JHARKHAND Rai University

COURSE SCHEME

BATCH 2021-2025

BTECH IN COMPUTER SCIENCE AND ENGINEERING

CHOICE BASED CREDIT SYSTEM

SEMESTER II

S.No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Basic Science Course	BSC103	Chemistry I	3	1	0	20	10	30	70	100	4
2	Basic Science Course	BSC104	Mathematics II	3	1	0	20	10	30	70	100	4
3	Engineering Science Course	ESC103	Programming for Problem Solving	3	0	0	20	10	30	70	100	3
4	Engineering Science Course	ESC104	Workshop Practice	1	0	0	20	10	30	70	100	1
5	**Mandatory Course**	**MC101**	**Environmental Science	3	0	0	20	10	30	70	100	0
PRACTICAL /SESSIONAL												
1	Basic Science Course	BSC103P	Chemistry I Lab	0	0	2			30	20	50	1
2	Engineering Science Course	ESC103P	Programming for Problem Solving Lab	0	0	2			30	20	50	1
3	Engineering Science Course	ESC104P	Workshop Practice Lab	0	0	2			30	20	50	1
									TOTAL		**650**	**15**

Program: B.Tech

Semester: Second

Course: Chemistry I
Course Code: BSC103

L	T	P	C
3	1	0	4

Course Objective:

- To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- To include the importance of water in industrial usage, significance of corrosion control to protect the structures, polymers and their controlled usage.
- To acquire knowledge of elements, their periodic properties and engineering materials and about fuels and batteries.
- To acquire required knowledge about few drug molecules and their synthesis and composites.
- The knowledge gained on polymer chemistry, thermodynamics, spectroscopy, stereochemistry will provide a strong platform to understand the concepts on these subjects for further learning.

Course Outcome:

On successful completion of this course students will be able to:

- Demonstrate knowledge of science behind common impurities in water and methods to treat them.
- Students will be able to analyze the basic knowledge of various types of Fuels, their properties and Industrial Applications.
- Knowledge of methods to determine the calorific value of fuels, perform flue gas analysis and combustion analysis.
- Apply the science for understanding corrosion and its prevention.
- Demonstrate knowledge of superconducting and organic electronic materials.
- Rationalize periodic properties such as ionization potential, electro negativity , oxidation states.

Module I: Atomic and molecular structure (8)
Schrodinger equation. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Module II: Spectroscopic techniques and applications (7 lectures)
Principles of spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging.

Module III: Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

Module IV: Use of free energy in chemical equilibria (6 lectures)
Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.

Module V: Periodic properties (6 Lectures)
Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

Module VI: Stereochemistry (5 lectures)
Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.

Module VII: Organic reactions and synthesis of a drug molecule (4 lectures)
Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Suggested Reading:

(i) University chemistry, by B. H. Mahan
(ii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
(iii) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
(iv) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
(v) Physical Chemistry, by P. W. Atkins
(vi) Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore.
(vii) Engineering Chemistry by Jain & Jain.
(viii) Engineering Chemistry by O P Agarwal.

Program: B.Tech
Semester: Second
Course: Chemistry I Lab
Course Code: BSC103P

L	T	P	C
0	0	1	1

List of Laboratory Experiments/Demonstrations:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs.
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Estimation of Hcl solution supplied titrating it against N/10 Hcl solution.
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulatio n of the white part of egg

Program: B.Tech

Semester: Second

Course: Mathematics II
Course Code: BSC104

L	T	P	C
3	1	0	4

Course Objective:

- The subject helps the students to develop the fundamentals and basic concepts in Laplace transform. Students will be able to solve problems related to engineering applications by using these techniques.
- Apply the principles of Differential Calculus to solve a variety of practical problems in Engineering and Applied Science.
- Apply the principles of Partial Differentiation, Directional Derivatives, and Double integral.

