Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Four Years B.E. Course
Scheme of Examination B.E. First year (All Branches of Engineering)

First Semester

Sub Code	Subjects	Workload in hrs			Credits	Marks					Minimum Passing Marks	
		L	T/A	P		Theory		Practical		Total		
						Internal	Uni	Internal	Uni		Theory	Practical
BSE1-1T	Mathematics-I	3	1	-	4	30	70	-	-	100	45	-
BSE1-2T	Applied Physics	3	2	-	4	30	70	-	-	100	45	-
BSE1-3T	Energy and Environment	2	2	-	3	30	70	-	-	100	45	-
BSE1-4T	Communication Skills	2	-	-	2	15	35	-	-	50	23	-
BSE1-5T	Engineering Graphics	1	-	-	1	15	35	-	-	50	23	-
BSE1-6T	Basics of Civil & Mechanical Engineering	4			Audit	50	-	-		Audit	-	-
BSE1-2P	Applied Physics Lab	-	-	3	1.5			25	25	50	-	25
BSE1-3P	Energy and Environment Lab	-	-	2	1			25	25	50	-	25
BSE1-4P	Communication Skills Lab	-	-	2	1			25	25	50	-	25
BSE1-5P	Engineering Graphics Lab	-	-	4	2			25	25	50	-	25
Three weeks Induction Program												
	Total	**15**	**11**		**19.5**	**120***	**280**	**100**	**100**	**600**		

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

Faculty of Science and Technology

R.T.M Nagpur University, Nagpur

Syllabus for B. Tech. First Semester

Mathematics – I

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

Subject Code: BES1-1
Examination Scheme
Theory T (U): 70 Marks, T (I): 30 Marks
Duration of University Exam: 3 hours

Course Objectives:

1. The topics covered will equip them the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power.
2. The aim is to inculcate and develop the basic mathematics skills of engineering students that are imperative for effective understanding of engineering subjects.

Course Outcomes:

After completing the course, students will be able to

1. Analyze real world scenarios to recognize when derivatives or integrals are appropriate, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) in order to solve the problems using multiple approaches, judge if the results are reasonable, and then interpret and clearly communicate the results.
2. Appreciate ODE and system of ODEs concepts that are encountered in the real world, understand and be able to communicate the underlying mathematics involved to help another person gain insight into the situation.
3. Apply knowledge of mathematics, physics and modern computing tools to scientific and engineering problems.
4. Develop an ability to identify, formulate and/or solve real world problems.
5. Understand the impact of scientific and engineering solutions in a global and societal context.

Unit 1: Differential Calculus **(8 Hours)**

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)**

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)**

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)

Linear, Reducible to linear and Bernoulli's differential equations, Exact differential equations (excluding the cases of integrating factors), 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 (12 Hours)

Higher order ordinary linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations, 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:

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

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

Teaching Scheme **Examination Scheme**

Lectures: 3hr/Week, **T (U): 70 Marks T (I): 30 Marks**

Activity/Tutorial: 2 hr/Week **Duration of University Exam. : 3 Hours**

Unit 1: Wave optics (09 Hours) 14 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.

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

Unit 2: Quantum Mechanics (10Hours) 14 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.

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 3: Crystal Structure (08 Hours) 14 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 4: Optical Fiber (08 Hours) 14 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 5: Electron Optics (07 Hours) 14 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.

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. Learn the basic concepts of dual nature of matter and wave packet and apply them to analyze various relevant phenomena and to solve related numerical problems

CO3. 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.

CO4. 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

CO5. 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

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.
4. Biography of Compton & de-Broglie in any electronic form (ppt./video).
5. Understanding the concept of micro and macro bodies, its identification and phenomenon observable using it with reason.
6. Justification of Heisenberg's Uncertainty Principle using thought experiment.
7. Applications of Heisenberg's Uncertainty Principle to prove electron does not exist in the nucleus.
8. Model making such as voids, planes, Miller Indices, FCC, BCC and SC.
9. Exhibition of variety of crystals in nature or day to day life.
10. Tyndall's demonstration.
11. Total Internal Reflection with the help of glass of water & laser source.
12. Collection of optical fibres to understand the internal structure.
13. Determination of 'λ' for various types of waves using CRO. (square, rectangular, sinusoidal)
14. Verification of $v = \frac{E}{B}$ using Thomson's experiment.

Note : Performance of at least one activities 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. *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. *Text book of Applied Physics, Dr. D. S. Hardas, Dr. D. S. Bhoumik, Dr.S. Shastri, Das Ganu Publication ISBN-978-93-84336-59-2 (2021)*
7. *Applied Physics, M. N. Avdhanulu, Shilpa A. Pande, Arti R. Golhar, Mohan Giriya, S. CHAND*
8. *A Text Book of Engineering Physics Dr. Devashree Hardas & Dr. Ashish Panat, Das Ganu Publication ISBN-978-81-921757-7-5 (2011)*
9. *Applied Physics, - Dr. (Mrs)S.P. Wankhede, Dr.Shruti Patle, Dr.(Mrs.)S.U.Bhonsule and Dr.N. S. Ugemuge DNA Publication ISBN-978-81-945174-6-7 (2020)*
10. *Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by R. Eisberg and R. Resnick, Wiley and Sons*
11. *Engineering Physics, second edition, Sanjay Jain, G. Sahasrabudhe, University's Press(India) Pvt. Ltd.(2016)*
12. *D. J. Griffiths, Quantum mechanics, Prentice Hall of India Private Limited, New Delhi*
13. *L. I. Schiff, Quantum Mechanics, TMH Publications*
14. *David Halliday, Robert Resnick, Jearl Walker, Principles of Physics, 10th Edition, John Wiley and Sons (2017)*
15. *Advanced physics - Dr.Shruti Patle, Dr.(Mrs).S.U.Bhonsule, Dr.Ashish N. Bodhaye, Dr.Manohar D.Mehare DNA Publication (2019)*
16. *Engineering Physics - Dr.N. S. Ugemuge, Dr.(Mrs.)S.U.Bhonsule and Dr.Shruti Patle DNA Publication(2019)*

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

Teaching Scheme **Examination Scheme**

Lectures: 3hrs/Week **P (I): 25 Marks P (U): 25 Marks**

List of Experiments

1. Interference in thin films: Study of wedge shaped thin film.
2. Radius of curvature of a plano convex lens by Newton's Rings
3. Diffraction due to plane diffraction Grating
4. Determination of principal refractive indices of a prism
5. Determination of Plank's constant by using LEDs.
6. Comparative study of cubic crystal structure (with the help of model)
7. Determination of NA for optical fiber
8. Determination of e/m of an electron by bar magnet method (Thomson's method)
9. Calibration of Time Base circuit of CRO and determination of frequency of electrical signals
10. Determination of phase of electrical signals using CRO.
11. Determination of AC and DC voltage using CRO.

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

Scope of the syllabus

B. E. Semester I Applied Physics

Unit One: Wave Optics

Interference in thin films, Interference in wedge shape thin film, characteristics of Newton's rings, Antireflection coating, phase and amplitude condition, derivation of minimum thickness, Advanced applications of interference in thin film, Concept of diffraction, Expression of resolving power of grating.

Unit Two: Quantum Mechanics

Equations for energy and momentum conservation, Mathematical equation for Compton shift & its interpretation (without derivation). Relative intensities of modified and unmodified wavelengths for high and low atomic number scatterers and its explanation, Free electron cannot absorb a photon (proof), Concept of wave particle duality, Matter waves and de-Broglie relation, Significance of matter waves in microscopic and macroscopic bodies.

Definition of wave function (Ψ), Heisenberg Uncertainty Principle; significance and applications, Schrodinger's time dependent and time independent wave equations (only equations), Application of Schrodinger's time independent equation to infinite potential well.

Unit Three: Crystal Structure

Central idea of periodic spatial arrangement of atoms and molecules, derivation of inter planer spacing and Bragg's Law, Applications of Bragg's Law.

Unit Four: Optical Fibers

Mechanism of attenuation: Attenuation versus wavelength plot, optical window, outline of mechanism of dispersion, Introduction to light source and detectors.

Unit Five: Electron Optics

Concept of motion of charged particle in electric and magnetic fields with expression of force, 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.

Cathode ray oscilloscope, Block diagram of CRO, Role of each block, Cathode Ray Tube, Various parts of CRT, Applications of CRO: 1)Measurement of AC voltage, 2) Measurement of DC voltage, 3) Determination of frequency, 4) Phase measurement.

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

Course Code	BESI-3T			
Course Title	**Energy and Environment**			
Scheme & Credits	**L**	**T/A**	**Credits**	**Semester**
	2	2	**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:

CO-1 Obtain the knowledge of solid and gaseous fuels and their Calorific Value determination.
CO-2 Recognize the type of liquid fuels and their uses in IC engines.
CO-3 Apply the knowledge about the use of alternative sources of energy& utilize solid waste as energy source
CO-4 Analyze the impacts of Industrial pollution and its control.
CO-5 Develop innovative ideas for use of advanced materials in sustainable development.

