



॥ ऋते ज्ञानान्मुक्तिः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana

Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University



SYLLABUS of Semester I & II of B.E.

SEMESTER PATTERN

SEMESTER: FIRST

Group -A

1A1 ENGINEERING MATHEMATICS-I

Aim:

The aim of this course is to familiarize the prospective engineers with techniques in differential calculus and equations. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Objectives:

1. To identify algebraic problems from practical areas and obtain the solutions in certain cases
2. To understand maxima and minima concept.
3. To solve differential equations of certain types, including systems of differential equations that they might encounter in the same or higher semesters.

Course Outcomes:

On completion of the course the students will learn:

- Able to understand Rolle's Theorem and its applications to Engineering Problems.
- Able to understand maxima and minima concept.
- Able to apply De Moivre's theorem in various concepts of complex number.
- Able to solve differential equations of certain type that they might encounter in the same or higher semester.

SECTION-A

Unit I: Differential Calculus:

Successive Differentiation, Leibnitz's Theorem, Rolle's Theorem, Mean value theorem, Expansion of function using Taylor's and Maclaurin's theorems; Indeterminate Forms Using L'Hospital Rule. (8)

Unit II: Multivariable Differential Calculus:

Partial differentiation, total differential coefficients, exact differential, Euler's theorem on homogeneous function, Maxima & Minima of a function of several connected independent variables (Lagrange's multipliers). (8)

Unit III: Complex Numbers :

De Moivre's theorem and its applications, Hyperbolic and inverse hyperbolic functions, separation of real and imaginary parts, Logarithm of complex numbers.

SECTION-B

Unit IV: -First order and First Degree Ordinary Differential Equations :

Ordinary differential equations of first order and first degree in various forms, (Variable separable, linear differential equation, homogeneous differential, exact differential equation) and reducible to above forms, methods of substitution. (8)



॥ ऋते ज्ञानान्न मुक्तीः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana

Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University



Unit V: First order and Higher Degree Ordinary Differential Equations:

Solution of differential equation of first order and higher degree by various methods.

Applications of Ordinary Differential Equations:

Applications of differential equations of first order and first degree to the problems on orthogonal trajectories and Electrical engineering. (8)

Unit VI: Sequences and Series

Convergence of Sequence and Series, Test for Convergence, Comparison Test, Ratio Test, Root Test, Raabe's Test, Range of Convergence. (8)

Text/Reference Books :

- i) Wartikar P.N., Wartikar J.N. – A text of applied Mathematics, Volume I, II, Pune V.G. Prakashan, Pune.
- ii) Grewal B.S. – Higher Engineering Mathematics, (latest Edition), Khanna Publishers.
- iii) Kreyszig E.K. – Advanced engineering Mathematics, John Wiley.
- iv) Ramana B.V. – Higher Engineering Mathematics, (TMH).
- v) Singh R.R. And Bhatt M. – Higher Engineering Mathematics, (TMH).
- vi) N.P. Bali and Manish Goyal – A text book of Engineering Mathematics, Laxmi Publications.
- vii) Veerarajan T. Engineering mathematics for first year, (TMH).

I A 2 ENGINEERING PHYSICS

Aim:

To enable the student to correlate the theoretical principles of fundamental aspects in Physics with application oriented studies of engineering.

Objectives:

At the end of the course the students would be exposed to fundamental knowledge in:

- Electromagnetic phenomena and wave propagation.
- Interferometric techniques in metrology, communication.
- Application of quantum physics to optical & electrical phenomena.
- Application of lasers and Fiber Optics in Engineering and Technology.
- Conducting, superconducting and dielectric materials.
- Semiconducting and new engineering materials.
- Physics of Modern engineering materials.
- Application of ultrasonic's, acoustics.

