Scheme of Examination B.E. First year (All Branches of Engineering)

Second Semester

Sub Code	Subjects	Workload in hrs			Credits	Marks					Minimum Passing Marks	
		L	T/A	P		Theory		Practical		Total		
						Internal	Uni	Internal	Uni		Theory	Practical
BSE2-1T	Mathematics-II	3	1	-	4	30	70	-	-	100	45	-
BSE2-2T	Advanced Engineering Materials	2	2	-	3	30	70	-	-	100	45	-
BSE2-3T	Applied Chemistry	3	2	-	4	30	70	-	-	100	45	-
BSE2-4T	Computational Skills	2	-	-	2	15	35	-	-	50	23	-
BSE2-6T	Basics of Electrical Engineering	2	-	-	2	15	35	-	-	50	23	-
BSE2-7T	Engineering Mechanics	2	-	-	2	15	35	-		50	23	-
BSE2-8T	Indian Culture & Constitution	2	-	-	Audit	50	-	-	-	Audit	-	-
BSE1-5P	Workshop Practices	-	-	4	2	-	-	50	50	100	-	50
BSE2-2P	Advanced Engineering Materials	-	-	2	1	-	-	25	25	50	-	25
BSE2-3P	Applied Chemistry			3	1.5	-	-	25	25	50	-	25
BSE2-4P	Computational Skills			2	1	-	-	25	25	50	-	25
Three weeks Induction Program												
	Total	**16**	**5**	**11**	**22.5**	**135***	**315**	**125**	**125**	**700**		

- L- Lecture , P-Practical, T- Tutorial, A- Activity (Half Credit per Hour)

* Audit course marks are not counted in total marks

Guidelines

- Energy and Environment shall be taught by faculty of Chemistry and will come under board of Applied Science and Humanities (only by Chemistry Dept)
- Advance Engineering Materials shall be taught by faculty of Physics and will come under board of Applied Science and Humanities (only by Physics Dept)

Faculty of Science and Technology

R.T.M Nagpur University, Nagpur

Syllabus for B. Tech. Second Semester

Mathematics – II

Total Credits: 4
Teaching Scheme
Lectures: 3 Hours/Week
Tutorial: 1 Hour/Week

Subject Code: BES2-1
Examination Scheme
Theory T (U): 70 Marks, T (I): 30 Marks
Duration of University Exam: 3 hours

Course Objectives:

1. The objective of the course is to inculcate and strengthen analytic ability among the engineering students and to create zeal of working with higher mathematics and its applications in the extensive field of engineering.
2. The topics covered will serve as basic tools for specialized studies in many fields of engineering and technology.

Course Outcomes:

After completing the course, students will be able to

1. Analyze real world scenarios to recognize when integrals are appropriate, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) in order to solve the problems using multiple approaches, judge if the results are reasonable, and then interpret and clearly communicate the results.
2. Define and understand the geometry of vector differential operators and line and surface integrals.
3. Explain and apply principles of study design and data collection.
4. Develop an ability to identify, formulate and/or solve real world problems.
5. Understand the impact of scientific and engineering solutions in a global and societal context.

Unit 1: Integral Calculus (13 Hours)

Evaluation of Definite and Improper Integrals: Beta and Gamma functions and their properties, Differentiation of definite integral, Mean value, Mean square value and Root mean square value.

Curve Tracing: Tracing of curves (Cartesian), Applications of definite integrals to find length of curve, area, volume and surface area of solids of revolution (Cartesian, Polar and Parametric curves).

Unit 2: Multivariable Calculus (Integration) (13 Hours)

Multiple Integration: Double integrals (Cartesian and Polar), Change of order of integration in double integrals, Change of variables (Cartesian to Polar).

Applications: Area, Mass, Volume and Center of Gravity (constant and variable densities), Elementary triple integrals.

Unit 3: Vector Calculus **(10 Hours)**

Vector Calculus: Vector triple product, Product of four vectors, Scalar point function,Vector point function,Vector differentiation, Gradient, Divergence and Curl, Directional derivatives, Solenoidal and Irrotational motions

Vector Integration: Line integrals and Work done.

Unit 4: Statistics **(6 Hours)**

Fitting of a Curve by Method of Least Squares: Straight line $y = a+bx$, Second degree parabola $y = a+bx+cx^2$ and curves of the type $y = ae^{bx}$, $y = ab^x$ and $y = ax^b$, Coefficient of correlation and Lines of regression, Rank correlation.

Unit 5: Finite Differences **(6 Hours)**

Operators E & Delta, Factorial polynomial, Lagrange's interpolation formula for unequal intervals of arguments.

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd rule and Simpson's 3/8th rule, Difference equations with constant coefficients.