UNIT 1:- Basics of Energy and Solid Fuels
(8 Hours) (Marks 14)

- 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.
- Numerical on Goutal's Formula for Gross Calorific Value based on Proximate Analysis
- Numerical on Calorific Value determination.
- Numerical on GCV & NCV by using relation formula (convert answer in joules or one of the CV given in joules)

UNIT 2: Liquid and Gaseous Fuels
(8 Hours) (Marks 14)

- 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:- AlternateSources of Energy &Waste to Energy Conversion
(8 hours) (Marks 14)

- Bio-energy, Photolysis of water- Chemical Conversion of Solar Energy.
- Nuclear fuels: Numerical on Binding Energy & Average Binding Energy per Nucleon
- Fuel cells- working, advantages and disadvantages of alkaline, methanol fuel cells.
- Classification of waste on the basis of segregation at source, hazardous solid waste management technology:Physical method, chemical method, biological treatment, Eco-friendly Incineration, Depoymerization,landfill techniques.
- Utilization of Biogas and Landfill Gas for Biofuels and High Value Chemicals, gasification and Utilization of Syngas, Thermochemical Conversion of Syngas

UNIT 4:- Environmental impacts of Energy Technologies
(8 Hours) (14 Marks)

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

UNIT 5:- Advanced materials for sustainable development
(8 Hours) (14 Marks)

- Introduction of Advance materials, properties and applications:- composites, liquid Crystal polymers, conducting polymers, insulating materials, adhesives, biodegradable polymers.
- Nanomaterials in energy- Photochemical devices like lithium ion batteries, Nanomaterials for Energy Storage, nanomaterials in solar cells.

Books Recommended:

1. Text Book of Engineering Chemistry: S.S. Dara, S. Chand and Company Ltd. New Delhi.
2. Textbook of Engineering Chemistry: P.C. Jain and Monica Jain, DhanpatRai and Sons, New Delhi.
3. Materials Chemistry: A.V. Bharati and Walekar, Tech Max Publications, Pune.
4. Energy and Environment: Archana R Chaudhari and Aditi Pandet, S. Chand Publication

Reference Books:

1. A Text book of Engineering Chemistry:Shashi Chawla; DhanpatRai& Sons, New Delhi.
2. Applied Chemistry by N. Krishnamurthy: P. Vallinavagam. And K. Jeysubramanian TMH
3. Applied Chemistry for Engineers: T.S. Gyngell.
4. Fuels and Combustion: Amir Circar, Orient Longmans
5. Fundamentals of Engineering Chemistry (Theory and Practice) :S. K. Singh (New Age Materials)
6. Environmental Chemistry: B. K. Sharma
7. Industrial Energy Management and Utilization: L.C. Witte, P.S. Schmidt and D.R. Brown (Hemisphere Publishing Corporation, Washington,1998
8. Energy and Environment- NPTEL lecture notes

ENERGY AND ENVIRONMENT LABORATORY (BESI-3P)

Course Code	BESI-3P				
Course Title	Energy and Environment Lab				
Scheme & Credits	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 temperatures.
5) To determine Sulphate Concentration in a given water sample.
6) Determination of amount of Chloride (in Cl^- form) by Mohr's method.
7) Determination of COD of water sample.
8) To determine the 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.

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 industries (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 biofuels.
8. Study of the biomass briquetting machine.

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. Gmiya

(B.R. Chide)

(Abhyankar)

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

B. Agrawal
(Dr Bhumika Agrawal)

(Dr. Sajid Anwar)

(B. R. Chide)

(Dr. Dora Thompson)

Dr M. N. Giri

(Dr Nawaz Khan)

(A V Bhosale)

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 M.N. Giri.'19

(Dr. Sajid Anwar)

(B. R. Chide)

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

(A V Bhosale)

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

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

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.	
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. V. Gosavi (Arvabhgadi) R. R. Chicle

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,

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

(A. V. Kharadi)

(B. R. Chicle)

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 Bhosadi

(B. R. Chicle)

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.

(A.V. Bharati) (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. Giriya

(B. R. Chidley)

(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. Grigg (R. R. Chicle)

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

Second Semester

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

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

* Audit course marks are not counted in total marks

Guidelines

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

Faculty of Science and Technology

R.T.M Nagpur University, Nagpur

Syllabus for B. Tech. Second Semester

Mathematics – II

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

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

Course Objectives:

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

Course Outcomes:

After completing the course, students will be able to

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

Unit 1: Integral Calculus (13 Hours)

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

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

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

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

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

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

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

Vector Integration: Line integrals and Work done.

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

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

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

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

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

Text/Reference Books:

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

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

Teaching Scheme **Examination Scheme**

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

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

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

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

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

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

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

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

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

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

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

Unit 4: Lasers (7 Hrs) 14 Marks

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

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

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

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

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

Course Outcomes

Students will be able to

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

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

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

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

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

Suggested Text Books &Reference Books

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

List of Activities

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

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

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

(Total Credits: 1)

Teaching scheme **Examination Scheme**

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

List of Experiments

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

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

Scope of the syllabus

Second Semester: Advanced Engineering Materials

Unit - 1: Band theory of solids

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

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

Unit-2: Semiconductor Devices

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

Unit 3: Magnetic and Superconducting Materials

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

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

Unit 4: Lasers

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

Unit 5: Nanoscience and Nanomaterials

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

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

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

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

Course Objectives.

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

Course Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

Books Recommended:

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

Reference Books:

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

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

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

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

Course Outcomes

After completion of course students will learn to:

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

Students should

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

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

ACTIVITY

Students should perform any one activity

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

Computational Skills

(Total Credits: 02)

SUBJECT CODE: BSE2 - 4T

Teaching Scheme
Practical: 2 Hours/Week

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

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

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

Unit 2: **(10 Hrs)**

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

Unit 3: **(8 Hrs)**

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

Unit 4: **(6 Hrs)**

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

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

Computational Skills (Total Credits: 01)

SUBJECT CODE: BSE2 – 4P

Teaching Scheme
Practical: 2 Hours/Week

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

Students have to perform Practicals based on the theory :

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

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

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

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

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

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

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

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

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

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

(B.R.Chide)

Dr M.N. Giriya

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

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

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

For example: Fundamentals of Loop Control Structures

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

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

Books Recommended:

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

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

Basic Electrical Engineering (BSE2-6T)

(Total Credits: 02)

Teaching Scheme
Lectures: 2 Hours/ Week

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

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

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

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

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

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

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

Generation of single phase voltage, average and RMS value for sinusoidal waveform, periodic function, phasor representation of sinusoidal electrical quantities, steady state behavior of RLC circuit with excitation, reactance, impedance, power and energy in AC circuit, simple numerical on series and parallel AC circuit, concept and importance of power factor, resonance in series circuits. Principal of Generation of three phase voltage, Phase sequence, Star & Delta Connected three phase system, Voltage, Current & Power relations for Balanced three phase system only (With numerical).

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

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

Books Recommended:

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

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

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

Engineering Mechanics (BES2-7T)

Total Credits 2

Teaching Scheme
Lecture : 2

Examination Scheme
TU:35 marks TI:15 Marks

Duration of Exam : 2 Hours

The Course Objective Is To Impart Knowledge Of

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

After the completion of course student will be able to

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

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

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

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

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

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

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

Unit - III : (10 Hrs)

(Dr. Sajid Anwar) (Abhasadi) Dr m. v. Giriya (B.R.Chicle)

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 2-8 T

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 Ahmad) (A.V.B. Kharadi) (B. R. Chicle)

SYLLABUS:

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

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.

(Prof. Bharadi) Dr. M. N. Giriya (B. R. Chide)

RTM Nagpur University
Syllabus (Practical)

Semester	Course Title(Subject)	Hours / Week			Credits	Maximum Marks		
		L	T	P		Continual Assessment	University Examination	Total
Semester II [First 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

(A.B. Ambhorkar)

(B.R. Chicle)

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering) (CBCS)
SCHEME OF EXAMINATION

THIRD SEMESTER

Board	Subject Code	Subject	Teaching Scheme				Credit	MARKS					Minimum Passing Marks	
								Theory		Practical		Total	Theory	Practical
			L	P	T/A	Total		Internal	Uni.	Internal	Uni.			
GS	BEEE3O1T	Electrical Engineering Mathematics	3	-	1T	4	4	30	70	-	-	100	45	
EE	BEEE3O2T	Network Analysis	3	-	1A	4	4	30	70	-	-	100	45	
EE	BEEE3O3T	Electrical Measurement & Instrumentation	3	-	1A	4	4	30	70	-	-	100	45	
EE	BEEE3O4T	Analog Devices & Circuits	3	-	1A	4	4	30	70	-	-	100	45	
EE	BEEE3O5T	Renewable Energy studies	3	-	-	3	3	30	70	-	-	100	45	
EE	BEEE3O6T	Introduction to Python programming	1	-	-	1	1	15	35	-	-	50	23	
	BEEE3O7T	Environmental studies	1	-	1A	1	Audit	50	-	-	-	Audit	-	
EE	BEEE3O2P	Network Analysis Lab	-	2	-	2	1	-	-	25	25	50		25
EE	BEEE3O3P	Electrical measurement & instrumentation Lab	-	2	-	2	1	-	-	25	25	50		25
EE	BEEE3O4P	Analog Devices & circuits Lab	-	2	-	2	1	-	-	25	25	50		25
EE	BEEE3O6P	Introduction to Python programming Lab	-	2	-	2	1	-	-	25	25	50		25
		Total	**17**	**8**	**1T+4A**	**29**	**24**	**165**	**385**	**100**	**100**	**750**		

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

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering) (CBCS)
SCHEME OF EXAMINATION

FOURTH SEMESTER

Board	Subject Code	Subject	Teaching Scheme				Credit	MARKS					Minimum Passing Marks	
								Theory		Practical		Total	Theory	Practical
			L	P	T/A	Total		Internal	Uni.	Internal	Uni.			
EE	BEEE4O1T	Signal & Systems	3	-	1T	4	4	30	70	-	-	100	45	
EE	BEEE4O2T	Digital Electronics	3	-	-	3	3	30	70	-	-	100	45	
EE	BEEE4O3T	Electrical machines-I	3	-	-	3	3	30	70	-	-	100	45	
EE	BEEE4O4T	Power System	3	-	-	3	3	30	70	-	-	100	45	
EE	BEEE4O5T	Electromagnetic Fields	3	-	1T	4	4	30	70	-	-	100	45	
EE	BEEE4O6T	Simulation & Programming Techniques	3	-	-	3	3	30	70	-	-	100	45	
		Internship (2 to 3 weeks)	-	-	-	-	1	-	-	-	-	-		
EE	BEEE4O2P	Digital Electronics lab	-	2	-	2	1	-	-	25	25	50		25
EE	BEEE4O3P	Electrical machines-I Lab	-	2	-	2	1	-	-	25	25	50		25
EE	BEEE4O6P	Simulation & Programming Techniques Lab	-	2	-	2	1	-	-	25	25	50		25
		Total	**18**	**6**	**2T**	**26**	**24**	**180**	**420**	**75**	**75**	**750**		

