Faculty of Science and Technology
R.T.M. Nagpur University, Nagpur
Syllabus for B.E. First Semester
Mathematics – I
Total Credits : 04 ; Subject Code : BES1-1

Teaching Scheme
Lectures : 3 Hours / Week

Tutorial : 1 Hour / Week

Examination Scheme
Theory T(U) : 70 Marks T(I) : 30 Marks

Duration Of University Exam : 03 Hours

Unit 1: Differential Calculus (8 Hours)   **10 Marks**
Successive differentiation: Leibnitz's Rule, Taylor's and Maclaurin's series for function of one variable, Indeterminate forms and L'Hospital's Rule, Maxima and Minima for function of one variable.

Unit 2: Multivariable Calculus (Differentiation) (12 Hours)   **18 Marks**
Functions of several variables, First and Higher order partial derivatives, Euler's theorem, Chain rule and Total differential coefficient, Jacobians, Taylor's and Maclaurin's series for function of two variables, Maxima and Minima for function of two variables, Lagrange's method of undetermined multipliers.

Unit 3: Matrices (8 Hours)   **12 Marks**
Inverse of a matrix by Partitioning method, Rank of a matrix, Consistency of linear system of non-homogeneous equations, Homogeneous system of Linear equations, Symmetric, Skew-symmetric and Orthogonal matrices, Linear and Orthogonal transformations, Cayley-Hamilton theorem.

Unit 4: First Order Ordinary Differential Equations: (8 Hours)   **12 Marks**
Exact differential equations (excluding the cases of integrating factors), Linear and Bernoulli's equation, Equations of first order and higher degree: Solvable for p, Solvable for y, Solvable for x and Clairaut's type, Application of first order differential equation to simple electrical circuits.

Unit 5: Higher Order Ordinary Differential Equations-I: (8 Hours)   **12 Marks**
Higher order ordinary linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations.

Unit 6: Higher Order Ordinary Differential Equations-II: (4 Hours)   **6 Marks**
Simultaneous differential equations, Equations of the type $d^2y/dx^2 = f(x)$ and $d^2y/dx^2 = f(y)$, Applications of higher order differential equations to simple electrical circuits.

Text/Reference Books:

(i) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

(ii) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11th Reprint, 2010.

(iii) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

(iv) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

(v) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.

(Dr. Sajid Anwar)   (Bharadi)   (B. R. Chidle)

Faculty of Science & Technology
R.T.M. Nagpur University, Nagpur

MATHEMATICS I

Course Objectives :

The topics covered will equip them with the techniques to understand advanced level Mathematics and its applications that would enhance analytical thinking power.

The aim is to inculcate and develop the basic Mathematical Skills of Engineering students that are imperative for effective understanding of Engineering subjects.

COURSE OUTCOMES : Students will be able to

1. Apply the concept of maxima, minima and successive differentiation in the analysis of engineering problems.

2. Understand the significance of derivatives of functions of several variables and use it to find series approximation to the function of two variables, extreme values of the function and functional relationship.

3. Apply the concept of matrices for analysis of system of linear equations, finding linear and orthogonal transformations.

4. Solve ordinary differential equations using elementary techniques and apply it to formulate mathematical models for simple electrical circuits.

5. Solve higher order differential equations by using various techniques and apply the concept to solve problems in engineering field.

Dr. M. N. Group

(A. V. Bharati)

B. E. Semester I Applied Physics (Total Credits: 4)

Code: BSE 1-2T

Teaching Scheme

Lectures: 3hr/Week,

Tutorial 1 hr/Week

Examination Scheme

T (U): 70 Marks T (I): 30 Marks

Duration of University Exam. : 3 Hours

Unit 1: Wave optics (08 Hours) 12 Marks

Huygen's principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting, Interference in thin films, Interference in Wedge shape thin film, Newton's rings, Anti-reflection coating.

Fraunhofer diffraction from a single slit and a circular aperture, Diffraction grating and its resolving power.

Unit 2: Quantum Mechanics (08 Hours) 12 Marks

Planck's Hypothesis, Properties of Photons, Compton Effect: Equations for energy and momentum conservation, Expression for Compton shift & its interpretation.

Concept of wave-particle duality, de-Broglie Hypothesis, Matter Waves, Davisson-Germer Experiment; Bohr's Quantization condition.

Unit 3: Wave Packet & Wave Equations (06 Hours) 11 Marks

Wave function Ψ and normalization condition, concept of wave packets, Heisenberg Uncertainty Principle.

Schrodinger wave equation (time dependent and time independent), Application to one dimensional infinite potential well.

Unit 4: Crystal Structure (08 Hours) 12 Marks

Crystal structure, Meaning of lattice and basis, Unit cell: primitive and non primitive unit cell; Cubic crystal structure: Simple, Body and Face centered cubic structures, Unit cell characteristics: Effective number of atoms per unit cell, atomic radius, nearest neighbor distance, coordination number, atomic packing fraction, void space, density.

Crystal planes and Miller indices, Inter-planar distance and its

co-relation with Miller indices and lattice parameter, Bragg's law of X-ray diffraction.

Unit 5: Optical Fiber (06 Hours) 12 Marks

Optical fibers: Propagation by total internal reflection, structure and classification (based on material, refractive index and number of modes), Modes of propagation in fiber, Acceptance angle, Numerical aperture, Attenuation and dispersion.

Light sources and Detectors, Applications of optical fiber as Sensors - i) Temperature Sensor ii) Pollution / Smoke detector iii) Liquid level sensor, Fiber optic communication system.

Unit 6: Electron Optics (06 Hours) 11 Marks

Basic idea of motion of charged particle in electric and magnetic fields, Velocity selector, Bethe's law of electron refraction, electric focusing, Construction & working of Electrostatic lens.

Devices: Cathode Ray Tube, Cathode Ray Oscilloscope and its applications, Block Diagram, Function & working of each block, Bainbridge mass spectrograph.

Dr. M. N. Giriya

Course Outcomes

Students will be able to

CO1. Apply concepts in interference and diffraction to solve relevant numerical problems and to relate to relevant engineering applications

CO2. Recall basic concepts of dual nature of matter and radiation and apply them to interpret Compton effect and Davisson and Germer experiment and to solve related numerical problems

CO3. Find how to extend the basic quantum concepts to interpret the wave function Ψ and to relate them to the idea of wave packet and Schrodinger equation

CO4. Recall the basic concepts of crystal structure and apply them in solving numerical problems based on them and in relating to applications for determination of crystal structure.