SECTION-A

Unit I: Solid State Physics: Classification of solids on the basis of energy band diagram, Covalent bonds, bound & free electrons, holes, electron and hole mobilities, Intrinsic and Extrinsic semiconductors, energy band diagram for semi-conductors. Fermi and Impurity levels, semiconductor conductivity with derivation, Law of mass action (only statement), P-N junction diode, Zener diode, Light Emitting Diode. Hall effect. (9)

Unit II: Modern Physics: Planck's hypothesis, properties of Photons, Compton effect, De-Broglie's concept of matter waves, wave particle duality, Heisenberg's Uncertainty Principle (only statement), applications of uncertainty principle (electrons cannot exist in the nucleus and binding energy of electron in atom), wave function and its significance, time independent Schrodinger equation. (7)

Unit III: Electric and Magnetic Fields : Motion of electron in uniform transverse electric field and transverse magnetic fields, velocity selector (energy filter), positive rays, Bainbridge mass spectrograph, Cathode ray oscilloscope: block diagram and working of each block. (7)

SECTION-B



॥ ऋते ज्ञानान्मुक्तिः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana

Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University



Unit IV: Interference and Diffraction: Fundamental condition of interference, thin film interference due to reflected light, Newton's ring; equation for radius of bright and dark rings, determination of wavelength λ , R .

- I. of medium using Newton's ring. Fresnel and Fraunhofer class of diffraction, single slit diffraction, plane transmission grating; construction and determination of wavelength of light using grating, dispersive power of grating. (7)

Unit V: Fibre Optics and LASER: Principle and construction of optical fibre, acceptance angle and acceptance cone numerical aperture, types of optical fibres and refractive index profile, attenuation in optical fibres, different mechanisms of attenuation, application of optical fibres.; LASER: spontaneous and stimulated emission of radiation, Pumping, Optical Pumping, Ruby LASER (Construction and Working), Characteristics & Applications of Laser in Industrial, Medical and Scientific field. (7)

Unit VI: Acoustics: Sound waves, reflection of sound waves, defects due to reflected sound (echo and reverberation), absorption of sound, Sabine's formula for reverberation time, Factors affecting architectural acoustics and its remedies.

Ultrasonics: Ultrasonic waves, Production of Ultrasonic waves (piezo-electric and magnetostriction methods), properties of Ultrasonic waves and applications. Fluid dynamics: Viscosity, Stoke's law, liquid flow (streamline and turbulent), flow of liquids through a capillary tube (Poiseuille's equation), Continuity equation, Bernoulli's theorem (only derivation). (7)

I A 6 ENGINEERING PHYSICS – Lab.

Practicals:

- 1) Determination of Band gap energy of semiconductor.
- 2) To study the forward and reverse characteristics of P-N junction diode.
- 3) To study the reverse characteristics of Zener diode.
- 4) To study the forward characteristics of Light Emitting Diode.
- 5) To determine the wavelength of monochromatic light by Newton's Rings method.
- 6) Determination of wavelength of spectral lines using diffraction grating.
- 7) Determination of grating element of a diffraction grating using LASER beam.
- 8) Study of Hall Effect
- 9) Amplitude and frequency measurement of a signal using CRO
- 10) Study of CRO
- 11) Determination of unknown frequency of a signal using Lissajous pattern
- 12) To determine resolving power of telescope
- 13) Determination of Planck's constant using photocell
- 14) To determine the coefficient of viscosity of water by capillary flow.
- 15) To determine the specific charge (e/m) of electron by Thomson method.
- 16) Experiment on the basis of Non Destructive Testing. (Note: Minimum 08 experiments shall be conducted)

Text Books:

- 1) M.N. Avadhanulu & P.G. Kshirsagar: Engineering Physics, S. Chand Pub., 2008
- 2) Dr. (Mrs.) S. D. Wakde & J. S. Bakare: Engineering Physics, SSGMCOE, 2004

Reference Books:

- 1) R.K. Gaur & S.L. Gupta: Engineering Physics, Dhanpat Rai & Sons.
- 2) Hitendra K. Malik & A.K. Singh: Engineering Physics, Tata McGraw Hill
- 3) Beiser: Modern Physics, Tata McGraw Hill
- 4) Mani & Mehta: Modern Physics, Affiliated East-West Press
- 5) N. Subrahmanyam, Brijlal, M.N. Avadhanulu: A Text Book of Optics, S. Chand & Company.