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

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering) (CBCS)
SCHEME OF EXAMINATION

FIFTH SEMESTER

Board	Subject Code	Subject	Teaching Scheme				Credit	MARKS					Minimum Passing Marks	
								Theory		Practical		Total	Theory	Practical
			L	P	T/A	Total		Internal	Uni.	Internal	Uni.			
EE	BEEE5O1T	Microprocessor & Microcontroller	3	-	1T	4	4	30	70	-	-	100	45	
EE	BEEE5O2T	Control systems	3	-	1T	4	4	30	70	-	-	100	45	
EE	BEEE5O3T	Power electronics	3	-	1T	4	4	30	70	-	-	100	45	
	BEEE5O4T	Open elective -I	3	-	-	3	3	30	70	-	-	100	45	
EE	BEEE5O5T	Professional elective-I	3	-	-	3	3	30	70	-	-	100	45	
EE	BEEE5O1P	Microprocessor & Microcontroller lab	-	2	-	2	1	-	-	25	25	50		25
EE	BEEE5O2P	Control systems lab	-	2	-	2	1	-	-	25	25	50		25
EE	BEEE5O3P	Power Electronics lab	-	2	-	2	1	-	-	25	25	50		25
		Total	**15**	**6**	**3T**	**24**	**21**	**150**	**350**	**75**	**75**	**650**		

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

Open Electives -I	Professional Elective-I
1. PLC and SCADA systems	1. Electrical Machine – II
2. Solar PV Systems	2. Power Station Practice
3. Organizational behavior	3. Electrical Power Utilization

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering) (CBCS)
SCHEME OF EXAMINATION

SIXTH SEMESTER

Board	Subject Code	Subject	Teaching Scheme				Credit	MARKS					Minimum Passing Marks	
								Theory		Practical		Total	Theory	Practical
			L	P	T/A	Total		Internal	Uni.	Internal	Uni.			
GS	BEEE6O1T	Engineering Economics & Management	3	-	-	3	3	30	70	-	-	100	45	
EE	BEEE6O2T	Computer Applications in power system	3	-	1T	4	4	30	70	-	-	100	45	
EE	BEEE6O3T	Switch gear & protection	3	-	1T	4	4	30	70	-	-	100	45	
	BEEE6O4T	Open electives-II	2	-	-	2	2	30	70	-	-	100	45	
EE	BEEE6O5T	Professional elective-II	3	-	-	3	3	30	70	-	-	100	45	
	BEEE6O6T	Yoga & Meditation	1	-	-	1	Audit	50	-	-	-	Audit		
		Internship 3 to 4 weeks	-	-	-	-	2	-	-	-	-	-		
EE	BEEE6O2P	Computer Applications in power system lab	-	2	-	2	1	-	-	25	25	50		25
EE	BEEE6O3P	Switch gear & protection lab	-	2	-	2	1	-	-	25	25	50		25
EE	BEEE6O7P	Electrical Workshop Lab	-	2	-	2	1	-	-	25	25	50		25
		Total	**15**	**6**	**2T**	**23**	**21**	**150**	**350**	**75**	**75**	**650**		

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

Open Electives -II	Professional Elective-II
1. Testing and maintenance of Electrical Equipments	1. Electrical Installation and Design
2. Advance Instrumentation	2. Electrical Machine Design
3. Optimization Technique	3. Electric Drives and their control

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering) (CBCS)
SCHEME OF EXAMINATION

SEVENTH SEMESTER

Board	Subject Code	Subject	Teaching Scheme				Credit	MARKS					Minimum Passing Marks	
								Theory		Practical		Total	Theory	Practical
			L	P	T/A	Total		Internal	Uni.	Internal	Uni.			
EE	BEEE7O1T	Professional elective-III	3	-	-	3	3	30	70	-	-	100	45	
EE	BEEE7O2T	Professional elective-IV	3	-	-	3	3	30	70	-	-	100	45	
EE	BEEE7O3T	Professional elective-V	3	-	-	3	3	30	70	-	-	100	45	
EE	BEEE7O4T	Open electives-III	3	-	-	3	3	30	70	-	-	100	45	
	BEEE7O5T	Ancient Indian History	-	-	-	-	Audit	50	-	-	-	Audit		
EE	BEEE7O6P	Elective Lab-I	-	2	-	2	1	-	-	25	25	50		25
EE	BEEE7O7P	Elective Lab-II	-	2	-	2	1	-	-	25	25	50		25
EE	BEEE7O8P	Project &Seminar	-	-	3A	3	3	-	-	50	-	50		25
		Total	**12**	**4**	**3A**	**19**	**17**	**120**	**280**	**100**	**50**	**550**		

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

Open Electives III	Professional Elective III	Professional Elective IV	Professional Elective V
1. Energy Management and Audit	1. Advanced Power Electronics	1. Fuzzy Logic and Neural Networks	1. Introduction to Artificial Intelligence
2. Industrial Economics and Entrepreneurship	2. HV Engineering	2. Advanced Electrical Power Systems	2. Digital signal processing and its applications
3. Electric and Hybrid Vehicles	3. Integrated Renewable Energy Systems	3. Flexible AC Transmission System	3. Introduction to Smart Grid

Elective lab I	Elective lab II
1) HV Engineering OR 2) Electrical Drawing and Simulation	1) Electrical Installation & Design OR 2) Advance Power Electronics

RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR
B.E. (Electrical Engineering) (CBCS)
SCHEME OF EXAMINATION

EIGHTH SEMESTER

Board	Subject Code	Subject	Teaching Scheme				Credit	MARKS					Minimum Passing Marks	
								Theory		Practical		Total	Theory	Practical
			L	P	T/A	Total		Internal	Uni.	Internal	Uni.			
EE	BEEE8O1T	Advance Professional elective-VI #*	3	-	-	3	3	30	70	-	-	100	45	
EE	BEEE8O2T	Advance Professional elective-VII #*	3	-	-	3	3	30	70	-	-	100	45	
		Internship (5 to 6 weeks) in Industry at appropriate work place	-	-	-	-	4	-	-	-	-	-		
EE	BEEE8O3P	Project	-		3A	3	3	-	-	50	50	100		50
EE	BEEE8O4P	Seminar	-	-	2A	2	2	-	-	50	-	50		
		Total	**6**	**-**	**5A**	**11**	**15**	**60**	**140**	**100**	**50**	**350**		

 # These subjects should be undertaken through online mode.

***Alternatively students can choose any course with 3 credits from MOOCs Platform for which the list is given below.**

Additional subjects may be conducted through online courses.

Teacher shall be assigned workload for internship and industrial project.

List of MOOCs platforms which offer online certifications courses as below: -

1. **SWAYAM-https://swayam.gov.in**
2. **NPTEL-https://onlinecourses.nptel.ac.in**
3. **MOOC-http://mooc.org**

OR

Students may opt following online courses designed by BoS Electrical Engineering, RTMNU Nagpur

Professional Elective-VI	Professional Elective-VII
1. Power semiconductor drives	1. EHVAC / DC transmission System
2. Electrical Distribution System	2. Power Quality

LIST OF ELECTIVE SUBJECTS

Semester	Elective Type	Subject
V	Open Elective-I	1. PLC and SCADA systems
		2. Solar PV Systems
		3. Organizational behavior
	Professional Elective-I	1. Electrical Machine – II
		2. Power Station Practice
		3. Electrical Power Utilization
VI	Open Elective-II	1. Testing and maintenance of Electrical Equipments
		2. Advance Instrumentation
		3. Optimization Technique
	Professional Elective-II	1. Electrical Installation and Design
		2. Electrical Machine Design
		3. Electric Drives and their control
VII	Open Elective-III	1. Energy Management and Audit
		2. Industrial Economics and Entrepreneurship
		3. Electric and Hybrid Vehicles
	Professional Elective-III	1. Advanced Power Electronics
		2. HV Engineering
		3. Integrated Renewable Energy Systems
	Professional Elective-IV	1. Fuzzy Logic and Neural Networks
		2. Advanced Electrical Power Systems
		3. Flexible AC Transmission System
	Professional Elective-V	1. Introduction to Artificial Intelligence
		2. Digital signal processing and its applications
		3. Introduction to Smart Grid
VIII	Professional Elective-VI	1. SWAYAM – https://swayam.gov.in
		NPTEL – **https://onlinecourses.nptel.ac.in/**
		2. MOOC – https://mooc.org
		3. Power semiconductor drives
		4. Electrical Distribution System
	Professional Elective-VII	1. SWAYAM – https://swayam.gov.in
		2. NPTEL – **https://onlinecourses.nptel.ac.in/**
		3. MOOC – https://mooc.org
		4. EHVAC/DC transmission System
		5. Power Quality

III Semester B.E. (Electrical Engineering)
ELECTRICAL ENGINEERING MATHEMATICS (Credits-04)

Teaching Scheme	Theory-03	Tutorial-01	Practical-00	Total-04
Examination Scheme	Internal Assessment-30	End Semester Assessment-70	Total-100	

Learning Objectives: Students will be able to –

- apply the various methods for the solution to partial differential equations
- analyze the systems with complex variables
- explore the basics of various transformation methods
- apply the mathematical analysis to electrical circuits and systems
- mathematical modeling and probability

Course Outcomes:

UNIT	COs	Learning Outcomes
I	**CO1**	Solution of Partial Differential Equations of First Order First Degree, Numerical Solution to Ordinary differential equations
II	**CO2**	Formulation and solving the systems with complex variables
III	**CO3**	Understanding the basics of various Transforms and converting the functions into required transforms, Laplace Transforms analysis and its application to solve differential equations
IV	**CO4**	Application of Differential equations and Laplace Transform for mathematical model formulation of the physical systems, Understanding the concept of transfer function
V	**CO5**	Understanding the concepts of Stochastic analysis and its application

UNIT – I: PARTIAL DIFFERENTIAL EQUATIONS (08Hrs)

Partial Differential Equations of First Order First Degree i.e. Lagrange's form, Linear Homogeneous Equations of higher order with constant coefficients. Method of separations of variables, Numerical solution of ordinary differential equations :Taylor's series method, Runge-Kutta 4th order method, Euler's modified method. Milne, s Predictor- Corrector method, Solution of Second Order Differential Equations and Simultaneous Differential Equations by Runge- Kutta method.

