Scheme of Instruction & Examination
B.E. FIRST YEAR
ELECTRICAL AND ELECTRONICS ENGINEERING

	Semester - I								
S. No	**Course Code**	**Course Title**	**Scheme of Instruction**				**Scheme of Examination**		
			Hours Per week			**Duration in Hrs**	**Maximum Marks**		**Credits**
			L	**T**	**P/D**		**CIE**	**SEE**	
Theory Courses									
1	4BS101 HS	Engineering Mathematics - I	3	1	0	4	40	60	4
2	4BS106 HS	Chemistry	3	1	0	4	40	60	4
3	4HS101 HS	English	2	0	0	2	40	60	2
4	4ES103 CE	Engineering Mechanics	3	0	0	3	40	60	3
Laboratories									
5	4BS153 HS	Chemistry Lab	0	0	3	3	40	60	1.5
6	4HS151 HS	English Lab	0	0	2	2	40	60	1
7	4ES152 ME	Engineering Workshop Practice	0	0	4	4	40	60	2
8	4MC151SP	Yoga/NSS/Sports	0	0	2	2	50	-	0
		Total	11	2	11	24	330	420	17.5

S. No	Course Code	Course Title	Semester - II: Scheme of Instruction: Hours Per week: L	T	P/D	Duration in Hrs	Scheme of Examination: Maximum Marks: CIE	SEE	Credits
Theory Courses									
1	4BS202HS	Engineering Mathematics - II	3	1	0	4	40	60	4
2	4BS204HS	Applied Physics	3	1	0	4	40	60	4
3	4ES203EE	Principles of Electrical and Electronics Engineering	3	0	0	3	40	60	3
4	4ES204ME	Principles of Mechanical Engineering	3	0	0	3	40	60	3
5	4MC201CE	Environmental Science	2	0	0	2	40	60	0
Laboratories									
6	4BS252HS	Applied Physics Lab	0	0	3	3	40	60	1.5
7	4ES253ME	Principles of Mechanical Engineering Lab	0	0	2	2	40	60	1
8	4ES252CE	Engineering Graphics Lab	1	0	4	5	40	60	3
		Total	15	2	9	26	320	480	19.5

BS: Basic Sciences ES: Engineering Sciences HS: Humanities and Sciences

MC: Mandatory Courses

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lectures T : Tutorials P: Practicals D : Drawing

Note: 1). Each Contact Hour is a Clock hour

Course code	Course Title	Core/ Elective					
		Core					
		L	T	P/D	Credits	CIE	SEE
4BS101HS	Engineering Mathematics - I	3	1	0	4	40	60

Prerequisite: Basics of Matrices, Differentiation, Integration and Trigonometric results

Course Objectives: The objective of this course is to make the student

- Study matrix algebra and its use in solving system of linear equations and solving eigen value problems.
- study mean value theorems and their application to mathematical problems.
- introduce the concepts of functions of several variables and multiple integrals
- introduce the concepts of Multiple Integrals
- study vector differential and integral calculus.

Course Objectives: After completion of the course, the student will be able to

- Find the rank of matrix and its use to find solution of linear equations, eigen value problem, Quadratic forms..
- Explain the concepts of derivatives using mean value theorems and their generalization. Concepts of curvature, evolutes, involutes, envelopes of family cf curves
- Find Partial derivatives of functions of two variables using concept of limits and continuity and study the concepts of maximum and minimum of functions of two variables.
- Identify the key concepts, theories and mathematical fundamentals to derive mathematical relations involved in evaluation of double integrals and triple integrals and solving Engineering problems.
- Evaluate gradient of a scalar field, divergence, curl of a vector field to find the values of line, surface and volume integrals and establish their relation using Green, Gauss and Stokes theorems.

Unit-I (10Hrs)

Matrices: Rank of a matrix, Echelon form, System of linear equations, Linear dependence, independence of vectors, Linear transformation, Orthogonal transformation, Eigen values, Eigen vectors, Properties of eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformation, Nature of quadratic form.

Unit-II (10Hrs)

Calculus of one variable: Rolle's theorem, Lagrange's, Cauchy's Mean value theorems, Taylor's series, Curvature, Radius of curvature, Circle of Curvature, Envelope of family of curves, Evolutes and Involutes.

Unit-III (10Hrs)

Multivariable Calculus (Differentiation): Functions of two variables, Limits and continuity, Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions (Chain rule), Change of variables, Jacobian, Higher order partial derivatives, Taylor's series of functions of two variables, Maximum and minimum of values of functions of two variables, Lagrange's method of undetermined multipliers.

Unit-IV (8Hrs)

Multivariable Calculus (Integration): Double Integrals, Change of order of integration, change of variables from cartesian to plane polar coordinates, Triple Integrals.

Unit-V (12Hrs)

Vector Calculus: Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Line, Surface and Volume integrals, green's theorem in a plane, Gauss's divergence theorem, Stoke's theorem (without proofs) and their verification.

TEXT BOOKS :

T1. Dr.B.S. Grewal, Higher. Engineering Mathematics, Khanna Publications, 43rd Edition,2014. (Unit 1-5)

T2. Advance Engineering Mathematics by Jain and Iyengar,5th Edition, Narosa Publications (Unit 1-5)

T3.B. V. Ramana, Higher Engineering Mathematics,3rd Edition 2015. (Unit 1-5)

REFERENCES/ SUGGESTED READING:

R1. M.D Raisinghania, Ordinary Differential Equations, 11th Revised Edition

R2. S.S. Sastry, Engineering mathematics, 3rd Edition, Paperback

R3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley, 9th Edition, 2012.