CO5. Relate the basic idea of total internal reflection to the propagation of light in an optical fiber and make use of the fiber concepts to solve numerical problems and relate to applications in engineering

CO6. Find how to extend the basic concepts of motion of charged particles in electric magnetic fields to solve numerical problems and to relate to applications in electron optic devices and CRO

List of activities

Unit-1: Wave Optics

1. Compilation of information regarding interference in day to day life.
2. Comparative study of interference pattern of Newton's ring using Plano convex lens of different radii.
3. Comparison of diffraction patterns of various obstacles such as razor, coin, knife, etc.

Unit-2: Quantum Mechanics

1. Biography of Compton & de-Broglie in any electronic form (ppt./video).
2. Understanding the concept of micro and macro bodies, its identification and phenomenon observable using it with reason.

Unit-3: Wave Packet & Wave Equations

1. Justification of Heisenberg's Uncertainty Principle using thought experiment.
2. Applications of Heisenberg's Uncertainty Principle to prove electron does not exist in the nucleus.

Unit-4: Crystal structure

1. Model making such as voids, planes, Miller Indices, FCC, BCC and SC.
2. Exhibition of variety of crystals in nature or day to day life.

Unit-5: Optical fibre

1. Tyndall's demonstration.
2. Total Internal Reflection with the help of glass of water & laser source.
3. Collection of optical fibres to understand the internal structure.

Unit-6: Electron Optics

1. Determination of 'λ' for various types of waves using CRO. (square, rectangular, sinusoidal)
2. Verification of $v = \dfrac{E}{B}$ using Thomson's experiment.

Note : Performance of at least one activity from each unit is compulsory in a semester.

Modes of Conducting/ Performing the activities

1. Quiz
2. Demonstration
3. Seminar
4. Group discussion
5. Assignment
6. Study of business model
7. Case study
8. Model making
9. Industry/research lab visit
10. Technical or research paper writing (for conference)
11. PPT making (Power Point Presentation)
12. Mini project

Dr m. N. Giriya

Suggested Text Books & Reference Books

1. P. M. Mathews and K. Venkatesan, A Textbook of Quantum Mechanics, Tata Mc Graw Hill (1977).

2. J. L. Powell and B. Crasemann, Quantum Mechanics, Narosa Publishing House (1993).

3. Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition, (1983).

4. A. J. Dekker, Solid State Physics, Prentice Hall of India (1971).

5. A Textbook of Engineering Physics, Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar, S. Chand Publication

6. Engineering Physics, second edition, Sanjay Jain, G. Sahasrabudhe, University's Press(India) Pvt. Ltd.(2016)

7. Text book of Applied Physics, Devashree Hardas, Debashis Bhowmick, Sanjivani Shastri, Das Ganu Publication ISBN-978-93-84336-59-2 (2020)

8. Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by R. Eisberg and R. Resnick, Wiley and Sons

9. Engineering Physics, Dr. K.C. Nandi, Dr.Mohan Giriya , Tech-Max publication.

10. Applied Physics, - Dr. Shruti Patle, Dr.(Mrs.)S.U.Bhonsule,Dr. (Mrs)S.P. Wankhede and Dr. N. S. Ugemuge DNA Publication ISBN-978-81-945174-6-7 (2020)

11. D. J. Griffiths, Quantum mechanics, Prentice Hall of India Private Limited, New Delhi

12. L. I. Schiff, Quantum Mechanics, TMH Publications

13. David Halliday, Robert Resnick, Jearl Walker, Principles of Physics, 10th Edition, John Wiley and Sons (2017)

Dr M.N. Giriya

B. E. Semester I Applied Physics (Practical) (Total Credits: 1.5)

Code: BSE1-2P

Teaching Scheme

Examination Scheme

Lectures: 3hrs/Week

P (I): 25 Marks   P (U): 25 Marks
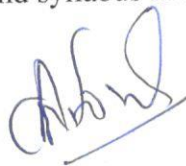
List of Experiments

1. Diffraction due to plane diffraction Grating

2. Radius of curvature of a plano convex lens by Newton's Rings

3. Determination of NA for optical fiber

4. Determination of e/m of an electron by bar magnet method (Thomson's method)

5. Determination of phase and frequency of electrical signals using CRO

6. Determination of AC and DC voltage using CRO

7. Comparative study of cubic crystal structure (with the help of model)

8. Determination of principal refractive indices of a prism

9. Interference in thin films: Study of wedge shaped thin film.

10. Study of R-C filter using CRO.

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

Two experiments should be performed beyond syllabus in a semester.

Dr m. N. Giriya

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

Course Code	BSE1- 3T				
Course	Energy and Environment				
Scheme &	L	T	A	Credits	Semester
	2	1		3	I

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

Course objectives
1. To impart knowledge in the domain of renewable and non-renewable energy sources.
2. To bring out Impact of Energy Technologies on Environment
3. To inculcate knowledge and skills about assessing the energy efficiency of different energy sources and use of advanced materials for sustainable development.

Course outcomes
After studying the course it is expected that the students will have/be able to:
1. Obtain the knowledge of solid and gaseous fuels and their Calorific Value determination.
2. Recognize the type of liquid fuels and their uses in IC engines.
3. Apply the knowledge about the use alternative sources of energy.
4. Differentiate the types of waste and its management
5. Analyse the impacts of Industrial pollution and its control.
6. Develop innovative ideas for use of advanced materials in sustainable development.

UNIT 1:- Basics of Energy and Solid Fuels (6 Hours)   (Marks 11)

- Basics of Energy - Introduction, sources and types of energy, Units of energy, Thermal Basics of energy -fuels, thermal energy contents of fuel, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer.
- Classification of fuels, Calorific Value (HCV & LCV). Determination of Calorific value by Bomb and Boy's Calorimeter.
- Solid Fuels:- Significance of Proximate and Ultimate Analysis of coal,
- Numerical based on Dulong's formula.
- Numerics on Calorific Value determination.

UNIT 2: Liquid and Gaseous Fuels (10 Hours)   (Marks 15)

- Liquid Fuel:-Fractional distillation of crude oil, Catalytic cracking and its advantages

- Knocking in internal combustion petrol and diesel engine, Octane and Cetane number, Knocking and its relationship with structure of fuel, Doping agents,
- Power alcohol, Gasohol, Diesehol, Aviation fuel, Bio-diesel.
- Gaseous Fuel:-CNG, H_2 as specialised fuel
- Combustion Calculations.

UNIT 3:- Alternate Sources of Energy   (6 hours)   (Marks 11)

- Hydro energy, Bio-energy, Photolysis of water- Chemical Conversion of Solar Energy. Nuclear fuels.
- Fuel cells- working, advantages and disadvantages of alkaline, methanol and phosphoric fuel cells.
- Green Technology: Hybrid Vehicle Technology, Industrial Ecology and Green computing.