॥ ऋते ज्ञानान्न मुक्तीः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana

Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University



1A3 ENGINEERING MECHANICS

Course Objectives:

Students will be taught-

1. Concepts related to Forces and its effects, resolution and composition of coplanar forces.
2. Application of principles of statics to the system of rigid bodies.
3. Analysis of simple structures like trusses and beams.
4. Concepts related to friction, its application.
5. Concepts related to centroid, moment of inertia, radius of gyration and product of inertia and its application.
6. Concepts related to kinematic and kinetic equations, and its application to various types of motion.
7. Concepts related to conservation of momentum and laws of impacts.

Course Outcomes:

At the end of course students will be able to-

1. Compose and resolve the forces along with its effect.
2. Apply principles of statics to the system of rigid bodies and analyse simple structures.
3. Calculate frictional forces for simple contact, wedges and belt friction.
4. Locate centroid and calculate moment of inertia.
5. Calculate various kinematic quantities.
6. Solve the problems using different kinetic equations related to direct and interconnected particles.
7. Apply principle of conservation of momentum and laws of impact.

SECTION-A

UNIT-I (STATICS):

Resultant: Concept of a force, force systems, moment of

a force about a point, couple, resolution and composition of coplanar force system.

Equilibrium: Free-body diagrams, equations of equilibrium, problems of equilibrium involving co-

planar force system acting on a particle, rigid body and system of rigid bodies.

(09)

UNIT-II (STATICS):

Trusses: Definitions, assumptions, types, Analysis of simple plane perfect trusses by method of joints and method of section.

Friction: Definitions of friction, types, angle of friction, angle of repose, cone of friction, Coulomb's law of friction. Application to simple contact friction, wedges and belt friction (09)

UNIT-III : Centroid, First Moment of Area, Problem on Centroid of composite sections, Second Moment of Area, Radius of Gyration, product of inertia, perpendicular and parallel axis theorem, polar moment of inertia, radius of gyration, Definition of principal axes and principal moment of inertia.

(07)

SECTION-B

UNIT-IV (DYNAMICS-KINEMATICS):

Definitions of displacement, velocity and acceleration and their relations, rectilinear motion under variable

& constant accelerations, curvilinear motion using rectangular coordinates, normal and tangential components (involves Problems on calculation of total acceleration, radius of curvature and projectile motion).

(06)



॥ ऋते ज्ञानान्न मुक्तीः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana

Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University



UNIT-V (DYNAMICS–KINETICS):

Kinetics of rectilinear, curvilinear and rotatory motion of a particle acted upon by a force system, Application of D'Alembert's principle, concept of dynamic equilibrium, rectilinear motion of several interconnected particles, and rotation of rigid body about a fixed axis. (07)

UNIT-VI (DYNAMICS –KINETICS):

Application of work-energy equation and impulse-momentum equation, law of conservation of momentum for a particle and a system of particles in a rectilinear translation, direct central impact, collision of two particles, coefficient of restitution.

TEXTBOOKS:

- 1) Bhattacharyya Basudeb, Engineering Mechanics, Oxford University Press.
- 2) Bhavikatti, S.S. and Rajashekarappa, K.G., Engineering Mechanics, New Age International Publishers, New Delhi.

REFERENCEBOOKS:

- 1) Singer, F.L., Engineering Mechanics, Harper Collins Pub., Singapore
- 2) Timoshenko, S.P. and Young, D. H., Engineering Mechanics, McGraw-Hill International C., Auckland.
- 3) Beer, F.P. and Johnston, E.R., Vector Mechanics for Engineers, McGraw-Hill International C., Auckland.
- 4) Shames, I.H., Engineering Mechanics, P.H.I. Pvt. Ltd., New Delhi.