R4. Peter. V. O' Neil, Advance Engineering Mathematics,' Publisher, Global Engineering 7th Edition, 2012

Course code	Course Title	Core/ Elective					
4BS106HS	Chemistry	Core					
		L	T	P/D	Credits	CIE	SEE
		3	1	0	4	40	60

Prerequisite: Electrochemistry &Batteries, Water & Corrosion, Polymers, Energy Sources, Inorganic Engineering Materials

Course Objectives: The objective of this course is to make the student

- Apply the principals of electrochemistry in storage of electrical energy in batteries.
- Rationalize bulk properties and processes using thermodynamic considerations.
- Gains knowledge in causes of corrosion and its prevention. Attains knowledge about the disadvantages of hard water and treatment of water for drinking purpose.
- Explain the influence of chemical structure on properties of materials and their choice in engineering applications.
- Exposed to qualitative and quantitative parameters of chemical fuels.

Course Outcomes: After completion of the course, the student will be able to

- **CO.1**. Apply concept of electrode potential in identifying feasibility of electrochemical reaction; illustrate electro analytical techniques and working of batteries
- **CO.2.** Identify the mechanism of corrosion of materials on basis of electrochemical approach and devise corrosion control methods. Estimate the physical & chemical parameters of quality of water and explain the process of water treatment.
- **CO.3** Explain the influence of chemical structure on properties of materials and their choice in engineering applications.
- **CO.4** Classify chemical fuels and grade them through qualitative analysis.
- **CO.5** Relate the concept of green chemistry to modify engineering processes and materials. Understand the function of drugs.

Unit-I: (10 Hrs)

Electrochemistry and Batteries :

Electrochemistry: Electrochemical cells, Electrolytic and Galvanic cells-notation, cell notation, cell reaction and cell potentials. Electrodes: Electrode potential and Standard Electrode Potential (SEP). Construction and function of Calomel Quinhydrone and Glass electrodes. Determination of pH of a solution by using Quinhydrone electrode. Thermodynamics of emf, Nernst equation and its derivation. Applications of Nernst equation to electrode potential and emf of

cells. Numerical problems.

Batteries: Primary batteries: Zn - Carbon battery. Secondary batteries: Pb-Acid cell & battery and Li-Ion cell battery, Applications. Flow batteries (Fuel cells): Hydrogen-Oxygen fuel cells& functioning. Applications of batteries.

Unit-II: (10 Hrs)

Water Chemistry--its treatment and corrosion:

Water Chemistry: Hardness of Water-Types and units of hardness, estimation of temporary and permanent hardness of water by EDTA method. Alkalinity of water and its determination. Water softening by Ion exchange process and desalination of water by reverse osmosis method. Numerical problems. Specifications of potable water--Steps involved in treatment of water – Sterilization by Chlorination -Disinfection of water by chlorination and ozonization. Break Point Chlorination – advantages.

Corrosion: Causes and effects of corrosion. Types of Corrosion-Dry corrosion – its types or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism.

Concentration cell corrosion. Waterline, Pitting and galvanic corrosion. Factors effecting rate of corrosion.

Unit-III: (10 Hrs)

Polymers: Basics of terms polymers: Monomer functionality, degree of Polymerization. Types of Polymerization (i) Addition--Mechanism of free radical polymerization (ii) Condensation (iii) Co-Polymerization with examples. Classification of polymers - Thermoplastics & Thermosetting resins.

Plastics, Fibres and Elastomers and their characteristics. Preparation, Properties & Uses of the following polymers: Plastics - PVC and Bakelite, Fibres - Nylon 6:6, and Dacron. Elastomers - Buna-S, Butyl Rubbers.

Conducting polymers : Concept, Classification and Mechanism of conduction in Trans Poly-acetylene, Doped Conducting Polymers. Applications of conducting polymers.

Biodegradable polymers: Concept. preparation, properties and applications of polylactic acid

Unit-IV: (10 Hrs)

Chemical Fuels: Concept, definition and classification of fuels- Primary and secondary fuels. Solid, liquid and gaseous fuels. Characteristics of a good fuel. Calorific Value – High Calorific Value (HCV) and Low Calorific Value (LCV). Numerical problems.

Solid Fuels: Coal and its types. Analysis of coal - Proximate and Ultimate analysis. Numerical Problems.

Liquid Fuels: Petroleum. Composition of Gasoline, Diesel and Kerosene.

Cracking & its Significance- Catalytic cracking by moving bed method, Knocking. Fuel rating – Octane and Cetane numbers.

Gaseous Fuels: LPG, CNG –Composition, characteristics and applications.

Unit-V: (10 Hrs)

Green Chemistry, Green Engineering Principles: Concept, Principles of green

chemistry –. Principles of Green Engineering.
Biodiesel: Sources, Concept of Trans esterification. Properties and significance

Text Books:

T1. PC Jain, M Jain Engineering Chemistry, Dhanapathi Rai &sons, 16th edition, 2015, New Delhi. (Unit: 1,4,5)
T2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. S. Chand & Company Ltd., Revised edition (2013). (Unit 2)
T3. Sashi Chawla,―Engineering Chemistry, Dhanpat Rai & Sons, New Delhi, 2017 (1St January 2017) (Unit 3)
T4. O G Palanna, ―Engineering Chemistry‖, Tata Mc Graw Hill, New Delhi, First Edition 2009.(Unit 2&4)

Reference Books :

R1. J D Lee, Concise inorganic chemistry, Blackwell science ltd, USA, Fifth edition
R2. P.W. Atkins,Physical Chemistry .
R3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley, 12th edition (2017).