UNIT 4:- Industrial pollution its impacts on Environment and control (6 Hours) (11 Marks)

- Industrial pollution due to non-renewable energy sources: General Introduction of Industrial pollution and its types.
- Environmental impact and its control with reference to Principle, processes, source of pollution of specific industries: Nitrogen containing fertilizers- ammonia synthesis, Cement manufacturing Industry; Sulphuric acid manufacturing industry and Petroleum Industry

UNIT 5:- Waste to Energy Conversion.   (6 Hours)   (Marks 11)

- Characterization of waste - composition, ignitability, corrosivity, reactivity, Toxicity. Freight and transport of chemicals, health effects, hazardous waste management technology: physical method, chemical method, biological treatment, Incineration -eco-friendly incineration, landfill.
- Utilization of Biogas and Landfill Gas for Biofuels and High Value Chemicals, gasification and Utilization of Syngas, Thermochemical Conversion of Syngas.
- Rules of regeneration of e-waste recycling and its managements as per government norms.

UNIT 6:- Advanced materials for sustainable development (6 Hours)(11 Marks)

- Introduction of Advance materials, properties and applications:- composites, liquid Crystal polymers, conducting polymers, insulating materials, adhesives, biodegradable polymers.
- Nanomaterials in Energy- Introduction, synthesis by Sol-gel and Chemical Vapour Deposition techniques, applications in Photochemical devices like lithium ion battery, Energy Storage and photovoltaic cells.

(Arshadi)

Dr. M. N. Gusya

(R. R. Chide)

ENERGY AND ENVIRONMENT LABORATORY (BES1-3P)

Course Code	BSE1- 3P				
Course Scheme &	**Energy and Environment Lab**				
	L	T	P	Credits	Semester
	0	0	2	1	I

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

Laboratory outcomes

After completion of this course, the student will develop competencies in

1) The practical knowledge of handling chemicals.
2) Analysing a broad foundation in energy and environment that stresses scientific reasoning and analytical problem solving with a molecular perspective.
3) Experimental techniques using modern instrumentation.

Students should-

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

1) Determination of Flash Point of the given sample by Cleveland's open cup apparatus.
2) Determination of Flash Point of the given sample by Abels/ Pensky Martens close cup apparatus.
3) Determination of Neutralisation number (Acid value) of oil.
4) Determination of Viscosity by Redwood Viscometer and specific gravity of Biodiesel at different temperature.
5) To determine Sulphate Concentration in a given water sample.
6) Estimation of amount of Chloride (in Cl⁻ form) by Mohr's method.
7) Determination of COD of water sample.
8) Determination of Total Solids, Suspended Solids and Total Dissolved Solids of a given water sample.
9) Determination of turbidity of given water sample by Nephelometry
10) Proximate analysis of coal -Determination of % of Moisture and % of Volatile Matter in coal sample
11) Proximate analysis of coal -Determination of % of ash in coal sample
12) Demonstration of determination of % carbon by Carbon residue Conradson apparatus.
13) Demonstration of determination of Consistency of grease by Penetrometer.
14) Demonstration (Virtual) of determination of Calorific value of solid/liquid fuels.
15) Demonstration (Virtual) of estimation of flue gas by Orsat's apparatus.

(A.R.Bhagvali)

(R. R. Chidi)

Dr. M. N. Group
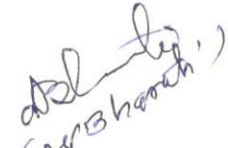
Laboratory Manual:

1. Applied Chemistry theory and practical O.P. Virmani and A.K.Narular (New Age International).
2. Laboratory Manual on Engineering Chemistry by Dr. Subdharani (Dhanpat Rai Publishing)
3. A Textbook on experiment and calculation in engineering chemistry by S.S. Dara S.Chand
4. Inorganic quantitative analysis, Vogel. (Prentice Hall).

Students should perform any one activity from the given activities list

Activities

1) Preparation of Audit Report for Industry waste generation.
2) Survey of greener synthesis of common drugs (in the form of chart and/or model)
3) Nearby industrial chemicals safety measures
4) Study of Chemical processes involved in nearby industry (Cement, Paper, Electroplating, Water purification industry etc.)
5) Study of separation and recycling techniques of polymers and E-waste.
6) Study of Biogas plant.
7) Study of the production process of bio-fuels.
8) Study of the biomass briquetting machine.

Dr. M. N. Girja

(A. V. Bharath)

(B. R. Chide)

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Subject: Communication Skills

Total Credits:02

Sub.Code: BSE1-4T

2020-21, Semester: I

Teaching Scheme

Lectures: 2 Hours/ Week (Theory)

Examination Scheme

T (U) : 35 Marks T (I) : 15 Marks

Duration of University Exam. : 02 Hours

Course Objective: To enhance competency in English language among learners.

Course Outcomes:

1. Students will be able to overcome barriers of communication.

2. Students will acquire public speaking skills and handle group situations professionally.

3. Students will be able to comprehend passages and compose paragraphs.

4. Students will be able to construct error free and meaningful sentences in English.

(Dr. Sajid Anwar)

Dr m. N. Giriya

(B. R. Chide)

(An Bharati)

Syllabus of Communication Skills (Theory)

Unit 1:A. Introduction to Communication, Importance of Communication, Process of Communication, Types of communication- Verbal and Non Verbal

B. Oral and Written Communication, Barriers to Communication and methods to overcome them. (6 hours)

Unit 2: A. Listening Skills, Importance of Listening, Types of Listening, Listening Barriers and methods to overcome them .

B. Effective Speaking Skills, Components of Public Speaking, Overcoming stage fear in public speaking, Group Discussion-Process and techniques   (6 hours)

Unit 3:A. Reading Skills, Importance of Reading, Sources of Reading, Skimming, Scanning, Comprehending passage

B. Writing Skills, Process and Techniques of Composition-Précis, Paragraph, Essay   (6 hours)

Unit 4:A. Basic Grammar: Tenses and its types, Sentences and its types
B. Transformation of Sentences- Assertive-Imperative-Interrogative-Exclamatory, Reported Speech.(6 hours)

Books Recommended:

1. Technical Communication by Meenakshi Raman and Sangeeta Sharma, OUP

2. Public Speaking and Influencing Men in Business by Dale Carnegie

3. Essentials of English Grammar by Micheal Swan

4. Professional Communication Skills by Bhatia and Sheikh

5. Business Communication by K.K. Sinha

6. Communication Skills by Dr. P. Prasad

7. Communication Skills by Sanjeev Kumar and Pushpalata, OUP

(Dr. Bhumika Agrawal)

(Dr. Sajid Anwar)

(B.R. Chide)

(Dr. Dora Thompson)

(Dr m. N. Giriya)

(Dr Nawaz khan)

(A. V Bhopadi)

Subject: Communication Skills

Total Credits:01

2020-21, Semester: I

Sub.Code ! BSE1 – 4P

Teaching Scheme

Practical : 2 Hours/ Week Practical

Examination Scheme

P (U) : 25 Marks P(I) : 25   Marks

Duration of University Exam. : 03 Hours

Course Objective: To enhance competency in all the four skills (LSRW) of English language among learners.