1A7 ENGINEERING MECHANICS–Lab.

Course Objectives:

Students will be taught-

1. Performance of practicals based on concepts related to engineering mechanics.
2. Working of Lifting Machines

Course Outcomes:

Students will be able to-

1. Prove the concepts related to engineering mechanics.
2. Calculate lifting machine parameters.
3. Perform graphical analysis of force systems and simple structures.

PRACTICALS:

(Two compulsory graphical solutions to the problems of statics)

1. Law of Polygon of forces
2. Reactions at the supports of simple beam.
3. Forces in members of Jib crane.
4. Determination of coefficient of friction on inclined plane.
5. Determination of Coefficient of friction.
6. Determination of law of machine for screw jack/differential axle wheel/single and double purchase crab (for any two machines).
7. Determination of mass moment of inertia of flywheel
8. Determination of gravitational acceleration by compound pendulum.



॥ ऋते ज्ञानान्न मुक्तीः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana

Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University



1A4COMPUTERPROGRAMMING

Aim: The course is aimed at impart knowledge to analyze, solve, design and code real-life problems using C language

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

- To explain fundamental concepts of computer and computing.
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To recognize various problem solving techniques and computer applications.
- To apply programming concepts to solve real-life problems.

UNIT I: Fundamental of the Computer and Computing Concepts : Generation of computers, Classification of computers, Basic Anatomy of Computer System, Input Devices, Processor, Output Devices, Memory Management, Types of Computer Software, Overview of Operating system, Networking Concepts, Microsoft Office, Numbers systems: Decimal, Binary, Hexadecimal, Octal, Conversion of Numbers, Binary Arithmetic Operations, Programming Languages, Logic gates (8)

UNIT II: C Fundamentals : Introduction, Importance of C, Basic Structure of C Programs, Program execution, Basic programs based on C such as Printing Message, Adding two numbers, Interest calculations, Use of subroutines, math function. C tokens, Keywords and Identifiers, Character set, Data Types, Constant and Variables, Declaration of Variables, Declaration of Storage Class (8)

UNIT III: Operators, Expression and Input-Output operation : Operators, Types of Operators: Arithmetic, Relational, Logical, Assignment, Increment-decrement, Conditional, Bitwise, Special. Arithmetic expression, Evaluation of Expression, Precedence of Arithmetic Operators, Input-Output Operation: Reading and Writing Character, Formatted Input, Formatted Output. (8)

UNIT IV: C Control constructs : Decision-making using if, if-else, nested if, else if ladder and switch-case statements, ?: Operator, Goto Statement, Loops using for, while, do-while statements, break and continue statements, Jump in Loops, Concise Test Expressions. (8)

UNIT V: Array, Strings and Structures: Introduction to array, One Dimensional Array: Declaration & Initialization, Two Dimensional: Declaration & Initialization, Multi Dimensional, Strings: Declaration and Initialization, Reading String from terminal, Writing String to Screen, Putting Strings together, Comparison of Two Strings, String-Handling Functions, Table of Strings, Other features of String, Structures – Define, Declaration, Accessing the members of a structure (8)

UNIT VI: User Defined Functions, Pointers and File Management : Functions, Need for User defined Functions, Multi Function Program, Elements of User Defined Functions, Return Values and their types, Function Calls, Function Declaration, and Categories of Functions. Definition and uses of pointers, Accessing the address of a variable, Introduction to File Management, Defining and Opening File, Closing File, Input/output Operations on File. (8)



॥ ऋते ज्ञानान्न मुक्तीः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana

Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University



TEXTBOOK: EBalagurusamy: Computing Fundamentals & C Programming – Tata McGraw-Hill, 2nd Edition .