Course Outcome:

- To introduce the basic concepts required to understand, construct, solve and interpret differential equations.
- To teach methods to solve differential equations of various types.
- To give an ability to apply knowledge of mathematics on engineering problems.
- Formulate and solve differential equation problems in the field of Industrial Organization Engineering.
- To give an idea about Power series solutions; Legendre polynomials, Bessel functions.

Module 1: First order ordinary differential equations:
Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 2: Ordinary differential equations of higher orders:
Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation.

***Module 3:* Power series**
Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

***Module 4:* Partial Differential Equations**
Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method. Second-order linear equations and their classification, Initial and boundary conditions, D'Alembert's solution of the wave equation; Heat diffusion and vibration problems, Separation of variables method to simple problems in Cartesian coordinates.

Module 5: Vector calculus

Gradient, curl and divergence ; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Suggested Readings:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc- Graw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Program: B.Tech
Semester: Second
Course: Programming for Problem Solving
Course Code: ESC103

L	T	P	C
3	0	0	3

Course Objective:

The course will enable the students to learn

- Understand the fundamentals of C programming
- The basics and syntax of C programming
- Array, Structure, Pointer and File concept
- Be able to apply concepts to solve real world problems
- Able to program in C programming for a given application.

Course Outcome:

- Students will learn about fundamentals of computer and programming language, draw flow chart to solve given problem logically and develop algorithm to solve given program.
- Students will be able to choose the loops and decision-making statements to solve the problem.
- Students will be able to understands the concepts of function, array , pointer and structure.
- Students will be able to Implement file Operations in C programming for a given application.

Unit 1: Introduction to Programming (2 hrs)

Introduction to Programming (Flow chart/pseudocode, compilation etc.), Variables (including data types)

Unit 2: Arithmetic expressions and precedence (2 hrs)

Unit 3: Conditional Branching and Loops (8 hrs)

Writing and evaluation of conditionals and consequent branching, Iteration and loops

Unit 4: Arrays (6 hrs)

Arrays (1-D, 2-D), Character arrays and Strings

Unit 5: Basic Algorithms (6 hrs)

Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity

Unit 6: Function and Recursion (8 hrs)

Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.

Unit 7: Structure and Pointers (6 hrs)

Pointers, Structures (including self referential structures e.g., linked list, notional introduction)

Unit 8: File handling (2 hrs)

Suggested Reading:

1. E. Balagurusamy – Programming in ANSI C, 3rd Edn. , TMH, New Delhi, 2004
2. Programming with C, B.S.Gottfried (TMH)
3. Y. Kanetkar – Let us C, 4th Edition, BPB Publication, New Delhi; 2002
4. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
5. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
6. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice

Program: B.Tech
Semester: Second
Course: Programming for Problem Solving
Course Code: ESC103P

L	T	P	C
0	0	2	1

Tutorial and Lab:

Tutorial 1: Problem solving using computers: Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions: Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions: Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops: Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting: Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings, memory structure: Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value: Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration): Lab 8 and 9: Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls: Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation Lab 11: Pointers and structures

Tutorial 12: File handling: Lab 12: File operations

Program: B.Tech

Semester: Second

Course: Workshop Practice
Course Code: ESC104

L	T	P	C
1	0	0	1

Course Objective:

- Students able to understand different tool &equipment for work shop practice.
- Students acquire skills for the preparation of different Carpentry/fitting/welding models.
- Students able to understand the safety precaution in the workshop
- Student acquires skills of Application orientated tasks.