Course Outcomes:

1. Students will be able to overcome listening barriers of communication.

2. Students will be able to enhance their comprehending skills and speaking skills.

3. Students will be able to give effective presentations and handle group situations professionally

4. Students will be able to use figurative language in their formal as well as informal communication.

(Dr. Sajid Anwar)

Dr M.N. Giri 79

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Syllabus of Communication Skills (Practical)

1. Barriers to Communication- Overcoming listening barriers

2. Non-verbal Communication

3. Reading Skills

4. Speaking Skills

5. Presentation Skills

6. Group Discussion

7. Interview Techniques

8. Use of Figurative Language

B. Agrawal
(Dr. Bhumika Agrawal)

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(B.R. Chide)

(Dr. Dora Thompson)

(Dr Nawaz Khan)

Dr m. N. Giriya

(AVBhosadi)

RTM Nagpur University
Syllabus (Theory)

Semester	Course Title (Subject) Code: BSE1-5T	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
B.E. I Sem	Engineering Graphics	1			1	15	35	50	03

Sr. No.	Course Objective The objective of this course is–
1	To acquire basic knowledge about engineering drawing language. line types, dimension methods, and simple geometrical construction. To draw conic sections by various methods, involutes, cycloid and spiral.
2	To acquire basic knowledge about physical realization of engineering objects and shall be able to draw its different views. To imagine visualization of lateral development of solids.
3	To visualize three dimensional engineering objects and shall be able to draw their isometric views

	Course Outcomes
	After successful completion of this course the student will be able to:
CO1	The learner will able to understand the basic knowledge of engineering graphics such as instruments, lines, dimensioning techniques, scales, sheet layout. Construct the various engineering curves using the drawing instruments and basic of orthographic projection through drawing the projection of point and line.
CO2	The learner will able to understand projections of different types planes (2D) and solids (3D) and will be able to draw different views of plane and solids.
CO3	The learner will able to understand concept of sectioning and development of lateral surfaces of solid and will able to represent it.
CO4	Apply the visualization skill to draw a simple isometric projection/view from given orthographic views precisely using drawing equipment

SYLLABUS

Contents	No of hours
Unit I: **Introduction to Engineering Graphics:** Introduction to Engineering Graphics, Use of various drawing instruments, Sizes of drawing sheets, different types of lines used in drawing practice. Dimensioning linear, angular, aligned system, unidirectional system, Introduction to scales & scale factor (RF). **Basics of Orthographic Projections:** Basic principles of orthographic projection, reference planes, concepts of four quadrants, methods of orthographic projections. First angle projections,	3

Projections of Points and Lines: Projections of points in all possible positions w.r.t. reference planes. Projections of lines when it is perpendicular to one of the reference planes, when line is inclined to one & parallel to other reference plane. Lines inclined to both reference planes. (Lines in First Quadrant Only) Construction of conic section by using various methods. Ellipse, Parabola and Hyperbola, Engineering Curves: Cycloid, Involute, Archimedean Spiral.	3
Unit II: **Projection of planes:** Types of planes, position of planes parallel to one of the reference planes, Perpendicular to one & inclined to other reference plane. Inclined to both reference planes. Types of Auxiliary Planes, projection on auxiliary planes. (Exclude determination of true shape). **Projection of Solids:** types of solids, Simple positions, Axis inclined to one plane & parallel to other plane(only two stage)	3
Unit III: **Section of Solids.** (only one stage)– Types of section plane, types of sectional views, true shape of section. Projection of different solids cut by different section plane(when solid is in simple position, i.e. axis perpendicular to one and parallel to other reference plane). **Development of Lateral Surfaces:** Principle of development, methods of development of lateral surfaces of solids. Development of lateral surface of above cut solids.	3
Unit IV: **Isometric View and Projection:** Definition of isometric projection/view, Isometric scale, isometric lines, planes, non isometric lines/plane. Plane figures. Construction of isometric view from given views of an object. Construction of isometric projection of combined solids (axes vertical and coinciding) Prism, Pyramid Cylinder and Cone.(Exclude Sphere)	3
Total	**12**

Sr. No.	List of Tutorials	No of hours
01	Projection of points.	1
02	Projection of Straight lines – Simple positions, Minimum 4 problems on Projection of Straight lines: Inclined to both the planes..	2
03	Two problem each of Construction of conic section by using various methods. Ellipse, Parabola and Hyperbola,	2
04	One problem each of Cycloid, Involute, Archimedean Spiral.	1
05	Projection of planes – Perpendicular and oblique planes	2
06	Projection on auxiliary planes	2
07	Projection of Solids : Simple positions, Axis inclined to one plane & parallel to other	2
08	Section of Solids – Prism & Pyramids ,Cylinder & Cones Development of Lateral Surfaces – Prism, Pyramid, Cylinder & Cones	6
09	Isometric View and Projection – Planes or plane figures ,Prism, Pyramid Cylinder and Cone, General Object	6
	Total no of Tutorial	**24**

Dr. M. N. Grya

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References:

Text Books Recommended:

Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication, Anand, India

Dhawan, R. K., (2000), "A Textbook Of Engineering Drawing", S. Chand, New Delhi

Reference Books Recommended:

Jolhe, D. A., (2015), "Engineering Drawing ", Tata McGraw Hill, New Delhi

Shah P J, (2012) 'Basics of Engineering Graphics' S. Chand, New Delhi

P.S. Gill , (2015) "Engineering Drawing', S.K.Kataria and sons,

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RTM Nagpur University
Proposed Syllabus (Practical)

Semester	Course Title (Subject) Code: BSE1-5P	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
B.E. I Sem	Engineering Graphics lab	-	-	4	2	25	25	50	

Sr. No.	Course Objective The objective of this course is–
1	To acquire basic knowledge about engineering drawing , line types, dimension methods, and simple geometrical construction. To draw conic sections by various methods, involutes, cycloid and spiral.
2	To acquire basic knowledge about physical realization of engineering objects and shall be able to draw its different views. To imagine visualization of lateral development of solids.
3	To visualize three dimensional engineering objects and shall be able to draw their isometric views
Course Outcomes	
After successful completion of this course the student will be able to:	
CO1	Draw the fundamental engineering objects using basic rules and able to construct the lines, simple geometries. Construct the various engineering curves using the drawing instruments.
CO2	Draw two dimensional and three dimensional objects. precisely using drawing equipment.
CO3	Draw the development of lateral surfaces for cut section of geometrical solids precisely using drawing equipment.
CO4	Draw a simple isometric projection from given orthographic views precisely using drawing equipment.