UNIT- II: FUNCTIONS OF COMPLEX VARIABLE (09Hrs)

Analytic function, Cauchy- Riemann Conditions, Harmonic Functions (excluding orthogonal system), Milne-Thomson Method, Cauchy Integral Theorem & Integral Formula (Statement only), Taylor's & Laurent's series (Statement only), Zeros and Singularities of Analytic function, Residue Theorem (Statement only), Contour integration (Evaluation of real definite integral around unit circle and semi-circle).

UNIT –III: Introduction to Transformation Methods (10Hrs)

Introduction to various transform methods, Definition and fundamentals of Laplace Transforms Simple Applications of Laplace Transform to solve Partial Differential Equations (One dimensional only). Laplace transform of step, ramp & parabolic signals, Time response of first order systems and second order systems for unit step input, Concept of characteristic equation $q(s) = 0$ vs time response, Introduction to Fourier and z-Transform,

UNIT–IV : MATHEMATICAL MODELING AND TRANSFER FUNCTION (08Hrs)

Mathematical Modeling of physical systems and Differential equations (Mechanical systems, basic translational and rotational systems, basic R-L-C series and parallel circuits), Concept of transfer function, Transfer function for elementary R-L-C circuits, Elementary block diagram single input single output closed loop system and its reduction.

UNIT – V: THEORY OF PROBABILITY (07Hrs)

Axioms of Probability, Conditional Probability, Baye's Rule, Random variables: Discrete and Continuous random variables, Probability function and Distribution function, Mathematical Expectation, Functions of random variable, Variance & Standard Deviation, Moments, Moment generating function, Measures of central tendency and Dispersion, Skewness and Kurtosis. Binomial distribution, Poisson distribution, Normal distribution.

Text Books:

1. Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication
2. A Text Book of applied Mathematics, Volume II , by P.N. Wartikar & J.N. Wartikar, Poona Vidyarthi Griha Prakashan
3. Mathematics for Engineers by Chandrika Prasad
4. A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication.
5. Theory & Problems of Probability and Statistics by Murray R. Spiegel , Schaum Series, McGraw Hills

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreysizig, 8th Edition, Wiley India
2. Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
3. Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville

4. A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication.
5. Control Systems Engineering by Nagrath & Gopal, New Age International Publishers

III Semester B.E. (Electrical Engineering)

NETWORK ANALYSIS

Total Credit- 04

Subject Code:-BEEE3O2T

Teaching Scheme	**Examination Scheme**
Theory-03 Hours/Week	Th (U)= 70 Th(I)=30
Tutorial/ Activity -01 Hours/Week	Duration of University Exam:- 3 Hours
Practical:- 02 Hours/ Week	

Course Objectives

Students will be able to –

- To provide various methods of analysis of electric networks under transient and steady state conditions.
- To provide concrete foundation needed to learn future professional courses.

Course Outcomes:

After studying the course, the students will be able to demonstrate the ability to

CO1. Apply mesh current and node voltage methods to analyze electrical circuits.
CO2. Apply network theorems for the analysis of networks.
CO3. Obtain transient and steady-state responses of electrical circuits.
CO4. Synthesize waveforms and apply Laplace transforms to analyze networks.
CO5. Evaluate different Network Functions and understand two port network behavior

Unit –I: Sources, Mesh Analysis, Node voltage analysis (07 Hrs)

Voltage and Current sources, source transformation, mesh basis equilibrium approach for simple networks of having mutual coupling, Node voltage analysis of networks, concept of duality.

Unit –II: Network Theorems (07 Hrs)

Thevenin's, Norton's, Maximum Power transfer, Reciprocity theorems as applied to D C. & A. C. circuits with independent and dependent sources.

Unit –III: Solution of First and Second Order Networks (07 Hrs)

Solution of first and second order differential equations of different combinations of series and parallel RLC networks. Initial and final conditions in network elements, free and forced response, time constants.

Unit –IV: Electric Circuit Analysis using Laplace Transforms (07 Hrs)

Review of Laplace transform, waveform synthesis, Analysis of electrical circuits using Laplace transform for standard inputs, analysis of networks with and without initial conditions using Laplace transforms.

Unit –V: Two port networks and Network functions (08 Hrs)

Two port networks, relationship between two port variables, driving point and transfer functions, properties, concept of complex frequency, Poles and zeros.

Two port network parameters: Impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnection of two port networks.

Text Books:

1. Van Valkenburg, "Network Analysis", Third Edition, 2009, Prentice Hall of India
2. Sudhakar, A, Shyammohan, "Circuits and Networks", Third Edition, 2006, Tata McGraw-Hill.
3. D. Roy Choudhary, "Networks and Systems", New Age International Publishers, 2nd Edition, 2012
4. Kelkar and Pandit, "Linear Network Theory", Pratibha Publications.

Reference Books:

1. Mahmood Nahvi, Joseph A Edminister, "Schaum's outline of Electric Circuits", 6th Edition, Tata McGraw-Hill, 6th Edition, 2013
2. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
3. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.
4. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.
5. K. Sureshkumar, "Electric Circuits & Network", Pearson Publication
6. Del Toro, "Electrical circuit", Prentice Hall

III Semester B.E. (Electrical Engineering)

NETWORK ANALYSIS (Practical)

Total Credit- 01

Subject Code:-BEEE3O2P

Teaching Scheme	**Examination Scheme**
Practical:- 02 Hours/ Week	Pr (U)= 25Pr(I)=25

Course Objectives

Students will be able to –

- To choose appropriate measuring instruments along with proper rating of wires to carry out various experiments
- To provide hands on experience of substantiating and verifying the theoretical concepts studied in Network Analysis.

Hands on Experiments related to the course contents of Network Analysis (minimum 10 experiments).

III Semester B.E. (Electrical Engineering)

ELECTRICAL MEASUREMENT AND INSTRUMENTATION

Total Credit- 04

Subject Code:-BEEE3O3T

Teaching Scheme	**Examination Scheme**
Theory-03 Hours/Week	Th (U)= 70 Th(I)=30
Tutorial/ Activity -01 Hours/Week	Duration of University Exam:- 3 Hours
Practical:- 02 Hours/ Week	

Course Objectives

Students will be able to –

- Understand the characteristics and operation of different electrical instrument used for measurement of electrical and non-electrical parameters
- Measurement of active and passive components of electrical circuit using various bridges and transducers.

Course Outcomes:

After studying the course, the students have understood:

CO1. Various aspects of measurement and instrumentation.
CO2. Different active and passive components measurement methods.
CO3. Power and Energy measurement.
CO4. Instrument Transformers.
CO5. Aspects and types of transducers.

Unit I: Generalized Measuring Instruments: (08Hrs.)

Classification of Instruments, forces acting in Indicating instruments, Moving iron, PMMC type instruments, Static and Dynamic characteristics and performance of instruments, Errors in measurements, loading effect of instruments.

Unit II: Measurement of RLC Elements (08Hrs.)

Measurement of Resistance: classification, Measurement of medium resistance :- Wheatstone Bridge. Low resistance: - Kelvin's Double Bridge. High resistance:- Ohm meter, Megger & loss of charge method.

Measurement of inductance using Maxwell's inductance-capacitance bridge, Measurement of Capacitance using Schering bridge.

Unit III: Measurement of Power and Energy (08Hrs.)

True RMS Measurement, Blondel's Theorem, Measurement of active, reactive and apparent power in polyphase circuits. Electrodynamometer type wattmeter, Measurement of Energy in single and polyphase circuits, Induction type Energy meter, digital energy meters.

Special Instruments: Power factor meter, frequency meter, synchronoscope

Unit IV: Instrument Transformers (08Hrs.)

General theory of Instrument transformers, various ratios, burden, characteristics and Phasor diagram of Current transformer and potential transformers & extension of range using C.T. & P.T., errors in instrument transformers.

Unit V: (Part A) Analog Transducer (06Hrs.)

Classification of Transducer, Measurement of Electric quantities through Resistive, inductive, capacitive effects, Measurement of Non-electric quantities like Displacement, pressure, Torque, Flow.

Special Instruments: load cell, seismic instruments, Anemometer, Pyrometer.

(Part B) Digital Measuring Instruments (06 Hrs.)

Definition of Digital transducer, Classification, Introduction to digital measurement, Measurement of Electric quantities like Digital Encoder, Hall effect sensor,

Latest trends of measurement in power sector like SCADA, EMS.