REFERENCE BOOKS:

1. Pradeep Dey and Manas Ghosh, "Computer Fundamentals & Programming in C" Oxford University Press 2006.
2. KR Venugopal and S R Prasad, "Mastering C" Tata-McGraw Hill.
3. Seymour Lipschutz, "Data Structure Using C", Tata-McGraw Hill.
4. Herbert Schildt - C Complete Reference (Tata-McGraw Hill).

1A8 COMPUTER PROGRAMMING-LABORATORY

Based on the Syllabus of 1A4 Computer Programming – Minimum Eight (8) experiments be performed preferably covering all the Units.

1A5 WORKSHOP PRACTICE

Course Objectives:

- To give students 'hands on experience' of craftsmanship.
- To make students familiar with different work trades.
- To develop quality & safety consciousness amongst the students.
- To develop awareness of fire safety amongst the students.
- To develop respect towards labor work amongst the students.
- To develop skill sets for creating entities from primitive engineering materials.
- To develop skill sets for establishing connection through wires and cables.
- This exercise also aims at inculcating respect for physical work and hard labor in addition to some value addition by getting exposed to interdisciplinary engineering domains.

Course Outcomes:

- Upon completion of this course, the students will gain knowledge of different manufacturing processes which are commonly employed in industry.
- Upon completion of this course, the students will be able to fabricate the components using various manufacturing techniques.
- The students will be conversant with the concept of dimensional accuracy and tolerances.

PERFORMANCE:

Students should perform minimum six jobs out of following :

I) **SMITHY:** Introduction to smithy operations like upsetting, drawing, bending, Forming; Tools- hammer, hot and cold chisels, swages, drifts, flatters, tongs, anvils and various smithy tools & equipments, their use. Forging Principle, forging welding, use of forged parts.

One job on smithy: Job involving upsetting, drawing down, flatter. Change of cross sectional area like round to rectangular or making a ring from a round bar, S – Hook, forming such as a square / hexagonal headed bolt, hook etc.

II) **FITTING:** Introduction to different fitting tools. Use and setting of fitting tools for marking, center punching, chipping, cutting, filing, drilling, their use, different measuring tools, Files – Material and Classification.

One job on fitting: involving operations like marking, filing, hacksaw cutting, drilling and tapping, making simple assemblies like a male-female type pair



॥ ऋते ज्ञानान्न मुक्तीः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana



Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University

III) **TAPS & DIES:** introduction to Taps & Dies, Different sizes of Taps & Dies their uses, holding instruments oftaps&dies.

One job on taps & dies: Job involving, External and internal threads on plate or pipe, marking, center punching, cutting, filing, drilling

IV) **SHEET METAL:** Introduction to sheet metal tools, their use, different sheet metal joints, soldering, surfacedevelopment. Specifications of metal sheets, Surface coatings; Operations like cutting, bending, folding, punching, riveting; Joining by brazing and soldering.

One job on sheet metal: Job involving soldering operation like marking ,cutting, bending, joining operations of small sheet metal parts. Typical examples: sheet metal tray, funnel, dustbin, etc.

V) **WELDING :** Classification & brief introduction to welding processes- Arc, Gas and Resistance. Definition of welding, brazing and soldering processes, and their applications. Oxy-Acetylene Gas welding process, Equipment and Techniques, Type of flames and their applications. Manual metal arc welding technique and equipment, AC and DC welding Electrodes, constituents and functions of Electrode coating. Welding positions. Type of welding joint. Common welding defects such as cracks, undercutting, slag inclusions, Porosity

One job on welding: Job consisting of edge preparation for arc welding of different parts like lap welding of two plates, butt welding of two plates and welding to join plates at right angles.

VI) **CARPENTRY :** Brief study of various hand tools like chisel, saw ,planer. Timber, definition, engineering applications, seasoning and preservation, plywood and ply boards. Use of marking tools & hand tools such as marking gauge, try squares, steel rules, saws, jack plane, etc. Use of power tools, safety precautions.