Text/Reference Books:

(1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
(2) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11th Reprint, 2010.
(3) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
(4) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
(5) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.
(6) H.K Dass, Rama Verma, Rajnish Verma, V.J. Dagwal, Sajid Anwar and D.F. Shastrakar, Engineering Mathematics, Volume I and II, S. Chand.

B.Tech. Semester II Advanced Engineering Materials (Total Credits 3)

Teaching Scheme **Examination Scheme**

Lectures: 2 Hours/Week Theory, **T(U): 70 Marks T(I): 30 Marks**

Tutorial/Activity: 2 Hours/week **Duration of University Exam: 3 Hours**

Unit - 1: Band theory of solids (6 Hrs) 14 Marks

Basic idea of free electron theory of metals, expression of conductivity of a metal. Formation of energy bands in Solids, Fermi energy and Fermi level.

Classification of solids on the basis of energy band diagram: Conductors, Semiconductors and Insulators, concept of Fermi energy.

Unit-2: Semiconductor Devices (7 Hrs) 14 Marks

Types of Semiconductor diodes, P-N junction Diode: Characteristics of P-N junction Diode, Tunnel Diode, Zener Diode, LED, Photodiode.

Transistors . Hall effect, Hall voltage and Hall coefficient; its applications,

Unit 3: Magnetic and Superconducting Materials (10 Hrs) 14 Marks

Diamagnetic, Paramagnetic, Ferromagnetic, Ferri-magnetic and anti ferromagnetic materials: Explanation on the basis of domain. Hysteresis curve, Characteristics of ferromagnetic, diamagnetic and paramagnetic materials and their applications.

Superconductors: Basics of superconductivity: Zero electrical resistance, Persistent current Effect of Temperature, Effect of Magnetic Field, Critical Current; The Meissner Effect.Type-I and type-II superconductors, London Equation: The penetration depth, Bardeen-Cooper-Schrieffer (BCS) theory.

Unit 4: Lasers (7 Hrs) 14 Marks

Quantum Transitions: Absorption, Spontaneous emission & stimulated Emission, Metastable states, Principle of laser, Laser characteristics, Coherence length and coherence time, Pumping schemes: Three level and Four level.

Optical Resonator, Construction & working of Ruby laser and He-Ne laser, Applications of laser.

Unit 5: Nanoscience and Nanomaterials (6 Hrs) 14 Marks

Introduction to Nanoscience, Classification of nano materials, Types of Synthesis of Nanomaterials, Comparison of properties of nanomaterials with bulk materials,

Some special nanomaterials: 1) Zeolites, 2) Graphine, Application of nanomaterials in engineering.

Course Outcomes

Students will be able to

CO1. Learn the concept of formation of energy bands and to classify solids on its basis.

CO2. Identify and explain different types of diodes, transistors and its applications

CO3. Learn the concepts of magnetism and superconductivity, classify and analyze various types of magnetic and superconducting materials.

CO4. Learn and explain quantum transitions and apply it to working of lasers.

CO5. Learn the concept of nano materials and compare its properties with those of bulk materials.

Suggested Text Books &Reference Books

1. *Solid state Physics, S. O. Pillai, New Age publications.*
2. *Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition,(1983).*
3. *A.J. Dekker Electrical Engineering Materials, Prentice Hall of India(1971).*
4. *Fundamentals of Physics by D. Halliday, R. Resnick and J. Walker, John Wiley and Sons Inc.*
5. *K. Thyagarajan and A. K. Ghatak, Lasers Theory and Applications, Mcmillan(1981).*
6. *A textbook of Engineering Physics, Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar, S. Chand Publication*
7. *A text Book of Advanced Engineering Materials, Dr. D. S. Hardas, , Dr.S.Shastri, Dr. (Mrs)S.P. Wankhede, Dr. D. S. Bhoumik, Dr.(Mrs.)S.U.Bhonsule, Dr.Shruti Patle, , Das Ganu Publication ISBN-978-93-84336-70-7 (2021)*
8. *A text Book of Advanced Physics, Dr. D. S. Hardas, Dr.A. R. Panat , Das Ganu Publication ISBN-978-93-81660-49-2 (2013)*
9. *Advanced physical science for Engineers, Dr. S. Patle, Dr. S. U. Bhonsule, Dr. N. Ugemuge, Dr. S. P. Wankhede, DNA publication*
10. *Advanced Engineering Materials, M. N. Avdhanulu, Shilpa A. Pande, Arti R. Golhar, Mohan Giriya, S. CHAND*
11. *W. Saslow, Electricity, Magnetism and light.*
12. *Solid state Physics by R. L. Singhal, Kedarnath Ramnath & Co.Meerut*
13. *Introduction to Lasers Theory and Applications by M. N. Avadhanulu, S. Chand and Company*
14. *Engineering Physics by P. K. Palaniswamy, Scitech(2005)*
15. *Engineering Physics by H. Malik and A. K. Singh,TMH(2010)*
16. *Engineering Physics by D. K. Bhattacharya and A. Bhaskaran, Oxford University Press (2010)*
17. *Materials Science and Engineering- A First course by V. Raghavan, PHILearning*