Dr. M. N. Giriya

(P. Prabhasati)

(B. R. Chicde)

Sr. No.	List of practical	No of hours	No of sheet
01	Projection of Straight lines – Simple positions, Minimum 4 problems on Projection of Straight lines: Inclined to both the planes.	2	1
02	Two problems each of Construction of conic section by using various methods. Ellipse, Parabola and Hyperbola,One problem each of Cycloid. Involute, Archimedean Spiral.	2	1
03	Minimum 4 problems on Projection of planes – Perpendicular and oblique planes	2	1
04	Minimum 4 problems on Projection on auxiliary planes(Excluding True shape)	4	1
05	Minimum 4 problems on Projection of Solids : Simple positions, Axis inclined to one plane & parallel to other	4	1
06	Minimum 4 problems on Section of Solids(only one stage) – Prism & Pyramids,Cylinder & Cones, Development of Lateral Surfaces – Prism, Pyramid, Cylinder & Cones	4	1
07	Minimum 4 problems on Isometric View and Minimum 4 problems Projection,Prism, Pyramid Cylinder and Cone, General Object	6	2
	Total	24	08

References:

Text Books Recommended:

Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication, Anand, India

Dhawan, R. K., (2000), "A Textbook Of Engineering Drawing", S. Chand, New Delhi

.**Reference Books Recommended:**

Jolhe, D. A., (2015), "Engineering Drawing ", Tata McGraw Hill, New Delhi

Shah P J, (2012) 'Basics of Engineering Graphics' S. Chand, New Delhi

P.S. Gill , (2015) "Engineering Drawing', S.K.Kataria and sons,

Dr. M. N. Giriya

(A V Bhosdi)

(B. R. Chile)

RTM Nagpur University
Syllabus (Theory)

Semester	Course Title (Subject) Code: BSE1-6T	Hours / Week			Credits	Maximum Marks			Exam Duration (Hrs.)
		L	T	P		Continual Assessment	University Examination	Total	
B.E. I Sem	Basics of Civil and Mechanical Engineering	4	-	-	0	50		50	

Sr. No.	Course Objective The objective of this course is–
1	To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of CivilEngineering
2	To motivate the student to pursue a career in one of the many areas ofCivil Engineering with deep interest andkeenness
3	To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of publicutility.
4	To introduce manufacturing processes applying proper method to produce components. To be able to select and compare domestic appliances.
5	To get knowledge about various energy sources and its conversion.
6	To get acquainted with vehicle systems.

Course Outcomes

After successful completion of this course the student will be able to:

CO1	Introduction to what constitutes CivilEngineering. Identifying the various areas available to pursue and specialize within the overallfield of CivilEngineering. Highlighting the depth of engagement possible within each of theseareas.
CO2	Exploration of the various possibilities of a career in this field. Understanding the vast interfaces this field has with the society atlarge. Providing inspiration for doing creative and innovativework
CO3	Showcasing the many monuments, heritage structures, nationallyimportant infrastructure, and impressive projects to serve as sources ofinspiration. Highlighting possibilities for taking up entrepreneurial activities in thisfield. Providing a foundation for the student to launch off upon an inspired academicpursuit into this branch ofengineering
CO4	Discuss several manufacturing processes and identify the suitable process. Explain various types of mechanism and its application
CO5	Describe and compare the conversion of energy from renewable and non-renewable energy sources.
CO6	List down the types of road vehicles and their specifications; Illustrate various basic parts and transmission system of a road vehicle.

(B.R.Chide) (Dr. Sajid Ansari)

SYLLABUS	
Contents	No of hours
Unit-I : **Basic Understanding**: Role of Civil Engineering in Infrastructure development. Current budgets for infrastructure works; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers. **Fundamentals of Architecture & Town Planning**: Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities **Fundamentals of Building Materials**: Stones, bricks, mortars, Plain, Reinforced&Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel,Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes **Basics of Construction Management & Contracts Management**: Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Importance of Contracts Management	8
Unit-II: **Environmental Engineering & Sustainability**: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction. **Geotechnical Engineering**: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics &tunneling. **Hydraulics, Hydrology &Water Resources Engineering**: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multi- purpose reservoir projects. **Structural Engineering**: Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies. **Surveying &Geomatics**: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR. **Traffic &Transportation Engineering**: Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; Road Safety under heterogeneous traffic.	8
Unit-III:. **Repairs & Rehabilitation of Structures:** Basics of corrosion phenomena and other structural distress mechanisms; some simple systems of rehabilitation of structures; Non-Destructive testing systems; Use of carbon fibre wrapping and carbon composites in repairs. **Computational Methods, IT, IoT in Civil Engineering:** Typical software used in	8