One job on carpentry: Job like preparing a wooden joint; involving operations like wood sizing, planning, marking, sawing, chiseling and groove making. Use and setting of hand tools like hack saw, jack plane, chisels and gauges for construction of various joints like T – Lap joint, Bridle joint ,Corner mortise joint, Dovetail / butt joints such as a tray, frame etc.

VII) **MACHINE TOOLS AND PROCESSES:** Introduction to different machining tools, different measuring tools.

One job on Lathe: Job involving marking, metal removing showing basic operations like plain turning, facing, step turning etc.

VIII) **FOUNDARY:** Molding sand, preparation of molding sand, pattern, core, runner, riser, cope & drag box.

One job on molding: Preparation of sand mould with pattern, core with runner riser

IX) **PRINTED CIRCUIT BOARDS:** PCB etching and drilling, tinning and soldering techniques. Assembly of Electronic components on the printed circuit board (PCB).

One job of PCB design: Job involving development of PCB for electronic circuit which comprises of layout design, masking, etching, drilling, tinning & components soldering.

X) **PLASTIC INJECTION Moulding:** Introduction, principle, equipment & its operation, mould introduction & setting, Safety precautions and demonstration of plastic injection molding process (Demonstration)

REFERENCES :

1. B.S.Raghuvanshi, A Course in Workshop Technology, Vol –I, Dhanapat Rai and Sons.
2. Hajara Choudhari, Elements of Workshop Technology, Vol –I, Media Promoters.
3. Gupta and Kaushik, Workshop Technology, Vol –I, New Heights.



॥ ऋते ज्ञानान्न मुक्तीः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana



Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University

4. Chapman, Workshop Technology, Vol-I, The English Language Book Society.
5. H.S. Bawa, Workshop Technology, Vol.-I, TMH Publications, New Delhi.
6. S.K. Hajra Choudhary, Elements of Workshop Technology, Media Promoters & Publishers Pvt. Ltd.
7. Workshop Technology, Vol II, II and III, Chandola S.P., Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
8. K.T. Kulkarni, Introduction to Industrial Safety, K.T. Kulkarni, Pune Reference Books
9. Hwaiyu Geng, Manufacturing Engineering Handbook, McGraw Hill Publishing Co. Ltd.
10. Lawrence E. Doyle, Manufacturing Processes and Materials for Engineers, Prentice Hall Inc.

NOTE : Journal should be prepared and submitted based on information of tools and equipments used, jobs prepared by using various tools, equipments, machines in the above trades of performance sections. The term work shall be assessed based on a) the record of attendance, b) Term work done, c) the written/ practical / oral tests on the term work to decide the depth of understanding. The term work is to be assessed weekly.

PRACTICAL EXAMINATION:

Practical examination will consist of actual preparation of one job from any of the above performance sections. Duration of examination will be 3 hrs. Total marks are 25, out of which 15 marks are for job preparation and 10 marks for viva voce which should be conducted when the students are on job.

SEMESTER: SECOND

Group B

IB1 ENGINEERING MATHEMATICS-II

Aim:



॥ ऋते ज्ञानान्न मुक्तीः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana



Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University

The aim of this course is to familiarize the prospective engineers with techniques in integral calculus, algebra.

Also to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well toward tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Objectives:

1. To find solution of simultaneous equations by matrix method.
2. To familiarize the prospective engineers with techniques in integral calculus.
3. To understand the expansion of Fourier series.
4. To understand double and triple integration and enable them to handle integrals of higher orders.
5. To deal with functions of several variables that is essential in most branches of engineering.