List of Activities

1. Study of band gap of various semiconducting materials.
2. Variation of Fermi energy with respect to various parameters.
3. Identification of N-type & P-type semiconductor on virtual lab.
4. Testing of resistor, transistor, diode, capacitor with the help of multimeter / CRO.
5. Compare Cut-in-voltages of various LEDs.
6. Study of lines of force using bar magnet & iron fillings.
7. Gather information about Maglev train.
8. Write up on History of superconductivity.
9. Study of application of superconductor.
10. Measure the divergence of various sources of light such as torch, laser, tubelight, etc.
11. Understanding the phenomenon of stimulated emission, absorption & stimulated emission.
12. Laser applications in day to day life.
13. Collect information about Holography.
14. Write short note on Discovery of nano materials
15. Applications of nano materials.
16. Industrial Visit

Note : Performance of at least one activities is compulsory in a semester.

B. E. Semester II Advanced Engineering Materials (Practical)

(Total Credits: 1)

Teaching scheme **Examination Scheme**

Lectures: 2 hrs/Week **P(I): 25 Marks P(U) : 25 Marks**

List of Experiments

1. Energy gap of semiconductor /thermistor
2. Parameter extraction from V-I characteristics of PN junction diode.
3. Parameter extraction from V-I characteristics of Zener diode.
4. Parameter extraction from V-I characteristics of PNP/NPN transistor in CB and CE mode.
5. V-I Characteristics of Tunnel diode.
6. V-I Characteristics of Light Emitting Diodes.
7. Study of Diode rectification.
8. Study of Hall Effect and determination of Hall Voltage of given sample.
9. Variation of Hall coefficient (R_H) with temperature.
10. To study B-H curve and to find out the values of coercivity, retentivity and saturation magnetisation of experimental material.
11. Laser source: Determination of wavelength by diffraction grating.

Note: Performance of at least **six** experiments is compulsory in a semester.

Scope of the syllabus

Second Semester: Advanced Engineering Materials

Unit - 1: Band theory of solids

Free electron theory in metals; Derivation for expression of conductivity of a metal, drift velocity, Band theory of solids, Energy Bands, Energy Gap, classification of solids, Fermi function and its variation with temperature; Detailed discussion of relative positions of conduction band and valence band in conductor, insulator and semiconductor.

Concept of effective mass, Semiconductors: Intrinsic and Extrinsic Semiconductors, conduction process in Semiconductors, Energy band diagrams of Intrinsic and Extrinsic Semiconductors at T=0K and T> 0K, expression for fermi energy in Intrinsic Semiconductors without derivation,

Unit-2: Semiconductor Devices

P-N junction Diode, Unbiased, forward biased & reversed biased mode, Transistor action, Hall effect, Hall Coefficient , Characteristics of Tunnel Diode, Zener Diode, LED,Photodiode

Unit 3: Magnetic and Superconducting Materials

Introduction to magnetic materials, magnetic field, magnetic dipole moment, magnetic induction, magnetization, magnetic susceptibility, magnetic permeability, classification of magnetic materials (diamagnetic, paramagnetic, ferromagnetic), domain hypothesis, B-H curve , antiferromagnetic, ferrimagnetism, Applications: Alnico and magnetic storage

Introduction to superconductivity: Zero electrical resistance, Persistent current Effect of Temperature, Effect of Magnetic Field, Critical Current; The Meissner Effect, Type-I and type-II superconductors, London Equation: The penetration depth, Bardeen-Cooper-Schrieffer (BCS) theory.

Unit 4: Lasers

Meaning of coherence length of laser, expression for coherence length and coherence time, Laser Emission, Lasing action, optical resonant cavity: Construction and its role in LASERS, three and four level pumping scheme, Laser characteristics: Directionality, Divergence, Intensity, Coherence, Monochromaticity.

Unit 5: Nanoscience and Nanomaterials

Introduction to nanoscience, Classification of nano materials, Types of Synthesis of Nanomaterials, Reasons for drastic changes in properties at nanoscale,Comparison of properties of nanomaterials with bulk materials, Some special nanomaterials: 1) Zeolites, 2) Graphine, Applications of nanomaterials in engineering.