Text Books:

1. A.K. Sawhney, "A Course in Electrical & Electronics Measurement and Instrumentation", Dhanpat Rai & Sons, 2015
2. E.W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.H. Wheeler & Co. India.
3. C.S. Rangan, G.R. Sharma, V.A.V. Mani, "Instrumentation, Devices and Systems", TMH, 2nd edition

Reference Books:

1. Ernest O.Doebelin, "Measurement Systems Application and Design, International Student Edition", McGraw Hill Book Company, 1998.
2. Alan S. Morris, Reza Langari, "Measurement and Instrumentation: Theory and application", Academic Press, 2012
3. Rajendra Prashad, "Electrical Measurement &Measuring Instrument" Khanna Publisher.
4. J.B. Gupta, "Electrical Measurements and Measuring Instruments", S.K. Kataria & Sons
5. H.S. Kalsi, "Electronic Instrumentation", 6th Edition McGraw Hill
6. W.D. Cooper, "Electronic Instrument & Measurement Technique" Prentice Hall International.
7. Dr. V. Kamaraju "Electrical Power Distribution System" McGraw Hill Education (1 July 2017)

III Semester B.E. (Electrical Engineering)

ELECTRICAL MEASUREMENT AND INSTRUMENTATION

Total Credit- 01

Subject Code:-BEEE3O3P

Teaching Scheme	**Examination Scheme**
Practical:- 02 Hours/ Week	Pr (U)= 25Pr(I)=25

List of Experiments:(Any 10)

1. Measurement of low resistance by Kelvin's Double Bridge.
2. Measurement of medium resistance by Ammeter Voltmeter Method.
3. Measurement of high resistance by Loss of Charge Method.
4. Measurement of Capacitance by schering bridge.
5. Measurement of inductance by Maxwell's bridge.
6. Measurement of three phase power by Two Wattmeter method.
7. Study of Differential and Additive connection of current transformer.
8. Reactive power measurement by one wattmeter method.
9. Calibration of energy meter.
10. Study of Differential and Additive connection of current transformer.
11. Measurement of energy using different CTs and PTs.
12. Determination of polarities and ratio of various CTs and PTs.
13. To study and plot the characteristics of LVDT.
14. To study and plot the characteristics of Stain gauge.
15. To analyse the characteristics of the Piezo electric sensor.
16. Study the performance and characteristics of Hall Effect voltage sensor.

Activity:

1. To assemble the components of a given electrical circuit. (Resistor, ammeter, voltmeter , battery, one way key, rheostat, connecting wires.
2. To measure the resistance and impedance of an inductor with or without iron core.
3. To measure resistance, voltage (dc/ac), current (dc) and check continuity of a given circuit using a multimeter.
4. To assemble a household circuit comprising of three bulbs, three (on/off) switches, a fuse and a power source.
5. To study the variation in potential drop with length of a wire for a steady current.
6. Measurement of Earth Resistance.
7. Calculation of residential and commercial energy bill.

III Semester B.E. (Electrical Engineering)

ANALOG DEVICES AND CIRCUITS

Total Credit- 04

Subject Code:-BEEE3O4T

Teaching Scheme	**Examination Scheme**
Theory-03 Hours/Week	Th (U)= 70 Th(I)=30
Tutorial/ Activity -01 Hours/Week	Duration of University Exam:- 3 Hours
Practical:- 02 Hours/ Week	

Course Objectives

Students will be able to –

- To provide basic knowledge and applications of diodes, transistors and MOSFETs.
- To provide basic functioning of OP-AMPs and applications of OP-AMPs.

Course Outcomes:

After studying the course, the students will be able to demonstrate the ability to

CO1. Design and Analyze rectifier circuits

CO2. Understand the characteristics and use of a transistor as amplifiers

CO3. Apply the knowledge of transistor for the analysis of power amplifiers and oscillators.

CO4. Understand OP-AMPs.

CO5. Analyze and utilize OP-AMPs

Unit I: Diode Circuits: (07 Hrs.)

P-N junction diode, operation and characteristics; half-wave and full-wave rectifiers, Filters, Ripple factor, characteristics and applications of Zener diodes, photo diodes, LED, Schottkey Diodes, voltage regulators

Unit II: Transistor Circuits (08 Hrs.)

Operation and characteristics of a BJT. BJT as a switch. BJT as an amplifier: Biasing circuits, small-signal analysis of CE, CB and CC amplifiers, high-frequency analysis. Power Transistors, Transistor as a switch. Field effect transistors and MOSFETs- Principle of operation and characteristics, biasing arrangements

Unit III: Power amplifiers (08 Hrs.)

Classification as A, B, AB, C, Push pull amplifiers, Cross over distortion, Positive and Negative amplifiers- classification, feedback amplifiers, advantages and applications

Oscillators- Barkhausen's criterion, RC and Crystal oscillators

Unit IV: Power amplifiers (08 Hrs.)

Differential amplifier circuits and their stages, current source, biasing, level Shifting techniques, Common mode and differential mode gain, Impedance of different stages.

Unit V: Applications of Op-Amp (08 Hrs.)

Inverting and non-inverting amplifier, integrator, active filter, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion. Hysteresis Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier.

Study of linear ICs: LM741, LM555, LM 7805

Text books:

1. Millman and Halkias, "Electronic Devices and Circuits", McGraw Hill.
2. Millman and Halkias, "Integrated Electronics", McGraw Hill
3. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.
4. R. Gaikwad, "Operational Amplifiers and applications"
5. Linear ICs Manual I, II, III, National Semiconductors

Reference Books:

1. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
2. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
3. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

III Semester B.E. (Electrical Engineering)

ANALOG DEVICES AND CIRCUITS

Total Credit- 01

Subject Code:-BEEE3O4P

Teaching Scheme	**Examination Scheme**
Practical:- 02 Hours/ Week	Pr (U)= 25Pr(I)=25

10 Experiments based on above syllabus.

III Semester B.E. (Electrical Engineering)
RENEWABLE ENERGY STUDIES
Total Credit- 03
Subject Code:-BEEE3O5T

Teaching Scheme	**Examination Scheme**
Theory-03 Hours/Week	Th (U)= 70 Th(I)=30
Tutorial/ Activity -0	Duration of University Exam:- 3 Hours
Practical:-	

Course Objectives

Students will be able to –

- Demonstrate understanding of the different types of renewable energy technologies that are currently available, and how they are used to provide energy.
- Identify strengths and limitations associated with the different renewable energy technologies.
- Identify the current major uses of energy (i.e., in agriculture, manufacturing, residential, etc.).

Course Outcomes:

After studying the course, the students will be able to demonstrate the ability to

CO1. Memorize the fundamental of solar radiation geometry
CO2. Identify and analyse the process of power generation through solar photovoltaic
CO3. Highlighting the various applications of Solar Energy.
CO4. Outline the site requirement criteria for wind farm & compare different types of wind generators.
CO5. Identifying non-conventional Energy sources such as Geothermal, MHD, Biomass, Fuel cell, Tidal, Ocean for generating Electricity.

Unit I- Solar Radiation & its Measurement (06 Hrs)

Solar Radiation & its Measurement: Solar Constant, Solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surfaces.

Unit 2 – Solar Photovoltaic power generation (10 Hrs)

Solar Photovoltaic power generation: Physics of solar cells, Characteristic of solar cell, series and parallel connection, types of solar cell, module manufacturing, partial shading, bypass and blocking diode, load calculation, different panel calculations and selection (Monocrystalline, Polycrystalline etc), Calculation of Solar rooftop setup (rating): stand alone PV system with battery and grid connected PV system with Net Metering, Introduction to MPPT.

Unit-3 Application of Solar Energy (07 Hrs)

Application of Solar Energy: Solar water heating, space heating, space cooling, solar thermal heat conversion, Solar Cooking, Solar pumping, Solar Water pumping for agriculture purposes, Calculation of solar setup required in solar water pumping, Solar Green Houses, Hydrogen production from Solar Energy.

Unit – 4 Wind Energy (10 Hrs)

Basic principles of wind energy conversion, wind energy conversion system, wind data & energy estimation, site selection consideration, basic components of wind energy conversion system (WECS), classification of WEC system, generating system, energy storage, application of wind energy. Stand-Alone and Grid Connected Wind-Electrical Power System

Unit- 5 Other Nonconventional Energy Source (07 Hrs)

Brief Introduction to operating principles only: Small scale hydro electric power generation, Energy from Bio –Mass, Geothermal Energy, MHD power generation, Fuel cell, Energy from Ocean, Ocean thermal electric conversion (OTEC), Claude & Anderson cycles, Hybrid cycle, Energy from Tides ,Estimation of Energy & Power in simple single basin ,Tidal system

Text Books:

1. Non Conventional Energy Sources G.D. Rai, Khanna publishers
2. Non Conventional Energy Resources B. H. Khan 2nd , The McGraw Hill Companies
3. Solar Energy: Principles of thermal collection and storage, S. P. Sukhatme 2nd edition, Tata McGraw Hill Publishing Company Ltd.
4. Solar Photovoltaics: Fundamental, Technologies and Applications, Chetan Singh Solanki , 3rd Edition, PHI Learning Pvt. Ltd.
5. Non-Conventional Energy Sources and Utilization, R.K. Rajput, S. Chand Publications.
6. Non-Conventional Energy Resources, D S Chauhan, S K Srivastava, New Age International Publishers

Reference Books:

1. Fundamentals of Renewable Energy Processes, Aldo Vieira da Rosa, Juan Carlos Ordóñez, Fourth Edition, Elsevier Academic Press
2. Wind and Solar Power Systems: Design, Analysis, and Operation, Mukund R. Patel and Omid Beik, THIRD EDITION CRC PRESS(TAYLOR & FRANCIS)
3. Renewable & Efficient Electric Power Systems, Gilbert Masters John,, Wiley and son's publications.
4. Solar Energy , Robert Foster, Majid Ghassemi and Alma Cota, CRC Press
5. Renewable Energy Systems, David M. Buchla, Thomas E. Kissell, Thomas L Floyd, 1st edition, Pearson Publication
6. Ocean Energy: Tide and Tidal Power, R. H. Charlier, Charles W. Finkl**, SPRINGER**

Reference Links:

- **http://www.nptel.iitm.ac.in/**
- **www.ocw.mit.edu**

III Semester B.E. (Electrical Engineering)

INTRODUCTION TO PYTHON PROGRAMMING

Total Credit- 01

Subject Code:-BEEE3O6T

Teaching Scheme	**Examination Scheme**
Theory-01 Hours/Week	Th (U)= 35 Th(I)=15
Tutorial/ Activity -	Duration of University Exam:- 2 Hours
Practical:- 02 Hours/ Week	

Course Objectives

Students will be able to –

- To understand why Python is a useful scripting language for developers
- To learn how to design and program Python applications
- To learn how to use lists, tuples, and dictionaries in Python programs
- To learn how to identify Python object types.