Course Outcomes:

On completion of the course the students will be able to:

1. The essential tool of matrices and linear Algebra in a comprehensive manner.
2. Evaluation of Integrals by Reduction Formulae, Gamma and Beta Function
3. Use the tool of Fourier series for learning advanced engineering mathematics.
4. Use new techniques DUIS to evaluate Integrals and Tracing of Curves

The Mathematical tools needed in evaluating Multiple Integrals and their usage

SECTION-A

Unit I: Matrices:

Inverse by Partitioning, Rank of a matrix, Rank-nullity theorem (without proof), System of linear equations; Eigen values and Eigen Vectors, Cayley-Hamilton Theorem. (8)

Unit II: Fourier series:

Periodic function, Fourier expansion of periodic function in $(C, C+2L)$, half range Fourier series, Parseval's Theorem, Harmonic Analysis. (8)

Unit III: Integral Calculus:

Reduction formulae, Beta and Gamma function, Evolutes and involutes. (8)

Section-B

Unit IV: (a) Rule of differentiation under integral sign.

- (b) Tracing of curves (Cartesian, Parametric and polar forms)
- (c) Rectification (Cartesian, Parametric and polar forms). (8)

Unit V: Multivariable Integral Calculus I:

Double Integrals, Cartesian, Change of Order of Integration, Change of Variables (Cartesian to polar coordinates), Evaluation of area by Double Integration.. (8)

Unit VI: Multivariable Integral Calculus II:

Triple integrals, Cartesian, transformation to spherical polar coordinates, Volume by Triple Integration, Mean and RMS Value Theorem. (8)

Text/Reference Books :

- i) Wartikar P.N., Wartikar J.N. – A text of applied Mathematics, Volume I, IIPune V.G. Prakashan, Pune.
- ii) Grewal B.S. – Higher Engineering Mathematics, (latest Edition), Khanna Publishers.
- iii) Kreyszig E.K. – Advanced engineering Mathematics, John Wiley.
- iv) Ramana B.V. – Higher Engineering Mathematics, (TMH).



॥ ऋते ज्ञानान्न मुक्तीः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana

Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University



- v) Singh R.R. and Bhatt M. - Higher Engineering Mathematics, (TMH).
vi) N.P. Bali and Manish Goyal - A text book of Engineering Mathematics, Laxmi Publications.
vii) Veerarajan T. - Engineering mathematics for first year, (TMH)

1B2 ENGINEERING CHEMISTRY

Aim: To impart the sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering students.

Course Objectives:

1. To provide the fundamental background required for industrial setups.
2. To provide the exposure for conducting the experiments in view of engineering aspects.
3. To provide the knowledge about properties of materials and their applications.
4. To utilize the knowledge about polymer and engineering materials towards different applications
5. To provide the knowledge about importance of fuels and lubricants
6. To provide the knowledge about analytical techniques.

Course Outcomes:

1. Apply the knowledge of chemistry in softening processes involved in water technology.
2. Identify various types of corrosion and methods to protect the metallic structures from corrosive environment
3. Understanding of the energy storage system (battery) .
4. Apply the knowledge of useful engineering materials such as cement, lubricants, ceramics, refractories and nano materials based on their properties.
5. Develop the technique involved in the manufacturing process of cement
6. Apply the knowledge about the properties of chemical fuels for the generation of power.
7. Apply the knowledge of various polymeric material, their synthesis and applications.
8. Identify various phases of material at different thermodynamic variables.
9. Identification and analysis of materials by using advanced analytical techniques.

SECTION-A

Unit I: Water Treatment and Analysis:

[8Hrs.]

Hardness of water: Types of hardness, Unit of hardness, Determination of hardness of water by EDTA method. Disadvantages of hard water, Boiler troubles: Scale and Sludge formation, Caustic embrittlement, Priming & Foaming, Boiler corrosion. Softening of water by Zeolite process, Ion exchange process and Reverse Osmosis (RO). Numerical problems based on calculations of hardness and Zeolite process.

Unit II: Corrosion and Energy storage system:

[8

Hrs.] **Corrosion:** Introduction, Dry & Wet corrosion and their mechanism, Types of corrosion: Pitting corrosion, waterline corrosion, inter-granular corrosion, Galvanic and Stress corrosion. Pilling Bedworth rule.