Course code	Course Title	Core/ Elective					
4HS101HS	English	Core					
		L	T	P/D	Credits	CIE	SEE
		2	0	0	1	40	60

Prerequisite: Know the basic functions of the Language

Course Objectives: The following are the Objectives of the Course:
To enable and enhance the English language abilities of engineering students, especially in reading and writing, by –

- Using authentic material for language learning and gaining proficiency in it (Knowledge) (Comprehension)
- Exposing them to a variety of content-rich text.
- Strengthening their grammar and vocabulary.
- Improving their reading and comprehension skill.
- Honing their writing skills.
- Encouraging them to think creatively and critically.

Course Outcomes:

After completion of the course, the student will be able to

- **CO1**. Read, understand, interpret and comprehend a variety of written texts and develop positive attitude and commitment towards their (students') goal and society.
- **CO2** Remember and recognize the significance of vocabulary (roots and affixes, homonyms, one- word substitutes, etc.) and use language accurately for effective communication.
- **CO3** Apply appropriate grammatical concepts (tenses, articles, prepositions, etc.) to spoken and written English in informal and formal ambience.
- **CO4** Compile information of various aspects of English diction – Develop creativity in writing skills by framing Paragraphs, Essays, Letters, Emails and SOPs.
- **CO5** Analyze different ways of life through reading prose and poetry, each symbolizing a particular virtue and the learners develop the ability to be creative.

Unit – I : (6 Hrs)
Reading : Amitav Ghosh "Coming Home"

Vocabulary : Word Formation – Prefixes, Suffixes , Root words

Grammar : Articles, Prepositions, Determiners

Writing : Types of Sentences; Guided Writing (Expanding the Outline / Writing from verbal cues)

Unit – II : (6 Hrs)

Reading : Rudyard Kipling, "If"
Vocabulary : Word Formation – Compounding and Blending, Contractions
Grammar : Transitions, Connectives, Question Tags
Writing : Précis & Paragraph Writing

Unit – III : (6 Hrs)

Reading : Martin Luther King Jr. "I have a Dream"
Vocabulary : Synonyms, Antonyms, One-Word Substitutes
Grammar : Voice
Writing : Letter Writing

Unit – IV : (6 Hrs)

Reading : Robert Frost, "Road Not Taken"

Vocabulary : Homophones, Homonyms, Homographs

Grammar : Narration (Direct – Indirect Speech)

Writing : Reporting Events (Swearing in, Poll-Address, News Events, Visit to Book Exhibition, Annual /Farewell Day)

Unit – V : (6 Hrs)

Reading : George Orwell' " The Sporting Spirit" (Excerpt)
Vocabulary : Inclusive Language, Euphemism
Grammar : Tense
Writing : SOP

Text Books :

T1. E. Suresh Kumar, *Engineering English,* Orient Black Swan, 2014.

References / Suggested Reading:

R1. Modern English Grammar
R2. "Grammar in Use" Raymond Murphy
R2. Sudharshana, NP and C Savitha, English for Engineers. Cambridge University Press 2018.

Course code	Course Title	Core/ Elective					
4ES103CE	Engineering Mechanics	Core					
		L	T	P/D	Credits	SEE	CIE
		3	0	0	3	40	60

Prerequisite: Basics of Mechanics section from Physics

Course Objectives: The objective of this course is to make the student

- The force systems and principles of static equilibrium in particles and rigid bodies at rest
- The laws of friction and their applications to various mechanical systems
- The centroids and moments of inertia of various regular and irregular plane areas and solid bodies
- The motion path (kinematics) of a rigid body under the action of forces (kinetics)
- The work energy principles and impulse momentum theory and their applications to the problems of dynamics

Course Outcomes

After completion of the course, the student will be able to

- **CO1. Apply** the concepts of force systems and static equilibrium for solving for unknown forces
- **CO2. Solve** for unknown forces in problems involving friction between contacting bodies
- **CO3. Determine** the centroids and moments of inertia for lines, areas and volumes.
- **CO4. Solve** for unknown parameters in problems kinematics and kinetics of particles and rigid bodies
- **CO5. Apply** the principles of work & energy and law of conservation of momentum solving for unknown kinematic and dynamic parameters of rigid bodies in motion and in collision.

Unit-I: (10 Hrs)

Force Systems: Resultant of collinear, parallel, coplanar & non-coplanar concurrent & non concurrent force systems. Resolving a planar or non-coplanar force system into different directions. Moment of a force and its applications, Couples and Wrench of a force system.

Equilibrium of Force Systems: Free body diagram, Equations of equilibrium, Equilibrium of planar & spatial systems.

Unit-II: (6 Hrs)

Friction: Laws of friction. Application to simple systems, connected systems, belt friction & wedge friction.

Unit-III: (08 Hrs)

Centroid and Moment of Inertia: Centroids of lines, areas and volumes, Areas and volumes of revolution, Pappu's theorem s & their applications, Area

moment of inertia, Product moment of inertia, Composite areas, radius of gyration, Mass moment of inertia.