Course Outcomes:

After studying the course, the students will be able to

CO1. Identify different operators and execute different programs using loops

CO2. Analyse Strings, List, Tuples, Dictionary and Sets

CO3. Illustrate functions and utilise Date Time in programming language.

UnitI : Introduction To Python (04 Hrs.)

Introduction To Python, Operators, Identifiers, Variables, Relational Operators, User Input And Output

Unit II: Data Types Of Python (05 Hrs.)

Strings – Indexing, Slicing, Methods For Strings – Isupper, Upper, Lower, Find, Swapcase Etc, List – Indexing, Slicing, Copy (Deep And Shallow), Methods For List – len, append, extend, sort ,insert, delete, pop, max, min, sum, count etc, List Comprehensions, TUPLES – discard, remove and pop, DICTIONARY – creation method, lists of tuple in dictionary, list of list in dictionary, len and del in dictionary, Deep and shallow copy in dictionary, Methods for dictionary, dictionary comprehension, SETS

Unit III : Functions, Loops And Modules (05 Hrs.)

Control Statement - Conditional Statement Like If, Else, Elif , Loop- While, For, Loop Control Statement - Break, Continue, Pass, Introduction To Functions, Logic With Python Functions, Keyword Arguments, Args And Kwargs, Return Statement, Lambda, Map And Filter, Import Module , Datetime With Python And Exception Handling

Time Class,Date Time Class, Date From Time Stamp, Time Delta, String Format Time, String Past Time, Handling Timezone In Python, Exception Handling- Try, Except, Finally

Text Books

1. Programming And Problem Solving With Python by Ashok Namdev Kamthane and Amit Ashok Kamthane, McGraw Hill
2. Let Us Python, Yashwant Kanetkar and Aditya Kanetkar, 2nd Edition, bpb Press
3. Python Crash Course, 2Nd Edition: A Hands-On, Project-Based Introduction To Programming, Eric Matthes (No Starch Press, 2016)
4. Zero To Mastery In Python Programming, Best Python Book For Beginners, by RAKESH K. YADAV , SRINIVAS ARUKONDA, MONU SINGH, VEI Publishers
5. Core Python Programming - Covers Fundamentals to Advanced Topics Like OOPS, Exceptions, Data Structures, Files, Threads, Networking, GUI, DB Connectivity and Data Science Second, Rao R. Nageswara, Dreamtech Press
6. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford Higher Education

Reference Book

1. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010
2. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
3. Head First Python 2e: A Brain-Friendly Guide By Paul Barry, Oreilly Publication

III Semester B.E. (Electrical Engineering)

INTRODUCTION TO PYTHON PROGRAMMING

Total Credit- 01

Subject Code:-BEEE3O6P

Teaching Scheme	**Examination Scheme**
Practical:- 02 Hours/ Week	Pr(U)= 25Pr(I)=15

List of Practical's (Minimum 10 experiments should be performed)

1. Print only the words that starts with letter 's' in the following statement –
2. St- 'print only the word that starts with s in this sentence'
3. Print Every word from the below sentence which has even number of letters –
4. St- 'print only the word that starts with s in this sentence'
4. write a program that prints the integer from 1 to 100, but for multiples of 3 print 'FIZZ' instead of number and for multiples of five print 'BUZZ'. For numbers which are multiples of both 3 and 5 print 'FIZZBUZZ'
5. Write a program using function to check who is employee of the month.
6. Write a program to mimic the carnival game 'Three Cup Montee'
7. write a program that returns the lesser of two given numbers if both numbers are even, but returns the greater if one or both numbers are odd.
8. Write a python function that accepts a string and calculate the number of upper case letters and lower case letters.
9. Write a python function that takes a list and return anew list with unique elements of the first list. For example,
5. Sample List =[1,1,1,2,2,3,3,4]
6. Unique List = [1,2,3,4]
10. Write a python function to multiply all the numbers in the list
11. Write a program for validating the user input
12. Using Object oriented Programming, write a program for opening a Bank account, deposit of money and withdrawal of money. Also generate a 4 digit unique code for each transaction.
13. Write a program to print next 5 days starting from today
14. Write a function that asks for an integer and prints square of it. Use a while loop with a try, except, else block to account for incorrect inputs.

III Semester B.E. (Electrical Engineering)

ENVIRONMENTAL STUDIES

Non – credit (Audit)

Subject Code:- BEEE307T

Teaching Scheme	**Examination Scheme : At college level**
Theory – 01 Hours/Week	Th (C) = 35, Th (I) = 15
Tutorial/Activity – 1 Hours/Week	Duration of college Exam: 2 Hours

Unit- I Air pollution and its control techniques: [06 Hours]

Contaminant behavior in the environment, air pollution due to Sox, NOx, photochemical smog. Indoor air pollution Natural pathways for degradation: Carbon cycle, Sulphur cycle, Nitrogen cycle, Oxygen cycle. Factors responsible for altering the composition of atmosphere (deforestation, burning of fossil fuels, industrial and vehicular emissions, CFCs).

Techniques to control air pollution, ambient air quality and continuous air quality monitoring, control measures at source, Kyoto Protocol, Carbon Credits.

Unit – II Water pollution and its control techniques: [06 Hours]

Major sources of water pollution: Eutrophication, acid mine drains, pesticides and fertilizers, dyeing and tanning, marine pollution, micro plastics.

Techniques to control water pollution: Conventional waste water treatment-types of sewage, sewerage system, alternative systems, primary, secondary and tertiary processes including aerobic and anaerobic techniques, safe disposal and its utility.

Treatment schemes for waste water from dairy, textile, power plants, pharmaceutical industries, and agro based industries such as rice mills.

Unit –III other Environmental Pollution & Waste Management: [06 Hours]

Soil pollution: Soil around us. Soil water characteristics, soil pollution. Causes, effects & control : noise pollution, nuclear & radiation hazards, marine pollution (Oil spills & Ocean Acidification)

Solid waste management: Compositing, vermiculture, landfills, hazardous waste treatment. Bioremediation technologies, conventional techniques (land farming, constructed wetlands), and Phytoremediation.

Degradation of xenobioties in environment: Petroleum hydrocarbons, pesticides, heavy metals introduction, types of e-wastes, environmental impact, e-waste recycling. e-waste recycling, e-waste management rules .

Unit-IV Social Issues and the Environmental Laws [06 Hours]

Concept of Sustainable development water conservation. Rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns. Environmental Laws (brief idea only) Environment Protection Act, air (Prevention and Control of Pollution) Act, water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act Issues involved in enforcement of environmental legislation. Different government initiatives (brief idea only)- National ambient air quality standard 2009, Swachh Bharat Abhiyan, National afforestation program and Act- 2016, National River conservation plan and National Ganga River basin authority, Formation of National Green Tribunal.

Activity

1. Field Trip & Report Writing
2. Case-study & Report Writing

Reference Books:

1. Benny joseph, Environmental Studies, Mc Graw Hill Education (India) Private Limited
2. B.K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut

3. P Aarne Vesilind, J. Jeffrey Peirce and Ruth F. Weiner, Environmental Pollution and Control, Butterworth-Heinemann
4. D.D. Mishra, S.S. Dara, A Textbook of Environmental Chemistry and Pollution Contol, S. Chand & company Ltd.
5. Shree Nath Singh, Microbial Degradation of Xenobiotics, Springer-Verlag Berlin Heidelberg
6. Indian Environmental Law: Key concepts and Principles edited by Shibani Ghosh, Publisher, Orient BlackSwan, 2019. ISBN, 9352875796.
7. P. Thangavel & Sridevi, Environmental Sustainability: Role of Green technologies, Springer publications.

IV Semester B.E. (Electrical Engineering)
SIGNAL AND SYSTEMS
Total Credit- 04
Subject Code:- BEEE401T

Teaching Scheme	**Examination Scheme**
Theory-03 Hours/Week	Th (U)= 70 Th(I)=30
Tutorial/ Activity -01 Hous/Week	Duration of University Exam:-3 Hours

Course Objectives

Students will be able to –

- Understand the various methods of analysis for continuous time and discrete time systems in time domain and frequency domain
- Apply various transformation analysis to electrical signals

Course Outcomes:

After studying the course, the students will be able to

CO1. Understanding the basics of signal space theory
CO2. Understanding the concepts of state space representation
CO3. Understand convolution sum of two signals
CO4. Apply Fourier and Laplace transforms, understand the duality Apply DFT, DTFT and z-transform
CO5. Understand the concept of sampling and reconstruction

UNIT I: Introduction to Signals and Systems (06 Hrs)

Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additively and homogeneity, shift-invariance, causality, stability, realizability. Examples.

