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   **Subject Code: BES1-1**
Teaching Scheme   **Examination Scheme**
Lectures: 3 Hours/Week   Theory T (U): 70 Marks, T (I): 30 Marks
Tutorial: 1 Hour/Week   Duration of University Exam: 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 $v = \dfrac{E}{B}$ 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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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

Examination Scheme

Lectures: 2 Hours/ Week (Theory)

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)

(B. R. Chide)

Dr m. N. Giriya

(AnBharati)

Syllabus of Communication Skills (Theory)

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

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

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

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

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

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

Unit 4:A. Basic Grammar: Tenses and its types, Sentences and its types

B. Transformation of Sentences- Assertive-Imperative-Interrogative-Exclamatory, Reported Speech.(6 hours)

Books Recommended:

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

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

3. Essentials of English Grammar by Micheal Swan

4. Professional Communication Skills by Bhatia and Sheikh

5. Business Communication by K.K. Sinha

6. Communication Skills by Dr. P. Prasad

7. Communication Skills by Sanjeev Kumar and Pushpalata, OUP

(Dr. Bhumika Agrawal)

(Dr. Sajid Anwar)

(B. R. Chide)

(Dr. Dora Thompson)

(Dr. M. N. Giriya)

(Dr Nawaz Khan)

(AV Bhapodi)

Subject: Communication Skills

Total Credits:01

2020-21, Semester: I

Sub.Code ! BSE1 - 4P

Teaching Scheme

Practical : 2 Hours/ Week Practical

Examination Scheme

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

Duration of University Exam. : 03 Hours

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

Course Outcomes:

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

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

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

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

(Dr. Sajid Anwar)

DR

(B. R. Chide)

Dr M. N. Giri 79

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)

(Dr. Sajid Anwar)

(B.R. Chide)

(Dr. Dora Thompson)

(Dr Nawaz Khan)

Dr M. N. Giriya

(A V Bharadi)

RTM Nagpur University
Syllabus (Theory)

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

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

Course Outcomes

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

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

SYLLABUS

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

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

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

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.

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(Arbhasati)

(B. R. Chidle)

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

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Dr M. N. Giriya

(A V Bhosadi)

(B.R.Chile)

RTM Nagpur University
Syllabus (Theory)

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

Sr. No.	Course Objective — The objective of this course is–
1	To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering
2	To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness
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 public utility.
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 Civil Engineering. Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering. Highlighting the depth of engagement possible within each of these areas.
CO2	Exploration of the various possibilities of a career in this field. Understanding the vast interfaces this field has with the society at large. Providing inspiration for doing creative and innovative work
CO3	Showcasing the many monuments, heritage structures, nationally important infrastructure, and impressive projects to serve as sources of inspiration. Highlighting possibilities for taking up entrepreneurial activities in this field. Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering
CO4	Discuss several manufacturing processes and identify the suitable process. Explain various types of mechanism and its application
CO5	Describe and compare the conversion of energy from renewable and non-renewable energy sources.
CO6	List down the types of road vehicles and their specifications; Illustrate various basic parts and transmission system of a road vehicle.

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

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 V **Introduction 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

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(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

(B. R. Chice)