Unit-IV: (08 Hrs)

Kinematics: Introduction, Motion of particle, Rectilinear and Curvilinear motions, Velocity and Acceleration, Types of Rigid body, Angular motion, Fixed axis rotation.

Kinetics: Introduction, fundamental equation of kinetics for a particle, D' Alembert's principle for particle motion, connected system.

Unit-V: (08 Hrs)

Work - Energy Method: Introduction, Equations for Translation, Work-Energy Applications to Particle Motion, Connected System and Fixed Axis Rotation.

Impulse Momentum Method: Linear impulse momentum, law of conservation of momentum, coefficient of restitution, Elastic impact**.**

Text Books

T1. Engineering Mechanics: Principles of Statics and Dynamics, R. C. Hibbler, Pearson Education; Fourteenth edition, 2017

T2. Engineering Mechanics S.S. Bhavikatti et al, New Age International Publishers, 2017 (Unit 1-5)

References/ Suggested Reading

R1. Engineering Mechanics (In SI Units), by S.P. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati, McGraw Hill International, 5th edition, 2017

R2. A Textbook of Engineering Mechanics, R.S. Khurmi and N. Khurmi, S. Chand Publications, 22nd Edition, 2018 (Unit1-5)

R3. Engineering Mechanics - Statics and Dynamics, by N H Dubey, McGraw Hill Education, 2017

R4. Singer's Engineering Mechanics Statics and Dynamics, by K. Vijay Kumar Reddy and J. Suresh Kumar, B.S. Publishers, 2011

R5. Engineering Mechanics Statics and Dynamics, A. K. Tayal, 14th Edition, Umesh Publishers, 2010.

Course code	Course Title	Core/ Elective					
4BS153HS	Chemistry Lab	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	3	1.5	40	60

Prerequisite: Higher secondary level Chemistry

Course Objectives: The objective of this course is to make the student

- Conduct experiments, take measurements and analyze the data though hands-on experience in order to demonstrate understanding of the theoretical concepts of quantitative Analysis while working in small group.
- Interpret the electro analytical principles with experimental results graphically
- Demonstrate writing skills through clear laboratory reports

Course Objectives: After completion of the course, the student will be able to

- **CO.1.** Apply the principles of volumetric analysis in quantitative estimations.
- **CO.2.** Analyse the parameters of water by titration method.
- **CO.3.** Understand the principle, concept, working and applications of Conductivity Meter to determine the concentration of chemicals.
- **CO.4.** Understand the principle, concept, working and applications of Potentiometer to determine the concentration of chemicals.
- **CO.5**. To apply the law for determining the concentration of a given chemical.

List of Experiments

1. Introduction to Chemical Analysis and Techniques of Weighing.

VolumetricAnalysis:

2. Preparation of Standard Mohr's salt solution, Standardization of $KMnO_4$ and estimation ferrous ion.

3. Preparation of Standard $K_2Cr_2O_7$ solution, Standardization of Mohr's Salt Solution and estimation of dichromate ion. ($Cr_2O_7^{2--}$)

Complexometry

4. Preparation of Standard Magnesium sulphate solution, standardization of EDTA and estimation of Total Hardness of water.Preparation of Standard Sodium Carbonate Solution, Standardization of HCl and Estimation of Carbonate and Bicarbonate Alkalinity of water sample.

Conductometry:

5. Estimation of HCl by conductometry.

Potentiometry

6. Estimation of HCl by potentiometry (acid base titration)

7. Estimation of Fe^{2+} by potentiometry(redox titration)

P^H metry

8. Estimation of HCl by P^HMetry.
9. Colorimetry
10. Verification of Beers Law using potassium permanganate and estimation of amount $KMnO_4$ in the given sample solution.

List of Additional Experiments

1. Estimation of CH_3COOH by conductometry

References **:**

1. B.D. Khosla, A. Gulati and V. Garg , ―Senior Practical Physical Chemistry‖, R. Chand & Co., Delhi, 2011.

2. K. K. Sharma and D.S. Sharma , ―An Introduction to Practical Chemistry‖, Vikas publishers, New Delhi, 1982.

Course code	Course Title	Core/ Elective					
4HS151HS	English Lab	Core					
		L	T	P/D	Credits	CIE	SEE
			0	2	1	40	60

Prerequisite: Understanding of the English Alphabet and the Corresponding Sounds

Course Objectives: The objective of this course is to enable the student to :

- Learn the Sound Systems, Word Stress, Intonation of English
- Gain the knowledge of the appropriate use of Language and Body Language
- Acquire the Techniques to Participate in Group Discussions
- Hone their Participation and Presentation Skills
- Comprehend how Interviews are conducted and faced

Course Outcomes: After completion of the course, the student will be able to

- Enhance Pronunciation, Stress, Intonation and Articulation Skills
- Speak the Language coherently, with a lesser MTI
- Employ Language and Body Language intelligibly
- Engage in Group Discussions efficiently
- Prepare and Produce Decent Presentations To Fare, Well in Interviews