RTMNU, Nagpur
SYLLABUS FOR FIRST YEAR (SEMESTER II) BACHELOR OF TECHNOLOGY
(For All Branches)

Course Code	**BSE2---3T**			
Course Title	**APPLIED CHEMISTRY**			
Scheme & Credits	**L**	**T/A**	**Credits**	**Semester II**
	3	**2**	**4**	

Examination Scheme	
T(U): 70 Marks T (1) 30 Marks	**Duration of University Exam. : 03 Hours**

Course Objectives.

1) To acquaint the students with the basic concepts of Chemistry, and their applications in the Engineering field.
2) To gain the knowledge on properties of materials, and protection of materials from corrosion.
3) To impart basic knowledge related to ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4) To provide an insight into Green Chemistry and its applications in engineering fields.
5) To enable the student to upgrade the existing knowledge of water technologies and to enhance the thinking capabilities in line with the modern trends in Engineering and technology.

Course Outcomes

The course will enable the students to
CO1. Rationalize the periodic properties and analyze the Microscopic Chemistry in terms of atomic and molecular orbital.
CO2. Rationalize bulk properties and processes using thermodynamic processes &understand the causes of corrosion, its consequences and methods tominimize corrosion.
CO3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
CO4. Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.
CO5. Know about treatment of water and its applications in industry.

UNIT-1: Periodic Properties and Atomic, Molecular Structure
(8 Hours) (Marks 14)

- Periodic properties :- Effective Nuclear charge, electronegativity and polarizability
- Numerical on Slater's Rule
- Atomic, molecular structure:- Atomic and Molecular orbitals. Molecular Orbital Theory and Energy level diagrams of homo diatomic molecules (Hydrogen to Fluorine) and hetero diatomic molecules, NO, NO^+, NO^- and HF.
- Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties (tetrahedral and Octahedral complexes).

UNIT-2 Thermodynamic & Corrosion
(8 Hours) (Marks 14)

- Definition & basic equation of internal energy and enthalpy
- Numerical on internal energy, enthalpy change (Hess's Law)
- Second law of Thermodynamics, reversible and irreversible reactions
- Role or use of Gibbs free energy in a) chemical equilibrium, b) oxidation reduction
- Corrosion- Definition, Causes, theories of corrosion- dry, wet and differential aeration

- Numerical on Pilling Bedworth Rule
- Types of corrosion- pitting, inter granular, and stress corrosion
- Prevention and control of corrosion- design and material selection, cathodic protection.

UNIT-3 Applications of Spectroscopic Techniques
(8 Hours) (Marks 14)

- Principles of spectroscopy and selection rules (Electronic Spectra of Transition Metal Complexes)
- Electronic spectroscopy- basic principles, Lambert-Beer's law, Woodward Fisher Rule for conjugated dienes.
- Numerical on Lambert-Beer's Law
- Numerical on Woodward Fischer Rule
- Fluorescence, Phosphorescence, Jablonski Diagram and its applications.
- Nuclear magnetic resonance - basic principle, chemical shift, spectral interpretation of some simple compounds and magnetic resonance imaging.

UNIT-4 Basic Green Chemistry
(7 Hours) (Marks 14)

- Green Chemistry:- Introduction, twelve principles of Green chemistry with examples,
- Numerical based on atom economy
- Carbon sequestration & Carbon Credits,
- Green reagents, Dimethyl carbonate and its applications,
- Supercritical CO_2 properties and applications, uses and applications of biopolymers – polyadipic acid and polycaprolactum.

UNIT-5 Water Technology
(9 Hours) (Marks 14)

- Importance of Hardness and Alkalinity of water.
- Industrial Water Treatment: Softening of water-principle, reactions, advantages, limitations and comparison of Zeolite process and De mineralization process.
- Numerical based on Zeolite process.
- Boiler Troubles - (causes, effect on boiler operation and methods of prevention) -Scales and sludges, Caustic embrittlement.
- Desalination of sea water- Principle methods and advantages of electro dialysis and reverse osmosis processes
- Waste Water Treatment (introduction and importance) - Water treatment from biological waste water to clean water production, Membrane bio reactors.

Books Recommended:

1. Applied Chemistry: Dr. Avinash V. Bharati, Dr. (Mrs.) Seema A. Shrivastava, Dr. (Mrs.) Seema G. Rawat, Dr. Indrani B. Das Sarma, Dr. (Mrs.) Jyoti N. Thakre, Dr. Kiran M. Khandalkar. Published by Das GanuPrakashan, Nagpur (India)
2. Text Book of Engineering Chemistry: S.S. Dara, S. S. Umare, Published by S. Chand and Company Ltd. New Delhi
3. Textbook of Engineering Chemistry P.C. Jain and Monica Jain, Published by DhanpatRai and Sons, New Delhi.

Reference Books:

1. A textbook of Engineering Chemistry by RajashreeKhare, Published by S. K. Katariya and sons
2. University Chemistry, by B. H. Mahan.
3. Organic Chemistry by Paula Y. Bruice, Published by Pearson
4. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
5. Fundamentals of Molecular Spectroscopy, by C. N. BanwellIndia.

6. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M.S. Krishnan
7. Physical Chemistry, by P. W. Atkins
8. A Text book of Engineering Chemistry: Shashi Chawla; DhanpatRai& Sons, New Delhi.
9. Engineering Chemistry: A.V. Bharati and Walekar, Tech Max Publications, Pune.
10. Selected Topics in Inorganic Chemistry: Madan, Malik, Tuli.
11. Elementry Organic Spectroscopy by Y. R. Sharma, Published by S. Chand and Company Ltd. New Delhi

Course Code	BSE2-3P				
Course Title	APPLIED CHEMISTRY LABORATORY				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	3	1.5	II

Examination Scheme	
P (U): 25 Marks P (I): 25 Marks	Duration of University Exam. : 03 Hours

Course Outcomes

After completion of course students will learn to:

1) Measure molecular/system properties like, concentrations, surface tension, conductance of solutions etc.
2) Estimate the soluble impurities present in the given water sample.
3) Handle the different instruments used in chemistry laboratory.

Students should

- Perform any eight experiments.
- Study of any one experiment in virtual lab topics based on the syllabus.
- Study of any one demonstration experiment.

1) Preparation of different solutions molar solution, Normal solution.
2) Determination of surface tension of a given liquid solution, percent
3) Determination Hardness of water sample by complexometric method.
4) Determination of types and extent of alkalinity of water sample
5) Determination of free chlorine in water sample by lodometry
6) Determination of cell constant and conductance of a given solution.
7) Synthesis of a polymer/drug
8) Estimation of Fe/Fe by redox titrimetry
9) Determination of capacity of cation exchange resin.
10) Determination of Dissolve Oxygen.
11) Demonstration of study of Adsorption of Acetic acid by Charcoal.
12) Demonstration of Thin layer Chromatography
13) Demonstration of Potentiometric titration of an unknown weak Monoprotic Acid
14) Virtual Demonstration of UV-Visible spectrophotometer and FTIR (Fourier transformation infrared spectroscopy)
15) Virtual Demonstration of Lambert-Beer's Law

ACTIVITY

Students should perform any one activity

1) Drinking water quality analysisHardness,Alkalinity, pH, TDS
2) Titration of Aspirin tablets
3) Study of commonly used antacid tablets
4) Interpretation of NMR spectra of 10 compounds
5) Corrosion of surrounding materials
6) Application of chromatography in industry

Computational Skills

(Total Credits: 02)

SUBJECT CODE: BSE2 - 4T

Teaching Scheme
Practical: 2 Hours/Week

Examination Scheme
Theory
T (U): 35 Marks **T (I):** 15 Marks
Duration of University Exam: 02 Hrs

Unit 1: Introduction to Programming **(6 Hrs)**

Introduction to components of a computer system (disks, memory, processor, where a program is
stored and executed, operating system, compilers etc.)
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.
Arithmetic expressions and precedence

Unit 2: **(10 Hrs)**

a) Conditional Branching and Loops : Writing and evaluation of conditionals and consequent branching Iteration and loops
b) Arrays : Arrays (1-D, 2-D), Character arrays and Strings
c) Basic Algorithms : Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit 3*:* **(8 Hrs)**

a) Function **:** Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference
b) Recursion : Recursion, as a different way of solving problems. Example programs, such as Finding Factorial

Unit 4*:* **(6 Hrs)**

a) Structure : Structures, Defining structures and Array of Structures
b) Pointers **:** Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

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(Sajid Ansari) (AV Bharadi) (B. R. Chide) Dr M. N. Giri

Computational Skills (Total Credits: 01)

SUBJECT CODE: BSE2 – 4P

Teaching Scheme
Practical: 2 Hours/Week

Examination Scheme
Practical
P (U): 25 Marks **P (I):** 25 Marks
Duration of Internal Practical Exam: 02 Hrs

Students have to perform Practicals based on the theory :

Practical Slot – 1: Fundamentals of Computers and Operating System
1) Demonstrate the internal structure of Computer, its assembly, use of each I/O device and ports.
2) Demonstrate the use of System Software like: Windows, Linux .
3) Explanation about "C" language Complier options. Introduction to C++ language.

Practical Slot – 2: Fundamentals of "C" language
1) To demonstrate all types of operators (Arithmetic, Logical and Relational) of "C" language.
2) To demonstrate different data types in "C" language.
3) To demonstrate the use of "printf" and "scanf" with all possible options.

Practical Slot – 3: Fundamentals of Decision Control Structures
1) To demonstrate the use of if-else structure, nested if structure.
2) To demonstrate the use of Conditional operators (? Operator).
3) To demonstrate the use of Switch.Case construct.

