union, etc
12	File handling: File operations e.g. Reading and writing to a file, file copy etc.

5. References:

Text & References 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
ESC-CS 292.CO1	**Familiarize** with programming environments and **solve** simple computational problems using arithmetic expressions and type conversions.	Familiarize, Solve	L-2
ESC-CS 292.CO2	**Develop** programs using branching constructs (if-else, switch, ternary operator) for logical decision-making.	Develop	L-3
ESC-CS 292.CO3	**Implement** programs using while, do-while, and for loops to **solve** iterative problems such as series sum, number reversal, prime numbers, Fibonacci series, and pattern printing.	Implement, Solve	L-3
ESC-CS 292.CO4	**Implement** 1D array for searching, sorting, and solve matrix operations (addition, transpose, multiplication), and specialized matrix transformations (sparse matrix conversions) using 2D	Implement, Solve	L-3

	array.		
ESC-CS 292.CO5	**Design** and **implement** functions using call by value and call by address, **develop** recursive solutions (Factorial, GCD, Fibonacci, Tower of Hanoi), string manipulation functions and **use** preprocessor directives (macro expansion, file inclusion).	Implement, Develop	L-6
ESC-CS 292.CO6	**Design** programs using structures and unions (e.g., student/library management systems), and **Implement** file operations for data storage and retrieval.	Design, Implement	L-6

7. Mapping of course outcomes to module / course content

Module	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
1	3	-	-	-	-	-
2	-	3	-	-	-	-
3, 4, 5	-	-	3	-	-	-
6, 7	-	-	-	3	-	-
8, 9, 10	-	-	-	-	3	-
11, 12	-	-	-	-	-	3

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

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	2	-	-	-
CO6	3	3	3	2	-	-	-	-	2	-	-	-
AVG.	3	3	3	2	0	0	0	0	2	0	0	0

9. Mapping to Program Specific Outcomes (PSO)

	PSO1	**PSO 2**	**PSO 3**	**PSO 4**
CO1	2	2	2	1
CO2	2	2	1	2
CO3	2	2	2	2
CO4	2	2	2	2
CO5	2	2	2	2
CO6	2	2	2	2

***** End of Syllabus*****

Course Name: National Service Scheme (NSS)
Course Code: EC-NSS 201
(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: EC-NSS 101
Hours per Week: 0
Credits: 0

Module	Topics	No.
1.	Orientation Seminar	1
2.	Activities generating environmental awareness	2

Module	Topics	No.
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
EC-NSS 101.1	Understand the meaning NSS and its importance in society.	Explain	Understand
EC-NSS 101.2	Identify and implement solutions to environmental hazards	Identify, Implement	Create
EC-NSS 101.3	Implementation of basic activities, method and adaptation done by NSS	Implement	Apply
EC-NSS 101.4	Uphold the concept of volunteerism & leadership among youth and women	Design	Apply
EC-NSS 1 101.5	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	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
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	PSO4
CO1	1	2	2	1
CO2	2	2	2	2
CO3	2	2	2	1
CO4	2	2	2	2
CO5	2	2	2	1

***** End of Syllabus*****