LIST OF EXPERIMENTS

1. **Ice-Breaking Session**
2. **Introduction to English Phonetics :** Organs of Speech **:** Speech Mechanism
3. **Sounds of English :** Introduction to International Phonetic Alphabet, Classification and Description of English Phonetic Sounds – Vowel Sounds & Consonant Sounds; Minimal Pairs; The Syllable
4. **Word Stress :** Primary Stress, Secondary Stress, Functional Stress, Rules of Word Stress
5. **Intonation :** Major Patterns of Intonation in English
6. **Speaking Activity: JAM** : an impromptu speech where the speaker is supposed to express the idea (s) on the given topic, within the duration of a **minute**.
7. **Role Play:** Use of dialogues in a variety of situations and settings
8. **Group Discussion:** Initiating, continuing and concluding a GD, Components and Types of GDs,

9. **Power-Point Presentation: (General Topics)** Making effective presentations, Expressions which can be used in presentations, Use of non-verbal communication, Coping with stage fright, Handling questions and answer session
10. **Interview Skills:** Facing interviews confidently, Use of suitable expressions during interviews; Mock interviews

Text Books :

T1. E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD).* Revised edition, Cambridge University Press India Pvt. Ltd. 2014

Reference / Suggested Reading :

R1. T. Balasubramanian. *A Text book of English Phonetics for Indian Students.* Macmillan, 2008.
R2. Edgar Thorpe. *Winning at Interviews*. Pearson Education, 2006.
R3. J. Sethi et al., A *Practical Course in English*
R4. Pronunciation (with CD). PrenticeHall of India,2005.
R5.Hari Mohan Prasad. *How to Prepare for Group Discussions and Interviews.* TataMcGraw Hill,2006.

Course code	Course Title	Core/ Elective					
4ES152ME	Engineering Workshop Practice	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	4	2	40	60

Prerequisite: Practical skill

Course Objectives: The objective of this course is to make the student

- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To gain basic knowledge on various manufacturing processes used for the production of various engineering products.
- To gain hands on exposure on computer hardware and working knowledge on computers and software.
- Adopt safety practices while working with various tools.

Course Outcomes: After completion of the course, the student will be able to

- **CO.1**. Identify and demonstrate the usage of different tools to be used in various manufacturing trades with safety measures.
- **CO.2.** Apply the skills developed to undertake the jobs connected to various engineering workshop trades including fitting, carpentry, sheet metal, house wiring, welding, and foundry.
- **CO.3.** Demonstrate the knowledge of various machine tools and their operations such as machining, injection moulding, casting and 3D printing and basic electronics lab instruments.
- **CO.4.** Illustrate the advanced machining processes like CNC, rapid prototyping.
- **CO.5** Apply the basic knowledge of computers to assemble and disassemble various components of computer and able to install various operating systems such as windows or Linux.

LIST OF EXPERIMENTS

A. TRADES FOR EXERCISES:

At least two exercises to be done from each trade.

1. **CARPENTRY:** Sawing and Grooving, T-lap joint, Dove-tail Joint.
2. **FITTING:** Step Cutting & Filing, Drilling & Tapping, V-Fitting

3. **HOUSE WIRING**: Parallel & Series, Two-Way Switch, Tube light Connections.
4. **SHEET METAL WORKING:** Open Scoop, Funnel, Rectangle Tray.
5. **BLACK SMITHY:** Upsetting, Fullering, S-Hook
6. **WELDING:** Lap joint, Single V-butt joint, Corner joint
7. **PLUMBING:** Practice of Internal & External Pipe Threading, Pipe Fitting, Tap and Shower connections.

B. TRADES FOR DEMONSTRATION AND EXPOSURE:

1. Machines (lathe and drilling)
2. Injection Molding
3. Mould making and Casting
4. Basic Electronics Lab Instruments
5. 3D Printing

C. PRESENTATIONS AND VIDEOS LECTURES:

1. Manufacturing Methods
2. Glass Cutting
3. 3D Printing
4. CNC Lathe

D. IT-WORKSHOP: Computer hardware, Identification of parts, disassembling and assembling of computer to working condition. Operating System Installation

Text Book:

1. P. Kannaiah, K.L.Narayana "Workshop Manual" Scitech Publications; 2nd Edition.

References:

1. Venugopal,K, "Workshop Manual", Anuradha Publications; 2012th edition.
2. K.C.John, "Mechanical Workshop" 2nd Edition, PHI, 2010.
3. Hajra Choudhury, "Elements of Workshop Technology" Vol.1, Asian Publishers, Edu., 2010.

Course code	Course Title	Core/ Elective					
4BS202HS	Engineering Mathematics – II	Core					
		L	T	P/D	Credits	CIE	SEE
		3	1	0	4	40	60

Prerequisite: Basics of Differentiation, Integration and Trigonometric results.

Course Objectives: The objective of this course is to make the student

- Study the concepts of sequences, series, and their properties.
- Provide the over view of ordinary differential equations of first order and their application to mathematical problems.
- Solving higher order ordinary differentiation by various mathematical methods.
- Evaluate improper integrals using Beta and Gamma functions
- Study Laplace transforms and its applications to differential equations.

Course Outcomes:

After completion of the course, the student will be able to

- **CO1**. To Test for the convergence and divergence of infinite series using the comparison test, Ratio test, Cauchy's n'th root test, Leibnitz's test, and also analyzing the nature of series.
- **CO2.** Solve the ordinary differential equations of first order and their physical and geometrical applications.
- **CO3** Solve the ordinary differential equations of second and higher with constant and variable coefficient by different methods. Solution of non-homogeneous equations, Euler-Cauchy equation. Method of variation of parameters.
- **CO4** Evaluate the improper integrals using beta and gamma functions. Solution of Legendre polynomials
- **CO5** Evaluate Laplace Transforms, Inverse Laplace Transforms of functions and their applications to ordinary differential equations.