Practical Slot – 4: Fundamentals of Loop Control Structures
1) To demonstrate the use of "while" control structure.
2) To demonstrate the use of "do..while" control structure.
3) To demonstrate the use of "for" control structure.
4) To demonstrate the use of "break" and "continue" construct

Practical Slot – 5 and 6: Fundamentals of One Dimensional Arrays
1) To demonstrate the creation of array, addition of an element, deletion ofan element and displaying the elements from one dimensional array.
2) To demonstrate the implementation of bubble sort, selection sort and insertion sort.
3) To demonstrate the implementation of linear search and binary search.

Practical Slot – 7: Fundamentals of Two Dimensional Arrays
1) To demonstrate the matrix manipulation operations like addition, multiplication.
2) To demonstrate the operations on row and columns of two dimensional matrix.

Practical Slot – 8: Fundamentals of Pointers
1) To demonstrate the pointer declaration and its use.
2) To demonstrate the implementation of pointer on array.
3) To demonstrate the creation of dynamic arrays using pointer.

Practical Slot – 9: Fundamentals of Strings
1) To demonstrate the basic operations on string like "length", "copy", "reverse", "truncate".
2) To demonstrate the implementation of two dimensional array of characters**.**

Practical Slot – 10: Fundamentals of Functions
1) To demonstrate the implementation of functions.
2) To demonstrate the call by value parameter passing method.
3) To demonstrate the call by reference parameter passing method.

Practical Slot – 11: Fundamentals of Functions
1) To demonstrate the implementation of recursive function.
2) To demonstrate the use of library function (mathematical and string).

(B.R.Chide)

Dr. M.N. Giriya

Method to conduct the practicals: Out of the two hours allotted:
The faculty member will teach the basic concepts of practical to the students for 30 minutes.

The next 30 minutes will be on how to implement the problem definition of the practical, i.e., algorithm to implement the problem definition.

The next 1 hour, the students will implement the practical and execute it on computers.

For example: Fundamentals of Loop Control Structures

Contents:
To demonstrate the use of "while" control structure.
To demonstrate the use of "do..while" control structure. To
demonstrate the use of "for" control structure.
To demonstrate the use of "break" and "continue" construct.

Cover the concepts of:
While loop, do..while loop, for loop and break & continue statement.
Explain the implementation of control structure on practical and LCD projector to students. Give one problem definition containing all the concepts of practical and allow students to implement and execute on the computers.

Books Recommended:

1. *Herbert Schildt - C Complete Reference (Tata-McGraw Hill)*
2. *Byron Gottfried," Programming with C", Schaum;s Outline Series .*
3. *R Venugopal & S R Prasad. "Mastering C" Tata-McGraw Hill-2207*

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(Arbhardi) (B. R. Chide) Dr M. N. Giri

Basic Electrical Engineering (BSE2-6T)
(Total Credits: 02)

Teaching Scheme
Lectures: 2 Hours/ Week

Examination Scheme
Theory
T (U) :35 Marks T (I) : 15 Marks
Duration of University Exam. : 02 Hours

Unit – I: Electric Circuits **(8 Hrs)**

EMF, Potential difference, current, power, Energy (Definition & Units SI), Ohms Law, types of sources (Current & Voltage), Ideal and Practical Sources (Independent Sources only), Source Conversion, Superposition theorem with DC source.

Circuit element resistance, factors affecting resistance, series & parallel combination of resistances, Kirchhoff's Laws (KVL, KCL) statement & Numerical, star Delta transformation, Circuit Element Inductance, Self and Mutual Inductance, Circuit Element Capacitance.

Unit – II: Magnetic Circuits **(6 Hrs)**

Types of Magnetic Materials, flux, flux density, flux intensity, MMF, reluctance, permanence, permeability, analogous electric circuit, calculation for composite magnetic circuit, concept of leakage flux and fringing, B-H curve, phenomena of magnetic hysteresis.

Unit - III: AC Circuits **(8 Hrs)**

Generation of single phase voltage, average and RMS value for sinusoidal waveform, periodic function, phasor representation of sinusoidal electrical quantities, steady state behavior of RLC circuit with excitation, reactance, impedance, power and energy in AC circuit, simple numerical on series and parallel AC circuit, concept and importance of power factor, resonance in series circuits.

Principal of Generation of three phase voltage, Phase sequence, Star & Delta Connected three phase system, Voltage, Current & Power relations for Balanced three phase system only (With numerical).

Unit – IV : Single Phase Transformer **(8 Hrs)**

Basic construction of Transformer (core & shell type), Principle of operation, EMF equation, Transformer ratings, No load & On load operation with leakage reactance, losses, efficiency, Definition & formula for voltage regulation, OC & SC test, equivalent circuit of the Transformer.