Course Outcome:

On successful completion of the course, the student will be able to:

- Ability to prepare simple wooden joints using wood working tools
- Ability to Produce Fitting jobs as per specified dimensions
- Ability to prepare simple lap, butt, T-, joint and Corner joints using arc welding equipment

Lectures & videos: (10 hours)

Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods (3 lectures)
CNC machining, Additive manufacturing (1 lecture)
Fitting operations & power tools (1 lecture)
Electrical & Electronics (1 lecture)
Carpentry (1 lecture)
Plastic moulding, glass cutting (1 lecture)
Metal casting (1 lecture)
Welding (arc welding & gas welding), brazing (1 lecture)

Suggested Reading:

1. *Workshop technology by Hajara Chaudhary*
2. *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.*
3. *Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",*
4. *4th edition, Pearson Education India Edition, 2002.*
5. *(iii)Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.*
6. *Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.*
7. *Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.*

Program: B.Tech
Semester: Second
Course: Workshop Practice Lab
Course Code: ESC104P

L	T	P	C
0	0	2	1

Workshop Practice: **(60 hours)**

1. Machine shop - 10 hours
2. Fitting shop - 8 hours
3. Carpentry - 6 hours
4. Electrical & Electronics - 8 hours
5. Welding shop - 8 hours (Arc welding 4 hrs + gas welding 4 hrs)
6. Casting - 8 hours
7. Smithy - 6 hours
8. Plastic moulding & Glass Cutting -6 hours

Program: B.Tech

Semester: Second

Course: Environmental Science
Course Code: MC101

L	T	P	C
3	0	0	0

Course Objective:

- Students understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Students appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.

Course Outcome:

- On successful completion of this course students will be able to:
- Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- Understand environmental problems arising due to developmental activities.
- Identify the natural resources and suitable methods for conservation and sustainable development
- Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
- Identify the environmental pollutants and abatement devices.

Unit I

Multidisciplinary nature of environmental studies, Natural Resources

Definition, scope and importance need for public awareness.

Renewable and non-renewable resources:

Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies.

Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.
f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
• Role of an individual in conservation of natural resources.
• Equitable use of resources for sustainable lifestyles.

Unit II

Ecosystems, Biodiversity and its conservation

• Concept of an ecosystem.
• Structure and function of an ecosystem.
• Producers, consumers and decomposers.
• Energy flow in the ecosystem.
• Ecological succession.
• Food chains, food webs and ecological pyramids.
• Introduction, types, characteristic features, structure and function of the following ecosystem:-a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
• Introduction – Definition: genetic, species and ecosystem diversity.
• Bio geographical classification of India
• Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
• Biodiversity at global, National and local levels.
• India as a mega-diversity nation
• Hot-sports of biodiversity.
• Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
• Endangered and endemic species of India
• Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit III:

Environmental Pollution, Social Issues and the Environment Definition, Cause, effects and control measures of:-a. Air pollution

b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards
• Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
• Role of an individual in prevention of pollution.
• Pollution case studies.
• Disaster management: floods, earthquake, cyclone and landslides.
• From Unsustainable to Sustainable development
• Urban problems related to energy
• Water conservation, rain water harvesting, watershed management
• Resettlement and rehabilitation of people; its problems and concerns. Case Studies
• Environmental ethics: Issues and possible solutions.
• Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust Case Studies.
• Wasteland reclamation.
• Consumerism and waste products.
• Environment Protection Act.
• Air (Prevention and Control of Pollution) Act.
• Water (Prevention and control of Pollution) Act
• Wildlife Protection Act
• Forest Conservation Act
• Issues involved in enforcement of environmental legislation.
• Public awareness.

Unit IV

Human Population and the Environment, Field work

• Population growth, variation among nations.
• Population explosion – Family Welfare Programme.
• Environment and human health.
• Human Rights.
• Value Education.
• HIV/AIDS.
• Women and Child Welfare.
• Role of Information Technology in Environment and human health.
• Case Studies.
• Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain

• Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
• Study of common plants, insects, birds.
• Study of simple ecosystems-pond, river, hill slopes, etc.

Suggested Reading:

- G. Kiely, *Environmental Engineering*, Irwin/ McGraw Hill International Edition, 1997
- M. L. Davisand S. J. Masen, *Principles of Environmental Engineering and Science*, McGraw Hill International Edition 2004
- D. D. Mishra, *Fundamental Concepts in Environmental Studies*, S. Chand and company PVT. LTD., 2014