Unit-I (10Hrs)

Sequence and series: Sequences—General properties of series, Series of positive terms, Comparison test, tests of convergence-D'Alembert's Ratio test, Cauchy's nth root test, Raabe's test, Logarithmic test, Alternating series, Series of positive and negative terms, Absolute convergence, and Conditional convergence.

Unit-II (10Hrs)

Differential Equations of First Order: Exact Differential Equations, Integrating Factors, Linear differential Equations, Bernoulli's Equation, Riccati's and Clairaut's differential equations, Orthogonal Trajectories of a Given Family of Curves, Applications of differential equations-L-C,

L-R circuit.

Unit-III (12Hrs)

Differential Equations of Higher Order: Solutions of second and higher order linear Homogenous Equations with Constant Coefficients, Solutions of non-homogeneous linear differential equations, Method of Variation of Parameters, solution of Euler-Cauchy Equation, Applications of differential equations-L-CR circuit.

Unit-IV (8Hrs)

Special functions: Gamma Function, Beta Function, Relation between Gamma and Beta Functions, Error Function, Power Series Method, Legendre's Differential Equations and Legendre's Polynomial Pn(x), Orthogonal property of Legendre's Polynomial Rodrigue's Formula (with proof).

Unit-V (10Hrs)

Laplace Transforms: Laplace Transforms, Inverse Laplace Transforms, Properties of Laplace Transforms and inverse Laplace Transforms, Convolution Theorem (without proof). Solution of ordinary differential Equations using Laplace Transforms**.**

TEXT BOOKS:

T1. Dr.B.S. Grewal, Higher. Engineering Mathematics, Khanna Publications, 43rd Edition,2014. (Unit 1-5)

T2. Advance Engineering Mathematics by Jain and Iyengar,5th Edition, Narosa Publications (Unit 1-5)

T3.B. V. Ramana, Higher Engineering Mathematics,3rd Edition 2015. (Unit 1-5)

REFERENCES/ SUGGESTED READING:

R1. M.D Raisinghania, Ordinary Differential Equations, 11th Revised Edition

R2. S.S. Sastry, Engineering Mathematics, 3rd Edition, Paperback

R3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley, 9th Edition, 2012.

R4. Peter. V. O' Neil, Advance Engineering Mathematics,' Publisher, Global Engineering, 7th Edition, 2012

Course code	Course Title	Core/ Elective					
4BS204HS	APPLIED PHYSICS	Core					
		L	T	P/D	Credits	CIE	SEE
		3	1	0	4	40	60

Prerequisite: Basics of electron theory, Semiconductors, magnetic materials, basics of black body radiation.

Course Objectives: The objective of this course is to make the student

- Familiarize with classical and quantum electron theories and use band theory to classify solids.
  To explain various types of semiconductors and their applications.
- Understand the properties of dielectric and Magnetic materials.
- Understand the Superconductivity phenomena and explain the dual nature of the particles.
- Know the construction of lasers and optical fibers and apply their basic principles to various laser systems and optical fibers
- Acquire knowledge of preparation of thin films and basic concepts of Nano materials

Course Outcomes: After completion of the course, the student will be able to

- Classify solids based on their energy band structures. Identify semiconductors for engineering applications.
- Classify magnetic and dielectric materials
- Explain the fundamental concepts on superconductivity and Quantum behavior of matter waves.
- Explain the lasing action in lasers, propagation of light in optical fibers and compile their applications different fields.
- Knowledge about preparation of thin film and Nano material, this helps the students to prepare new materials.

Unit-I: (11 Hrs)

Band theory of solids: Classical free electron theory and its limitations, Band theory – Kronig penny model (qualitative treatment), Energy bands in solids, Classification of materials as conductors, semiconductors and insulators.

Semiconductors: Introduction, Intrinsic and extrinsic semiconductors, carrier concentration and conductivity in intrinsic semiconductors, formation of P-N junction diode and its I-V characteristics, Thermistor, Hall effect and its applications.

Unit-II: (11 Hrs)

Dielectric materials: Introduction, Types of dielectric polarizations – Expression for electronic polarizability, Frequency and temperature dependence of dielectric polarizations, Determination of dielectric constant by Capacitance bridge method, Ferro electricity – Structure of Barium Titanate – Applications of ferroelectrics.

Magnetic materials: Introduction, Magnetization, Magnetic Flux, Magnetic Susceptibility, Classification of magnetic materials – Dia, para, ferro, antiferro and ferri magnetic materials. Ferrites - properties and its applications, Domain theory of Ferromagnetism, Hysteresis curve, Soft and hard magnetic materials and their

applications.

Unit-III: (10 Hrs)

Superconductivity: Introduction, General properties of superconductors- persistent current, critical current, critical magnetic field, critical temperature, Meissner effect, Type I and Type II superconductors, Applications of superconductor, BCS theory (qualitative), High Temperature superconductors and its applications.

Quantum Mechanics: Introduction to Planck's Theory, de-Broglie's concept – wave nature of particles (Debroglie wavelength), properties of wave function and its physical significance, Schrodinger's Time independent and Time dependent wave equations, Application of Schrodinger's Time independent - Particle in a 1D box.