॥ ऋते ज्ञानान्न मुक्तीः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana

Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University



Corrosion Control: a) Design and material selection b) Cathodic protection, c) Protective surface coatings - Hot Dipping (Galvanizing and Tinning).

Energy storage system: Basic principles of batteries & their types, Construction, working and applications of lithium-ion battery, Ni-Cd battery.

Unit III: Engineering Materials:

[8Hrs.]

Cement: Raw materials, Ingredients of cement and their functions, Wet process of manufacturing of cement, Properties of cement: Setting & Hardening, Heat of hydration & Soundness of cement.

Lubricants: Introduction, Functions of Lubricant, Classification of lubricant: Thick Film, Thin Film & Extreme Pressure lubrication. Physical Properties of lubricants (Definitions): Viscosity & Viscosity index, Flash & Fire point, Cloud & Pour point, Carbon residue.

Industrial Material: Definition, properties and Applications of ceramics & refractories, Nano material.

SECTION-B

Unit IV: Energy Science:

[8Hrs.]

Introduction of chemical fuels its classification, Calorific value: Gross & Net calorific values, and its relation. Analysis of coal: Proximate & Ultimate analysis and their significance, Characteristic of Good fuel, Cracking of petroleum fractions, use of gasoline and diesel in IC engine. Knocking, octane number, cetane number. Numerical based on combustion (Mass to Mass, Volume to Volume and less air supplied type)

Unit V: Polymer Chemistry:

[8Hrs.]

Introduction and Classification of polymers, Methods of polymerization: Addition polymerization: - Free radical, Cationic & Anionic mechanism of polymerization, Preparation, properties and uses of Polyethylene, Poly vinyl chloride, Teflon. Condensation polymerization: Preparation, properties and uses of Bakelite. Thermosetting & Thermoplastic, Rubber: Natural rubber, Drawbacks of natural rubber & Vulcanization. Synthetic rubbers: Preparation, Properties & Applications of - Styrene rubber, Nitrile rubber, Butyl rubber. Biodegradable polymers: properties and applications, Conducting polymers: Introduction, types of conducting polymer and their examples.

Unit VI: Phase rule and Spectrophotometric techniques:

[8Hrs.]

Phase rule: Gibb's Phase rule, Explanation of the terms: Phase, Components and Degree of Freedom, Application of Phase rule to One Component System (Water System), Condensed phase rule and its application to two component system (Bi-Cd).

Spectrophotometric techniques:

Qualitative and quantitative analysis, Principles and instrumentation of spectrophotometry: UV and IR spectroscopy. Principle & instrumentation of NMR spectroscopy. Applications of spectroscopy technique. Surface characterization technique: X-ray diffraction.



॥ ऋते ज्ञानान्न मुक्तीः ॥

Dwarka Bahuuddeshiya Gramin Vikas Foundation's

Rajarshi Shahu College of Engineering, Buldana

Approved By AICTE New Delhi, NAAC Accredited, Affiliated to Sant Gadge Baba Amravati University



TEXTBOOKS:

- (1) "A Textbook of Engineering Chemistry" - S.S. Dara. (S. Chand).
- (2) "Engineering Chemistry" - Jain & Jain. (Dhanpat Rai & Sons).
- (3) A Textbook of Engineering Chemistry Shashi Chawla.

REFERENCE BOOKS:

- 1 "A Textbook on Experiments & Calculations in Engineering Chemistry" - S.S. Dara. (S. Chand).
- 2 "Textbook of Engineering & Technology" Vol I & II - Rajaram & Kuriacose.
- 3 "A Textbook of Polymer Science & Tech" - V. Gowariker.
- 4 Nanotechnology Fundamentals and Applications: Manasi Karkare, IK International Pub
- 5 Fundamentals of Molecular Spectroscopy: C.N. Banwell.