UNIT II: Behavior of continuous and discrete-time LTI systems (08 Hrs)

Impulse response and step response, convolution, input-output behavior with a periodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

UNIT III Convolution (04 Hrs)

Convolution Sum, Convolution Integral and Their Evaluation, Time Domain Representation and Analysis of LTI Systems Based on Convolution and Differential Equations.

UNIT IV Time and Frequency Domain Transformations (17 Hrs)

Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and study of system behavior, The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

UNIT V: Sampling and Reconstruction (07 Hrs)

The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction, ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory, filtering, feedback control systems.

Text Books:

1. Oppenheim A.V., Willsky A.S. and Young I.T., “Signals and Systems”, Second Edition, 1997, Prentice Hall.
2. Simon Haykin and Barry Van Veen, “Signals and Systems”, Second Edition, Wiley International.

Reference Books:

1. R.F. Ziemer, W.H Tranter and J.D.R.Fannin, “Signals and Systems - Continuous and Discrete”, Forth Edition Prentice Hall.
2. M. J. Roberts, “Signals and Systems”, 2003, Tata McGraw-Hill

IV Semester B.E. (Electrical Engineering)

DIGITAL ELECTRONICS

Total Credit- 04

Subject Code:- BEEE402T

Teaching Scheme	**Examination Scheme**
Theory-03 Hours/Week	Th (U)= 70 Th(I)=30
Tutorial/ Activity -01 Hous/Week	Duration of University Exam:-3 Hours
Practical- 02 Hours/week	

Course Objectives

Students will be able to –

- To provide basic knowledge and applications of logic gates and logic families.
- To provide basic understanding of Analog to digital and digital to analog converters.

Course Outcomes:

After studying the course, the students will be able to demonstrate the ability to

CO1. Understand number system, logic gates and logic families.

CO2. Design and implement combinational digital circuits.

CO3. Design and implement sequential logic circuits.

CO4. Understand the process of Analog to Digital conversion and Digital to Analog conversion.

CO5. Understand memories and PLDs to implement given logic.

UNIT I: Fundamentals of Digital Systems and Logic Families (07 Hrs)

Number systems-binary, signed binary, binary arithmetic, one's and two's complements arithmetic, octal and hexadecimal number system , codes, error detecting and correcting codes, Digital Signals, basic digital circuits, NAND and NOR operations, Exclusive – OR and Exclusive NOR operations, Boolean algebra, Examples of IC gates, Digital logic families, TTL and Schottkty TTL and CMOS logic, interfacing CMOS and TTL, Tri-State logic.

UNIT II: Combinational Digital Circuits (07 Hrs)

Standard representation for logic functions, K-map representation (up to 4 variables), and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, use in combinational logic design, Adders, Subtractors, BCD arithmetic, carry, Arithmetic logic unit (ALU), popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices.

UNIT III: Sequential circuits and systems (07 Hrs)

A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J- K flip flop, T and D types flip-flops, excitation table of flip flop, conversion of flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial

converter, ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

UNIT IV: A/D and D/A Converters (07 Hrs):

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit.

Analog to digital converters: quantization and encoding, parallel comparator, A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs

UNIT V: Semiconductor memories (08 Hrs).

Memory organization and operation, expanding memory size, classification and characteristics of memories, Types of Memory commonly used memory chips.

Programmable Logic Devices: ROM as Programmable logic devices (PLD), Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA)

Text Books /References:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. H.Taub, "Digital Integrated Electronics" McGraw Hill
4. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
5. Herbert Taub, Donald LSchilling "Digital Integrated Electronics", McGraw Hill, 1977
6. Thomas C Bartee, "Digital Computer Fundamentals",McGraw Hill,1985.

IV Semester B.E. (Electrical Engineering)

DIGITAL ELECTRONICS

Total Credit- 01

Subject Code:- BEEE402P

Teaching Scheme	**Examination Scheme**
Practical- 02 Hours/week	Pr (U)= 25Pr(I)=25

Experiments based on the above syllabus with at least one experiment from each unit.

IV Semester B.E. (Electrical Engineering)

ELECTRICAL MACHINES-I

Total Credit- 04

Subject Code:- BEEE403T

Teaching Scheme	**Examination Scheme**
Theory-03 Hours/Week	Th (U)= 70 Th(I)=30
Tutorial/ Activity -01 Hous/Week	Duration of University Exam:-3 Hours
Practical- 02 Hours/week	

Course Objectives

Students will be able to –

- The Basic Principle of Transfer of Electrical Power Operation and Construction of Single Phase and Three Phase Transformer with Phasor diagram and Connection.
- The Construction, Principle and Applications of D.C.Machines.
- The Construction, Principle and Applications of Three Phase Induction Motor.
- The Construction, Principle and Applications of Three Phase Synchronous Machines.
- The Construction, Principle and Applications of Single Phase Machines and Special Machines.

Course Outcomes:

After Completing the Course, Students Will Be Able to –

CO1. Determine Equivalent Circuit parameter, Efficiency and Regulation of Single Phase Transformer and to Explain the Phasor groups of Three Phase Transformer.

CO2. Analyze different characteristics of D. C. Motor and Speed Control of D.C. Motor.

CO3. Explain different types of Three Phase Induction Motor and Analyze the characteristics at different Value of Slip.

CO4. Know Voltage Regulation of Three Phase Synchronous Generator and Behavior of Synchronous Motor with Different Excitations

CO5. Understand Single Phase Machines and Special Machines.

Unit-I Single Phase Transformer (12-Hrs)

Revision of Single Phase Transformer, Phasor Diagram Under Different Load Conditions, Losses, Equivalent Circuit, Open Circuit and Short Circuit Test, Voltage Regulation, Efficiency, Condition of Maximum Efficiency, All Day Efficiency, Polarity Test. Single phase Auto-Transformer, Working, Merits and Demerits. Applications.

Three Phase Transformer: -Principle and Operation, Connection and Phasor Groups, Polarity Test, Open Circuit and Short Circuit Test, Conditions of Parallel Operation.

Unit II D.C. Machines (08-Hrs)

Basic Principle and Operation of D.C. Motor and D.C. Generator, Emf Equation and Torque equation, Types of D.C. Machines, Characteristics and Speed Control of D.C. Shunt and D.C. Series Motor, Losses and Efficiency of D.C. Motor. Necessity of Starter and Constructional Details of Three Point Starter. Armature Reaction in D. C. Machines. Applications.

Unit III Three Phase Induction Motor (08-Hrs)

Construction Details, Types, Principle, Production of Torque, Torque Equation and Condition of Maximum and Starting Torque, Losses and Efficiency, Torque-Slip Characteristics, Behavior for Different values of Slip. No Load Test and Blocked Rotor Test. Starting methods of Three Phase Induction Motor. Applications.

Unit IV Synchronous Machines (08-Hrs)

Three Phase Synchronous Generator : -Introduction, Constructional features of Salient Pole and Cylindrical Pole Rotor Machines, Introduction to Armature Winding and Field Winding, Winding Factors and EMF Equation, Armature Reaction, Phasor Diagram Under Load Condition, Regulation and Synchronous Impedance Method to Find Voltage Regulation.

Three Phase Synchronous Motor: - Construction and Principle, Starting of Synchronous Motor, Motor on Load, Effect of Changing Field Excitation at Constant Load, V and Inverted-V Curves.

Applications.

Unit V Single Phase Machines (07-Hrs)

Single Phase Induction Motor :-

Principle and Operation, Double Field Revolving Theory. Principle and Working of Shaded Pole Induction Motor , Split Phase Induction Motor and Capacitor Start Capacitor Run Motor. Applications.

Principle, Working And Applications Of Special Machines:-

Universal Motor, Hysteresis Motor, Brushless D. C. Motor, A.C. Series Motor.

TEXT BOOKS:-

1. I. J. Nagrath , D.P. Kothari, “Elecrtcal Machines,”, Tata McGraw- Hill Publishing Company Ltd.
2. P.S.Bhimbra,”Electrical Machinery”, Khanna Publishers.
3. P.K. Mukherjee, S. Chakrabvorty, “ Electrical Machines”, Dhanpat Rai Publications.
4. P.S. Bhimbra , “Generalized Theory in Electrical Machines”, Khanna Publishers.
5. D C Kulshreshtha, “Basic Electrical Engineering,” The McGraw Hill Higher Education Private Limited, New Delhi.

6. S.G.Tarnekar, P.P. Kharbanda, S.B.Bodkhe, S.D. Naik , " Laboratory Courses in Electrical Engineering," S. Chand & Company Ltd., New Delhi.
7. Use of ICT Tools.

REFERENCE BOOKS :-

1. M.G.Say, " Performance and Design of A.C. Machines," CBS Publishers and Distributors Pvt. Ltd.
2. A.F. Fitzgerlad, Charles Kingdey, Jr. Stephan D. Umans, "Electrical Machinery", Fifth Edition in SI Units, McGraw Hill Book Company.
3. D.P. Kothari, B.S.Umre, "Laboratory Manual for Electrical Machines," Second Edition , I.K. International Publishing House Pvt.Ltd., New Delhi.

IV Semester B.E. (Electrical Engineering)

ELECTRICAL MACHINES-I

Total Credit- 01

Subject Code:- BEEE403P

Teaching Scheme	**Examination Scheme**
Practical- 02 Hours/week	Pr (U)= 25 Pr (I)=25

10 EXPERIMENTS BASED ON ABOVE SYLLABUS.

IV Semester B.E. (Electrical Engineering)

POWER SYSTEM

Total Credit- 03

Subject Code:- BEEE404T

Teaching Scheme	**Examination Scheme**
Theory-03 Hours/Week	Th (U)= 70 Th(I)=30
Tutorial/ Activity -0	Duration of University Exam:-3 Hours

Course Objectives

Students will develop the ability

- To model and represent the power system components, understand and calculate the transmission line parameter, evaluate its performance, understand the method of load flowanalysis and the concept of voltage stability.