Unit-IV: (9 Hrs)

Lasers: Characteristics of Lasers – monochromatic, directionality, coherence, divergence, Basic concepts of transitions - absorption, spontaneous and stimulated emissions, Einstein's theory of matter and radiation interaction (A & B coefficients), Concepts of meta stable states, population inversion and pumping, Components of lasers, Types of lasers- Ruby laser, He-Ne laser, Semiconductor laser and Applications of laser.

Fiber optics: Introduction to Optical fiber, structure of an optical fiber, Basic principle – total internal reflection, Concept of Numerical Aperture (NA) and acceptance angle, Derivation of Numerical Aperture, Types of optical fibers – Step Index and Graded Index fibers(w.r.t to refractive index and mode of propagation), Fiber drawing process (Double crucible method), Applications of optical fibers.

Unit-V: (9 Hrs)

Thin Films: Distinction between bulk and thin films – Thin films preparation Techniques- Thermal evaporation method, Electron beam evaporation method, Pulsed laser deposition, Solar cell- Construction, working – and its applications.

Nano materials: Introduction, Properties of materials at reduced size, Surface to volume ratio at Nano scale, Classification of Nano materials, Preparation of Nano materials – Bottom-up methods (sol-gel & CVD) and Top-down method (ball milling), Basic ideas of carbon nanotubes, Applications of Nano materials and their health hazards

Text Books:

T1. S.L.Gupta and Sanjeev Gupta, Modern Engineering Physics, Dhanpat Rai publications, 2011Edition, Reprint 2012.(Unit 1-4)

T2. B.K.Pandey and S.Chaturvedi, Engineering physics, Cengage Publications, 2012, 1st Edition. (Unit 1-5)

T3. M.N.Avadhanulu, P.G. Kshirsagar and TVS Arun Murthy, A Text Book Engineering Physics, 11th Edition, S.Chand, 2018.(Unit 1-4).

References/ Suggested Reading

R1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition Paperback – 1 January 2019

R2. V. Raghavan, Materials Science and Engineering, Prentice Hall India Learning Private Limited; 6th Revised Edition, 2015.

R3. K.L. Chopra, Thin film Phenomena, New York, McGraw – Hill, 1969.

Course code	Course Title	Core/ Elective					
4ES202EE	PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING	Core					
		L	T	P/D	Credits	SEE	CIE
		3	0	0	3	40	60

Prerequisite: ---

Course Objectives: The objective of this course is to make the student

- Familiarize with electrical networks, circuits and different Laws used to solve electrical circuits.
- Understand various network reduction techniques to analyze electrical circuits.
- Understand the concept of network theorems for reducing complex networks.
- To know the basics of semiconductors and different diodes with their applications.
- To acquire knowledge of Construction and operation of different transistors along with their applications.

Course Outcomes: After completion of the course, the student will be able to

- CO.1 Understand the concepts of electrical circuits and basic Laws.
- CO.2 Apply various network reduction techniques to obtain any response in an electrical circuit.
- CO.3Analyze complex electrical circuits with the help of different network theorems.
- CO.4 Explain the operation and application of various diodes.
- CO.5 Knowledge about different configurations and applications of various transistors.

Unit-I: (07 Hrs.)

Introduction to Electrical Circuits: Circuit Concept, R-L-C Parameters, Voltage and Current Sources, Independent and Dependent Sources, Source Transformation, Voltage – Current relationship for Passive Elements, Ohm's Law, Kirchhoff's Laws.

Unit-II: (10 Hrs.)

Network Reduction Techniques: Series, Parallel, Series Parallel, Star –to-Delta or Delta-to-Star Transformations, Nodal Analysis, Mesh Analysis, Super node and Super mesh Analysis.

Unit-III: (09 Hrs.)

Network Theorems for DC Excitations: Superposition, Thevenin's, Norton's, Maximum Power Transfer, Reciprocity, Milliman's, Tellegen's and Compensation theorems.

Unit-IV: (07 Hrs.)

P-N Junction Diode: P-N Junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Ideal versus Practical – Resistance levels (Static and Dynamic), Transition and Diffusion Capacitances, Diode Equivalent Circuits, Breakdown

Mechanisms in Semiconductor Diodes, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Zener Diode Characteristics, Voltage Regulation using Zener Diode.

Unit-V: (07 Hrs.)

BJT, UJT & MOSFET: Transistor Construction, BJT Operation, BJT Symbol, Transistor as an Amplifier, Common Base, Common Emitter and Common Collector Configurations, Limits of Operation, BJT Specifications, UJT and its Characteristics, MOSFET Construction, principle of operation, symbol, MOSFET Characteristics in Enhancement and Depletion modes.

Text Books:

T1. Fundamentals of Electric Circuits, Charles k. Alexander and Matthew N. O. Sadiku, Tata McGraw Hills Education, Edition 3, 2013.(Unit 1-3)

T2. Electrical Circuit Analysis, William H Hayt and Jack Kemmerly , 8th Edition, 2014 (Unit 1-3)

T3.Electronic Devices, Floyd, Pearson Publications, Seventh Edition, 2019. (Unit 4-5)

References/ Suggested Reading:

R1. "Basic Electrical Engineering", N. K. De, Universities Press, 2015.

R2. "Fundamentals of Electrical Engineering and Electronics", J.B. Gupta, S. K. Kataria & Sons Publications, 2002.

R3. "Electronic Devices and Circuits", Theodore F Bogart, Pearson Publications,2004.