Books Recommended:

1) *Basic Electrical Engineering: D.C. Kulshreshtha, Tata Mc-Graw Hill Pvt. Ltd.*
2) *A Text Book of Electrical Technology: B. L. Thareja and A. K. Thareja, S. Chand Publication.*
3) *Generation of Electrical Energy: B. R. Gupta 4th Edition, S Chand Publication*
4) *Art & Science of Utilization of Electrical Energy: H. Pratab, III Edition, Dhanpat Rai and Sons.*
5) *Electric Circuits & Network: K. Suresh Kumar, Pearson Publication.*

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(Dr. Sajid Ansari) (M. G. Wasty)

(Arbhorali) (B. R. Chicle) Dr M. N. Gaikwad

Engineering Mechanics (BES2-7T)

Total Credits 2

Teaching Scheme
Lecture : 2

Examination Scheme
TU:35 marks TI: 15 Marks

Duration of Exam : 2 Hours

The Course Objective Is To Impart Knowledge Of

1. To understand the effect of force and moment on the body.
2. To understand the concept of equilibrium and apply the conditions of equilibrium
3. To understand the concept of moment of inertia and apply on rectangular, square, circle or composite section of rectangular, square, circle.
4. To understand the principle of virtual work and apply on connected bodies.
5. To understand the work, energy, D Alemberts Principle and apply on connected bodies.
6. To understand the Impact, Impulse and apply on connected bodies

After the completion of course student will be able to

1. Students will be able to find effect of force on a body.
2. Students will be able to analyze the effect of a system of forces on a given body with the concepts of Equilibrium & Free body diagram.
3. Students will be able to calculate centroid/C.G. and moments of inertia.
4. Students will be able to solve problem of connected bodies by virtual work principal.
5. Students will be able to solve problem of connected bodies by work, energy, D Alemberts Principle.
6. Students will be able to solve problem of connected bodies by Impact, Impulse.

Unit - I : Important Vector Quantities: (10 Hrs)

Position-vector, moment of a force about a point about an axis, couples, couple moment as a free vector. Equivalent force systems: Resultant of a 2 dimensional distributed loads and three-dimensional general force system Wrench.

UNIT - II : Equations of Equilibrium: (10 Hrs)

Free body diagrams, Equations of equilibrium coplanar concurrent and Non-concurrent systems, General spatial force system.

Truss: Analysis of simple pin jointed frames by method of joints method of sections.

Friction forces: Law of Coulomb friction, problems involving dry friction, simple applications like wedges and band brakes.

Unit - III : (10 Hrs)

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Centriods and Moments of Inertia: Second Moment and products of inertia of plane areas, Moment of inertia of masses. Transfer theorems for moment of inertia and Product of inertia, Polar moment of inertia, Principal axes, Mohr''s circle of inertia.

Virtual Work: Introduction of Virtual work theorem: Principle of Virtual work applied to equilibrium of Mechanisms, simple beam, Pin jointed frames.

Unit -IV: (10 Hrs)

D'Alembert,,s Principle, work Energy method, (Expressions based on center of mass). **Methods of Momentum :** Linear impulse momentum, considerations for a system of particles, Consideration of linear momentums, Elastic impact of two bodies, Direct central impact.

Books Recommended:

1. Engineering Mechanics: F.L Singer
2. Engineering Mechanics: Tmoshenko & Young
3. Engineering Mechanics: Bear and Johnson
4. Engineering Mechanics: I.H.Shames
5. Engineering Mechanics: R.D.Askhedkar & P.B.Kulkarni

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Subject: Indian Culture and Constitution (ICC) BSE 2-8T

Semester: II

Course: Audit (Non-credit), Total Marks: 50 (Internal)

Credit: Nil, Teaching Load: 2(Theory)/week

Course Objective:

1. To create an understanding of Indian Constitution and develop respect for the same.
2. To create awareness of India as a State Indian culture and Tradition.

Course Outcomes:

1. Students will become aware of Indian culture and civilization and their role in development of society.
2. Students will understand Industrial work-culture.
3. Students will be sensitized towards professional ethics.
4. Students will understand Indian Constitution and governance of the country.
5. Students will be able to understand the structure and system of work organizations.