Civil Engineering: Highway design (MX), Building Information Modelling; Highlighting typical available software systems (SAP, STAAD, ABAQUS, MATLAB, ETAB, NASTRAN,NISA,MIKE21,MODFLOW,REVIT,TEKLA,AUTOCAD,…GEOSTUDIO, EDUSHAKE,MSP, PRIMAVERA, ArcGIS, VisSIM,) **Basics of Professionalism**: Professional Ethics, Entrepreneurial possibilities in Civil Engineering, Possibilities for creative & innovative working, Technical writing Skills enhancement; Facilities Management; Quality & HSE Systems in Construction.	
Unit IV : **Introduction to Manufacturing**: Conventional Manufacturing Processes: Casting, Forging, Metal forming (Drawing, Extrusion, etc.), Sheet metal working, Metal joining, etc and components produced. Metal cutting processes and machining operationsTurning, Milling and Drilling, etc. Additive manufacturing and 3D Printing.. Basic CNC programming: Concept of Computer Numerical Controlled machines. **Engineering Mechanisms and their application in Domestic Appliances**: Introduction to Basic mechanisms and equipment: Pumps, blowers, compressors, springs, gears, Belt-Pulley, Chain-Sprocket, valves, levers with its applications in day to day life. Introduction to terms: Specifications, Input, output, efficiency, etc. Applications of: Compressors - Refrigerator, Water cooler, Split AC unit; Pumps - Water pump for overhead tanks, Water filter/Purifier units; Blower - Vacuum cleaner, Kitchen Chimney; Motor - Fans, Exhaust fans, Washing machines.	8
Unit VIntroduction of energy sources & its conversion **Energy sources**: Conventional and Renewable Energy sources, Thermal energy, Power plant,Hydropower energy, Nuclear energy, Solar energy, Geothermal energy, Wind energy, Hydrogen energy, Biomass energy and Tidal energy. **Energy conversion devices**: Introduction of pump, compressor, turbines, wind mills, photovoltaic cells, Two stroke and Four stroke engines (Petrol, Diesel and CNG engines). Steam generators.	8
Unit VI: **Vehicles and their Specifications**: Classification of automobile. Vehicle specifications of two/three wheeler, light motor vehicles, trucks, buses and multi-axle vehicles. Engine components (Introduction). Study of engine specifications, comparison of specifications of vehicles. Cost analysis of the Vehicle. **Vehicle systems:** Introduction of chassis layouts, steering system, suspension system, braking system, cooling system and fuel injection system and fuel supply system. Study of power transmission system, clutch, gear box,propeller shaft, universal joint, differential gearbox and axles. Vehicle active and passive safety arrangements: seat, seat belts, airbags and antilock brake system. Study of Electric and Hybrid Vehicle systems.	8
Total no of hours	48

Dr m. N. Gir13

(B.R.Chidue)

	(ORGANISATION OF COURSE)Only for Basic Civil Engineering	
	Module [No. of Lectures Within brackets]	Tutorials/Activity
1	Basic Understanding (1)	Develop a matrix of various disciplines and possible roles for engineers in each
2	History of Civil engineering (1)	Identify 10 ancient monuments and ten modern marvels and list the uniqueness of each
3	Overview of National planning for Construction and Infrastructure Development (1)	Develop a Strategic Plan for Civil Engineering works for next ten years based on past investments and identify one typical on-going mega project in each area
4	Architecture & Town Planning (1)	Identify ten best civil engineering projects with high aesthetic appeal with one possible factor for each; List down the possible systems required for a typical Smart City
5	Building Materials (1)	Identify three top new materials and their potential in Construction
6	Construction Management, Contracts management (1)	Identify 5 typical construction methods and list their advantages/ positive features
7	Environmental Engineering (1)	Write a report on Water Treatment plant and Waste water treatment plant.
8	Geotechnical Engineering (1)	List top five tunnel projects in India and their features; collect and study geotechnical investigation report of any one.
9	Hydraulics, Hydrology & Water Resources Engineering (1)	Identify three river interlinking projects and their Features.
10	Ocean Engineering, Ports & Harbours (1)	Identify 5 typical ports in India and list the structures available in them; Case study report of any one.
11	Power Plant Structures (1)	Collect the typical layout for a large thermal power plant.
12	Structural Engineering (3)	Identify 5 unique features for typical buildings, bridges, tall structures and large span structures; and make a report.
13	Surveying &Geomatics (1)	Identify five location by using Google Earth Map and study.
14	Traffic & transportation (1)	Enlist the NH,SH and their linking and make a report
15	Repairs & rehabilitation of Structures (1)	Identify the major rehabilitation project and make case study report
16	Computational Methods, IT, IoT in Civil Engineering (2)	Visit an AutoCad lab and prepare a report; Identify ten interesting software systems used in Civil Engg and their key
17	Basics of Professionalism (3)	List 5 cases of violation of professional ethics and list preventive measures; Identify 5 interesting projects and their positive features; Write 400 word reports on one ancient monument and a modern marvel of civil engineering
	Total 22 lectures	In 11 Tutorials or any 17 Activity expected

References:

Text Books Recommended:

1. Patil, B.S.(1974), Legal Aspects of Building and EngineeringContract
2. MeenaRao (2006), Fundamental concepts in Law of Contract, 3rd Edn.Professional Offset
3. Chaudhari and Hajra, "Elements of Workshop Technology", Volume I and II, Media Promoters and Publishers, Mumbai
4. Rai ,G.D.,(1999), Nonconventional Energy Sources" Khanna Publisher.
5. Rajput, R.K., (2007), "Basic Mechanical Engineering", Laxmi Publications Pvt. Ltd.
6. Ganeshan, V., (2018), "Internal Combustion Engines", McGraw Hill
7. Agrawal,Basant and Agrawal, C. M., (2008), "Basics of Mechanical Engineering", John

Wiley and Sons, USA

Reference Books Recommended:

1. Pravin Kumar, (2018), " Basic Mechanical Engineering, 2nd Ed.", Pearson (India) Ltd
2. Groover,Mikell P., (1996), "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", Prentice Hall, USA
3. Khurmi, R.S. ,and Gupta, J. K.,"A Textbook of Thermal Engineering", S. Chand & Sons
4. The National Building Code, BIS,(2017)
5. RERA Act,(2017)
6. Chandiramani, Neelima (2000), The Law of Contract: An Outline, 2nd Edn.Avinash PublicationsMumbai
7. Avtarsingh (2002), Law of Contract, Eastern Book Co.
8. Dutt (1994), Indian Contract Act, Eastern LawHouse
9. Anson W.R.(1979), Law of Contract, Oxford UniversityPress
10.   Kwatra G.K.(2005), The Arbitration & Conciliation of Law in India with case lawon UNCITRAL Model Law on Arbitration, Indian Council ofArbitration
11. Avtarsingh (2005), Law of Arbitration and Conciliation, Eastern BookCo.
12. Wadhera (2004), Intellectual Property Rights, Universal Law PublishingCo.
13. P. S. Narayan (2000), Intellectual Property Rights, Gogia LawAgency
14. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia LawHouse
15. Bare text (2005), Right to Information Act
16. O.P. Malhotra, Law of Industrial Disputes, N.M. TripathiPublishers
17. K.M. Desai(1946), The Industrial Employment (Standing Orders)Act
18. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia PublishingHouse
19. Vee, Charles &Skitmore, Martin (2003) Professional Ethics in the Construction Industry, Engineering Construction and Architectural management, Vol.10, Iss. 2,pp 117-127, MCB UPLtd
20. American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study andApplication
21. Ethics in Engineering- M.W.Martin&R.Schinzinger,McGraw-Hill
22. Engineering Ethics, National Institute for Engineering Ethics,USA
23. www.ieindia.org
24. Engineering ethics: concepts and cases – C. E. Harris, M.S. Pritchard,M.J.Rabins
25. Resisting Bureaucratic Corruption: Alacrity Housing Chennai (Teaching CaseStudy)
26.   -S. Ramakrishna Velamuri -CEIBS
27. CONSTRUCTION CONTRACTS,http://www.jnormanstark.com/contract.htm
28. Internet and Business Handbook, Chap 4, CONTRACTSLAW, http://www.laderapress.com/laderapress/contractslaw1.html
29. Contract&Agreements http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm
30. Contracts,http://206.127.69.152/jgretch/crj/211/ch7.ppt
31. Business & Personal Law. Chapter 7. "How ContractsArise", http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt
32. Types of Contracts,http://cmsu2.cmsu.edu/public/classes/rahm/meiners.con.ppt
33. IV. TYPES OF CONTRACTS AND IMPORTANTPROVISIONS, http://www.worldbank.org/html/opr/consult/guidetxt/types.html
34. Contract Types/Pricing Arrangements Guideline- 1.4.G(11/04/02), http://www.sandia.gov/policy/14g.pd