Course Outcomes:

After Completing the Course, Students Will Be Able to –

CO1. Understand the basic structure of powersystem , smart grid and microgrid.
CO2. Model and represent the power systemcomponents in its per unit value.
CO3. Learn the parameters of transmission linesand cables.
CO4. Evaluate the performance of transmissionlines.
CO5. Acquaint with the method of load flowanalysis and the concept of voltage stability.

UNIT- I: Evolution of Structure of Power Systems (08Hrs)

Structure of power systems, brief exposure to generation, transmission and distribution aspects, Present-Day Scenario, Introduction to Smart Grids and Micro-grids, their components, Standardization of transmission voltages, Overhead and Underground transmission system, EHVAC verses HVDC transmission, HVDC Components, distribution connection scheme (radial, ring main and interconnected), Feeders and distributors, Substation and its equipments.

UNIT- II: Per Unit Representation (06Hrs)

Representation of power system elements, models and parameters of generator, transformer and transmission lines and load, voltage and frequency dependence of loads, single line impedance diagram, advantages of per unit representation.

UNIT-III: Overhead Transmission Lines and Cables (10Hrs)

Components of overhead lines, choice of conductors, Skin effect, Proximity effect, Corona, Transposition of conductors, Bundled conductor, Types of insulators , string efficiency, Method to improve string efficiency, Derivation for Inductance of a single phase line, concept of self GMD and mutual GMD, Derivation for Capacitance of a single phase line, Insulated Cables, Dielectric stress in single core cables, Grading of cables, XLPE cables.

UNIT-IV: Performance of Transmission line (08Hrs)

Classification of transmission line (short, medium (nominal T and nominal Π) and long), Characteristics (voltage regulation and efficiency) of transmission lines, determination of generalised (A,B,C,D) constants for transmission line, Ferranti effect, Surge Impedance Loading, Series and Shunt Compensation of transmission lines (using capacitors only) .

UNIT-V: Load Flow Studies (08Hrs)

Introduction to load flow studies, Classification of buses , Formation of bus admittance matrix, Static load flow equations, Gauss Seidel and Newton-Raphson method for solution (Numerical is not expected), Introduction of frequency and voltage as system state indicators, Concept of Voltage Stability, P-V and V-Q curves, Methods to improve voltage stability.

Text Book

1. I. J. Nagrath, D. P. Kothari, Power System Engineering, Tata McGraw-Hill publications, 2008
2. Ashfaq Husain, Electrical Power System, CBS Publication, 5th Edition
3. C. L. Wadhwa, Electrical Power Systems, New Age International Publiser, 6th Edition
4. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand Publication, 2008

Reference Books:

1. W.D. Stevenson, Elements of power system analysis, McGraw-Hill publications, 3rd Edition
2. O. I. Elgerd, Electric Energy Systems Theory: An Introduction, McGraw-Hill publications, 2ndEdition
3. Hadi Saadat, Power System Analysis , TMH , 2002
4. James A Momoh, Smart Grid : Fundamentals of Design and Analysis, Wiley 2012
5. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, “Smart Grid: Technology and Applications”,Wiley 2012

IV Semester B.E. (Electrical Engineering)

ELECTROMAGNETIC FIELDS

Total Credit- 04

Subject Code:- BEEE405T

Teaching Scheme	**Examination Scheme**
Theory-03 Hours/Week	Th (U)= 70 Th(I)=30
Tutorial/ Activity – 01 Hours/week	Duration of University Exam:-3 Hours

Course Objectives

Students will be able to –

- Introduce the concepts of different coordinate systems, Maxwell`s equations, static electric and magnetic fields and methods of solving for the quantities associated with these fields, time varying fields and displacement current.

Course outcomes

At the end of this course students will demonstrate the ability to

CO1. Recognize and apply the knowledge of different co-ordinate systems.

CO2. Evaluate the physical quantities of electromagnetic fields in different media and apply Gauss law.

CO3. Describe static electric fields boundary conditions, nature of dielectric materials and evaluate potential fields.

CO4. Explain steady magnetic fields, their behavior in different media, associated laws and inductance.

CO5. Understand Maxwell's equations in different forms and different media.

Unit I: Review of Vector Analysis: **(08 Hrs)**

Review of Scalars and vectors, Vector Algebra, Rectangular Co-ordinate System, Cylindrical Co-ordinate System, Spherical Co-ordinate System and transformation of Cartesian to Cylindrical, Cartesian to Spherical and vice versa.

Unit II: Coulomb's law, Electrical field intensity and electric flux density, Gauss's law, Divergence: (08 Hrs)

Coulombs Law, Electric field intensity, field due to continuous volume charge distribution, field of point charge, field of line charge, field of sheet charge, Electric Flux density, Gauss's law and Applications of Gauss's law, the divergence theorem.

Unit III: Potential of charge system , Conductors, Dielectric, Capacitance and poison's and Laplace Equations: (07 Hrs)

Definition of potential difference and potential, the potential field of a point charge, the potential field of a system of charges, potential gradient. Metallic conductors, conductor properties, the

nature of dielectric materials, boundary conditions for perfect dielectric materials, Capacitance of parallel plate capacitor, capacitance of two wire line, Poisons and Laplace Equation.

Unit IV: The steady Magnetic Field and Magnetic forces: (08 Hrs)

Biot Savart's law, Ampere's Circuital law, Stoke's theorem, magnetic flux density, scalar and vector magnetic potentials. Force on moving charge, force between differential current elements, nature of magnetic material, Magnetization and permeability, Inductance and mutual inductance.

Unit V: Boundary conditions, Maxwell's equation and wave propagation: (08 Hrs)

Magnetic boundary conditions, Faraday's law, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Wave propagation, Poynting vector, skin effect.

Text books:

1. W.H. Hayt , "Engineering Electromagnetics" ,TMH Publication 2006

Reference books:

1. N.N.Rao Electromagnetic Engg. V Edition ,Prentice Hall. 2005
2. Fawwaz T.Ulaby Applied Electromagnetics, Prentice Hall. 1999
3. Krauss Electromagnetic Engg. IV Edition,Tata Mc Graw Hill. 2003
4. Shevgaonkar Electromagnetic Waves,Tata Mc Graw Hill 2002
5. Matthew, N. O. Sadiku Elements of Electromagnetics, Oxford University publication, 6th edition, 2014.

IV Semester B.E. (Electrical Engineering)

SIMULATION & PROGRAMMING TECHNIQUES

Total Credit- 03

Subject Code:- BEEE406T

Teaching Scheme	**Examination Scheme**
Theory-03 Hours/Week	Th (U)= 70 Th(I)=30
Tutorial/ Activity –0	Duration of University Exam:-3 Hours
Practical:-02 Hours/ week	

Course Objectives

Students will be able to –

- The concept of programming and topics using C & C++ language and apply it in the field of engineering and technology. Similarly student will know about the MATLAB, various matrix operation and use of graphic tools for representation.

Course outcomes

At the end of this course students will be able to

- **CO1.** Learn the basics of C programming and apply the knowledge for developing small programs including Function.
- **CO2.** Apply the knowledge of C language for developing simple programs using variables, arrays, structures etc. for applications like searching and sorting, use of pointers & File handling functions.
- **CO3.** Understand the basics of C++
- **CO4.** Study the basic of MATLAB and apply fundamental knowledge for analysis of basic engineering problems.
- **CO5.** Apply knowledge of MATLAB, Toolboxes and Simulink to solve matrix equations, plot graphs, build and analyze simple electrical circuits.

Unit-I: (08 Hrs)

Structure of C program, Data types, Variables, Input/output statements, Storage class, operators, Program control statements, Concept of function & Recursion

Unit-II: (08 Hrs)

Introduction to Arrays, Programs with Arrays, Searching (Linear & Binary), Sorting (Bubble & Selection), Introduction to Structures, Simple programs using structures, Introduction to Pointers, File Handling

Unit III:

Introduction to C++ concepts **(06 Hrs)**

Unit-IV: **(08 Hrs)**

Introduction to MATLAB Programming, Import/export data, Program and run simple scripts (M-files), Use graphics tools to display data, Conditional Statements (If-else, if-else-if), and Iterative statements (while, for loop)

Unit -V: **(10 Hrs)**

Matrix operation (Transpose, Determinant, Inverse), Plotting of graphs (Basic plot, generating waveforms) using MATLAB Programming. Programming using MATLAB functions, Introduction to Toolbox (SimPower system, Control System) and Simulink

Text Book

1. Kakade & Deshpande, A text book on Programming languages C& C++ ,DREAMTECH PRESS 2nd . Ed.
2. E. Balgurusami, Programming in ANSI- C, TATA MCGRAW-HILL Publishing Company Ltd.
3. Y. Kanetka, Let us C, 8 th BPB PUBLICATIONS
4. Jaydeep Chakravorty Introduction to MATLAB Programming, Toolbox & Simulink, Universities Press
5. Stephen Chapman, MATLAB Programming for Engineers, 4th Edition, CENGAGE Learning

Reference Book

1. B.W. Kernighan and D.M. Ritchie, C Programming languages, 2 nd EDITION PEARSON EDUCATION
2. Stormy Attaway, METLAB-A Practical introduction to programming problem Solving, Elsevier
3. Duane Hansselman Bruce Littlefield, Mastering METLAB, Pearson

IV Semester B.E. (Electrical Engineering)

SIMULATION & PROGRAMMING TECHNIQUES

Total Credit- 01

Subject Code:- BEEE406T

Teaching Scheme	**Examination Scheme**
Practical:-02 Hours/ week	Pr (U)= 25 Pr(I)=25

10 EXPERIMENTS BASED ON ABOVE SYLLABUS.