(Dr. Sajid Anwar)

(A V B Nandi)

(B. R. Chicle)

SYLLABUS:

Unit-I

1. Concept of Culture and Civilization
2. Vedic Civilization and Indus Valley Civilization
3. Introduction to Vedas, Ashram system, Varna System
4. Concept of Social Engineering (5 Hours)

Unit-II

1. Meaning and Scope of Industrial Psychology and Industrial Sociology
2. Recruitment, Selection and Training of Workers,
3. Fatigue in industry.
4. Motives for work in industry (5 Hours)

Unit-III

1. Sustainable Development
2. Social change .
3. Professional Ethics
4. Concept and styles of Leadership in Industry. (4 Hours)

Unit-IV

1. Indian Constitution and Federal System
2. Fundamental Rights and Directive Principles of State Policy
3. Role of Bureaucracy in Modern Society
4. Socio-Legal Awareness: Right to Information(RIL), Public Interest Litigation(PIL) (5 Hours)

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(R.R. Chide)

Unit-V

1. Industrial Democracy
2. Works Organization: Formal and Informal Organization
3. Concept of Power, Authority and Status system;
4. Industrialization, Urbanization and Study of Slums in India . (5 Hours)

Books Recommended:

1) A New Look into Social Sciences- Shabbir, Sheik and Dwadashiwar
2) An Introduction to Sociology- Vidya Bhushan and Sachdeva
3) Social Science: The Indian Scene-Yogesh Atal
4) Applied Humanities-Rajni Tandon
5) A History of World Civilizations-J.E.Swain
6) Industrial Psychology-Haire Mason
7) Introduction to Constitution of India- Durga Das Basu
8) Industrial Sociology in India-N.R.Seth
9) Human Resource Development and Management- Dr.A.M.Sheikh
10) The Economics of Sustainable Development-Surender Kumar

Note: As AICTE has recommended that students of Engineering should learn about Indian Constitution and Indian tradition, we propose above non-credit subject entitled 'Indian Culture and Constitution' to be included in second semester for all branches.

(Prabhakar) Dr. M. N. Giriya (B. R. Chide)

RTM Nagpur University
Syllabus (Practical)

Semester	Course Title(Subject)	Hours / Week			Credits	Maximum Marks		
		L	T	P		Continual Assessment	University Examination	Total
Semester II |First Yearl	Workshop Practices Code: BSE2-5P	-	-	4	2	50	50	100

Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Read and interpret job drawing and plan operations
CO2	Identify and select proper material, tools, equipments, machines and proper operational parameters.
CO3	Set tools, work piece, and machines for desired operations.
CO4	Complete job of Carpentry, Fitting, Welding and Smithy as per job drawing in allotted time.
CO5	Use safety equipment and follow safety procedures during operations.
CO6	Inspect the job for confirming desired dimensions and shape.

List of Practical's

Sr. No.	List of Practical's
01	CARPENTRY SHOP • Demonstration of different wood working tools and machines. • Demonstration of different wood working processes, like planing, marking, chiseling, grooving, turning of wood etc. One simple job involving any one joint like mortise and tenon, dovetail, bridle, half lap etc.(4 Hours of actual working)
02	FITTING SHOP: • Demonstration of different fitting tools and drilling machines and power tools. • Demonstration of different operations like chipping, filing, drilling, tapping, cutting etc. One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc.
03	WELDINGSHOP : Demonstration of different welding tools / machines. Demonstration on Arc Welding, Gas Welding, gas cutting. One simple job involving butt and lap joint. For each students.
04	SMITHY SHOP • Demonstration of different forging tools and Power Hammer. • Demonstration of different forging processes, likes shaping, caulking fullering, setting down operations etc. • One job like hook peg, flat chisel or any hardware item.

05	

Suggested References:

- S.K. HajaraChaudhary- Workshop Technology-Media Promotors and Publishers, New Delhi
- B.S. Raghuwanshi- Workshop Technology- DhanpatRai and sons, New Delhi
- H.S.Bawa- Workshop Technology- Tata McGraw Hill Publishers,New Delhi
- Kent's Mechanical Engineering Hand book- John Wiley and Sons, New York
- Electronics Trade & technology Development Corporation.(A Govt. of India undertaking) Akbar Hotel Annex, Chanakyapuri, New Delhi- 110 021
- Learning Materials Transparencies and CDs, CBT Packages developed by N.I.T.T.E.R. and other organizations.

Notes:

A journal shall consist of one job assignment each on the topics 1 to 4 mentioned above.

Each assignment shall consist of –

- Procedural steps in completing a given job
- Description and drawings of different tools used
- List of safety equipments used and safety rules observed during working

Notes: 1] The subject teacher should provide necessary theory inputs to students of all shops before their actual practical.

2] The instructor shall give demonstration to the students by preparing a specimen job as per the job drawing.

3] The workshop diary shall be maintained by each student duly signed by instructor of respective shop

4] Workshop Tool Manual at institute level shall be provided to the students

5] Distribution of Continuous Assessment marks is as follows:

20 marks for jobscompleted (05 marks for each job)+ 05 marks for Practical journal= Total 25 marks

6] University Examination – Performance of any one job as mentioned in list of practical and oral.

Dr M.N. Giriya

(Arbhardi)

(B.R. Chicle)