Dr.M.N.Gryg

(B.R.Chicle)

Faculty of Science and Technology
R.T.M. Nagpur University, Nagpur
Syllabus for B.E. Second Semester
Mathematics – II
Total Credits : 04 ; Subject Code : BES2-1T

Teaching Scheme   **Examination Scheme**

Lectures : 3 Hours / Week   Theory T(U) : 70 Marks T(I) : 30 Marks

Tutorial : 1 Hour / Week   Duration Of University Exam : 03 Hours

Unit 1: Integral Calculus-I: (8 Hours)   **10 Marks**
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.

Unit 2: Integral Calculus-II: (8 Hours)   **12 Marks**
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 3: Multivariable Calculus (Integration): (12 Hours)   **16 Marks**
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 4: Vector Calculus: (8 Hours)   **12 Marks**
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 5: Statistics: (6 Hours)   **10 Marks**
Fitting of a curve by method of least square: 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 6: Finite Differences (6 Hours)   **10 Marks**
Operator 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 equation with constant coefficients.

Text/Reference Books:

(i) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

(ii) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11th Reprint,
2010.

(iii) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,
Reprint, 2008.

(iv) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

(v) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II

(Dr. Sajid Anwar)   (ArvBharati)   (B.R. Chide)

Faculty of Science & Technology
R.T.M. Nagpur University, Nagpur

MATHEMATICS II

Course Objectives :

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

COURSE OUTCOMES : Students will be able to

1. Apply the concept of Beta and Gamma Functions to solve improper integrals.

2. Construct the plane curve and determine the length of curve, area, volume and surface area.

3. Apply concepts of double and triple integrals of different coordinate systems to measure area, mass, volume and center of gravity.

4. Apply concepts of Vector algebra and calculus to resolve the components of vectors in various directions and find directional derivatives. Apply concept of line integral to solve engineering problems.

5. Analyze the correlation between the variables. Apply method of least square to find the curve of best fit for the given data and solve statistical problems using computational tools.

6. Solve problems of interpolation of unequal intervals of arguments and find analytical solutions to difference equations.

(A V Bhagvah)

B.E. Semester II
Advanced Engineering Materials (Total Credits 3)
Subject Code: BSE2 – 2T

Teaching Scheme

Lectures: 2 Hours/Week Theory,

Tutorial: 1 Hours/week

Activity: 1 Hours/ week

Examination Scheme

T(U): 70 Marks T(I): 30 Marks

Duration of University Exam: 3 Hours

Unit - 1: Band theory of solids (6 Hrs) 12 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 (6 Hrs) 12 Marks

Types of Semiconductor diode and their applications, P-N junction Diode: Characteristics of P-N junction Diode, Tunnel Diode, Zener Diode, LED, Photodiode.

Transistors (CB and CE mode) and its application as an amplifier. Hall effect, Hall voltage and Hall coefficient; its applications,

Unit 3: Magnetic Materials (6 Hrs) 11 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.

(A v Bharati) (Sajid Annwar) (B. R. Chide)

Dr m. N. Ginya

Unit 4: Superconductors (6 Hrs) 12 Marks

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 5: Lasers (6 Hrs) 12 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 6: Nanoscience and Nanomaterials (6 Hrs) 11 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. Apply the basic concepts of electrical conductivity and band theory to classify solids into conductors, semiconductors and insulators

CO2. Recall the basic ideas of semiconductor physics and relate them to devices such as diodes and transistors and their applications in engineering

CO3. Recall the basic concepts in magnetism and make use of them to classify magnetic materials in different types and to relate to their engineering applications

CO4. Relate basic ideas of electrical conduction and magnetism to superconductors and apply them to classify superconductors in different types

CO5. Find how to extend the basic concepts of quantum transitions to explain the characteristics, working and applications of different lasers and to solve relevant numerical problems

CO6. Make us of quantum concepts to explain the properties and applications of different nanomaterials

List of Activities

Unit-1: Band Theory of Solids

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.

Unit-2: Semiconductor device

1. Testing of resistor, transistor, diode, capacitor with the help of multimeter / CRO.
2. Cut-in-voltages of various LEDs.

Unit-3: Magnetic Materials

1. Study of lines of force using bar magnet & iron fillings.
2. Maglev train.

Unit-4: Superconductors

1. History of superconductivity.
2. Study of application of superconductor.

Unit-5: Lasers

1. Measure the divergence of various sources of light such as torch, laser, tubelight, etc.
2. Understanding the phenomenon of stimulated emission, absorption & stimulated emission.
3. Laser applications in day to day life.
4. Holography.

Unit-6: Nanoscience & Nano materials

1. Discovery of nano materials
2. Applications of nano materials.

Note : Performance of at least one activity from each unit is compulsory in a semester.

Modes of Conducting/ Performing the activities

1. Quiz
2. Demonstration
3. Seminar
4. Group discussion
5. Assignment
6. Study of business model
7. Case study
8. Model making
9. Industry/research lab visit
10. Technical or research paper writing (for conference)
11. PPT making (Power Point Presentation)
12. Mini project

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, Macmillan(1981).

6. A Textbook of Engineering Physics, Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar, S. Chand Publication.

7. Engineering Physics, second edition, Sanjay Jain, G. Sahasrabudhe, University's Press (India) Pvt. Ltd.(2016).

8. A Text Book of Engineering Physics Dr. Devashree Hardas & Dr. Ashish Panat, Das Ganu Publication ISBN-978-81-921757-7-5

9. Engineering Physics , Dr. K.C. Nandi, Dr.Mohan Giriya , Tech-Max publication.

10. W. Saslow, Electricity, Magnetism and light, Elsevier Science,(2002)e-book

11. Solid state Physics by R. L. Singhal, Kedarnath Ramnath & Co.Meerut

12. Introduction to Lasers Theory and Applications by M. N. Avadhanulu, S. Chand and Company

13. Engineering Physics by P. K. Palaniswamy,Scitech(2005)

14. Engineering Physics by H. Malik and A. K. Singh,TMH(2010)

15. Engineering Physics by D. K. Bhattacharya and A. Bhaskaran, Oxford University Press (2010)

16. Materials Science and Engineering- A First course by V. Raghavan, PHI Learning

Dr. M.N. Giriya

B. E. Semester II
Advanced Engineering Materials (Practical) (Total Credits: 1)
Subject Code: BSE2- 2P

Teaching scheme   **Examination Scheme**

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

List of Experiments

1. Laser source: Determination of wavelength by diffraction grating.

2. Energy gap of semiconductor /thermistor

3. Parameter extraction from V-I characteristics of PN junctiondiode.

4. Parameter extraction from V-I characteristics of Zenerdiodes.

5. Parameter extraction from V-I characteristics of PNP/NPN transistor in CB and CE mode.

6. Study of Hall Effect.

7. Variation of Hall coefficient (R_H) with temperature.

8. V-I Characteristics of Tunnel diode.

9. V-I Characteristics of Light Emitting Diodes.

10. Study of Diode rectification.

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

Two experiments should be performed beyond syllabus in a semester.

RTMNU, Nagpur
SYLLABUS FOR FIRST YEAR (SEMESTER II) BACHELOR OF ENGINEERING

(For All Branches)

Course Code	BSE2 --- 3T				
Course Title	**APPLIED CHEMISTRY**				
Scheme & Credits	L	T	A	Credits	Semester
	3	1		4	II

Examination Scheme	
T (U) : 70 Marks T (I) : 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-
1. Rationalize the periodic properties and analyze the Microscopic Chemistry in terms of atomic and molecular orbital.
2. Rationalize bulk properties and processes using thermodynamic processes.
3. Understand the causes of corrosion, its consequences and methods to minimize corrosion.
4. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
5. Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.
6. Know about treatment of water and its applications in industry.

(R. R. Chide)   (Dr. Sajid Ahmed)   Dr. M. N. Giriya

UNIT-1
Periodic Properties and Atomic, Molecular Structure (9 Hours) (Marks 11)

- **Periodic properties :-**Effective nuclear charge, penetration of orbital, electronic configurations, Periodic trends of atomic and ionic sizes, ionization energies, electron affinity, electronegativity and polarizability
- **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 Functions (8 Hours)   (Marks 11)

- **Thermodynamic Functions: Energy, Entropy and Free Energy**
- Brief introduction of system surrounding, boundary, extensive and intensive properties.
- Definition & basic equation of internal energy and enthalpy
- Numericals on internal energy and enthalpy change
- Second law of Thermodynamics, reversible and irreversible reactions
- Role or use of Gibbs free energy in a) chemical equilibrium, b) oxidation reduction.

UNIT-3
Corrosion of Metals (7 Hours)   (Marks 11)

- Basic concepts of Free energy and emf., Cell potentials, the Nernst equation and applications.
- Corrosion- Definition, Causes, theories of corrosion- dry, wet and differential aeration, types of corrosion- pitting, inter granular, and stress corrosion
- Prevention and control of corrosion.- design and material selection, cathodic protection

UNIT-4
Applications of Spectroscopic Techniques (8 Hours)(Marks 11)

- Principles of spectroscopy and selection rules.
- Electronic spectroscopy- basic principles, Lambert-Beer's law, Woodward – Fisher Rule for conjugated dienes. 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-5
Basic Green Chemistry   (8 Hours)   (Marks 11)

- 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 carbon dioxide properties and applications, uses and applications of biopolymers (any two)

UNIT-6
Water Technology (10 Hours) (Marks 15)

- Importance of pH, Hardness and Alkalinity of water.
- Domestic Water Treatment: Brief discussion of coagulation by commonly use coagulants like Alum, polyaluminium chloride, ferric chloride, lime. Sterilization by using Ozone and chlorine (Break point chlorination).
- Industrial Water Treatment: Softening of water-principle- reactions, advantages, limitations and comparison of Zeolite process, and De-mineralization process. Numericals 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 Ganu Prakashan, 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 Dhanpat Rai and Sons, New Delhi.

Reference Books:
1. A textbook of Engineering Chemistry by Rajashree Khare, Published by S. K. Katariya and sons .
2. University Chemistry, by B. H. Mahan.
3. Organic Chemistry by Paula Y. Bruice, Published by Pearson India.
4. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
5. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
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; Dhanpat Rai & 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, percent solution.
2) Determination of surface tension of a given liquid.
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 Iodometry.
6) Determination of cell constant and conductance of a given solution.
7) Synthesis of a polymer/drug.
8) Estimation of Fe^{2+}/Fe^{3+} 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
15) Virtual Demonstration of Lambert- Beer's law

Laboratory Manual:

1. Applied Chemistry theory and practical O.P. Virmani and A.K.Narular (New Age International).
2. Laboratory Manual on Engineering Chemistry by Dr. Subdharani (Dhanpat Rai Publishing)
3. A Textbook on experiment and calculation in engineering chemistry by S.S. Dara S.Chand
4. Inorganic quantitative analysis, Vogel. (Prentice Hall).

Students should-

- **Perform any one activity.**

Activities

1. Drinking Water quality Analysis: hardness, alkalinity, pH, TDS
2. Titration of Aspirin Tablets
3. Study of commonly used antacid tablets.
4. Interpretation of NMR Spectra of 10 compounds.
5. Study the corrosion of surrounding materials.
6. Applications of chromatographic techniques in industry.

(Dr M. N. Ariya)

(D. R. Chide)

(A N Bhgvodi)

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 Anwar)   (A.V Bharadi)   (B. R. Chide)   Dr.m.N.Giriya

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 of an 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.Giri79

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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(A. V. Bharadi)   (B. R. Chide)

Dr. M. N. Giriya

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 Year|	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

(Arbharadi)

(B.R.Chicle)

Basic Electrical Engineering (BSE 2-6T)
(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 Answer)

(M.G.Wath)

(Ar Bhosali)

(B. R. chicle)

Dr M. N. Gaya

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)

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)   (AVBharadi)   (R.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)

Dr m.N. Giriya

(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.

(A.V.Bharadi)   A.m.N-Giriya   (B.R.chide)