R4. "Electronics Devices and Circuits", J B Gupta, Katson Educational Series, 6th Edition.

Course code	Course Title	Core/ Elective					
4ES204ME	PRINCIPLES OF MECHANICAL ENGINEERING	Core					
		L	T	P/D	Credits	SEE	CIE
		3	0	0	3	40	60

Prerequisite: ---

Course Objectives: The objective of this course is to make the student

- To understand the basic concepts and applications of Thermodynamics
- To understand the basic concepts of IC Engines
- To understand the working principles of hydraulic turbines
- To understand the working principles of hydraulic pumps.
- To understand the basic principles of major manufacturing Processes such as casting, welding, forming.

Course Outcomes: After completion of the course, the student will be able to

- CO.1. Define the fundamental concepts in thermodynamics
- CO.2 Classify the IC Engines and Gas turbines
- CO.3. Demonstrate the operating principles of hydraulic turbines
- CO.4. Distinguish the working principles of Centrifugal pump and Reciprocating pump
- CO.5 Explain the different manufacturing techniques, such as welding, casting and forming.

UNIT-I:

Sources of Energy: Introduction and application of energy sources like fossil fuels hydal, solar, wind, nuclear fuels and bio-fuels; environmental issues like globa warming and ozone depletion

Basic concepts of Thermodynamics: Concept of system, Process & Properties, First law of thermodynamics, concept of Heat Engine, Heat Pump & Refrigerator. Steady flow energy equation for an open system, Second law statements, Concept of entropy.

UNIT-II:

Internal Combustion Engines: Introduction, Classification, Engine details, Otto cycle, Diesel-cycle, Difference between Otto cycle and Diesel cycle, Two-stroke cycle engine, Difference between two-stroke and four-stroke engines, indicated power, brake Power, friction power & Efficiencies.

Steam power plant cycles: Carnot and Rankine cycles of operation and their efficiencies. Analysis of Rankine cycle.

Gas Turbines: Simple gas turbine plant, Ideal cycle, Actual cycle, essential components, Parameters of performance.

UNIT-III:

Introduction to Bernoulli's equation, applications- Venturi meter, Orifice meter, Flow through pipes-Hygen's formula, Friction loss in pipes, Dracy's formula, Reynolds number and it's significance.

Hydraulic Turbines: Classification- Working principle- Pelton wheel, Francis, Kaplan – Work done, power output, efficiency, specific speed- Unit quantities, Draft

tube, Performance characteristic curves.

UNIT-IV:

Centrifugal pumps: Classification, working, work done – barometric head-losses and efficiencies, specific speed – performance characteristic curves, NSPH

Reciprocating pump: Working, Discharge, slip, indicator diagrams.

UNIT-V:

Welding: Definition of Welding, Types of welding processes. Brief description of important welding processes like: Arc welding, GMAW, GTAW, Gas welding & Resistance welding.

Principle of operation of Brazing, Soldering.

Casting: Basic concepts of casting process. Principle, process and applications of sand and die casting processes.

Forming: Basic concepts of metal forming processes: Extrusion, rod/wire drawing and rolling.

Text books:

1.Thermal Engineering, RK. Rajput, Laxmi Publications Tenth Edition (2018)

2. Fluid mechanics & Hydraulic machines by, R.K.Bansal, Laxmi Publications Ninth Edition (2018)

3.Manufacturing Technology, Vol-1 by P. N. Rao, McGraw Hill Publications, Fifth Edition (2018)

References:

1. Internal combustion engines by V. Ganesan, McGraw Hill Publications, Fourth Edition (2012)
2. Hydraulic fluid mechanics and fluid machines by S. Ramamuratham, Dhanapathi rai publications, Ninth Edition (2014)
3. Production Technology 4ED by Pakirappa First Edition(2015)

Course code	Course Title	Core/ Elective					
4MC201CE	Environmental Science	Core					
		L	T	P/D	Credits	SEE	CIE
		2	0	0	0	40	60

Prerequisite: NIL

Course Objectives: The objective of this course is to make the student

- Describe various types of natural resources available on the earth surface.
- Explain the concepts of an ecosystem and the biotic and abiotic components of various aquatic ecosystems.
- Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity.
- Explain the causes, effects and control measures of various types of environmental pollutions.
- Describe the methods for water conservation, the causes, effects of global warming, climate change, acid rain, ozone layer depletion, population explosion.

Course Outcomes After completion of the course, the student will be able to

- **CO.1**.Describe the various types of natural resources.
- **CO.2** Differentiate between various biotic and abiotic components of ecosystem.
- **CO.3** Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India.
- **CO.4** Illustrate causes, effects, control measures of various types of environmental pollutions.
- **CO.5** Explain the methods of water conservation, causes, effects of climate change, global warming, acid rain and ozone layer depletion, population explosion.

Unit-I: (08 Hrs)

The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance, need for public awareness.

Natural Resources: Water Resources – Use and over utilization of surface and ground water, flood, drought, conflicts over water, Dams: Benefits and Problems. Food Resources –World Food Problems, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, Forest Resources –Use and over exploitation, deforestation & its effect on tribal people. Land Resources –Land Degradation, environmental effect of mining, man induced landslides, soil erosion and desertification**.** Energy Resources –Growing energy needs, Renewable and Non-renewable energy resources.

Unit-II: (06 Hrs)

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in ecosystem, food chains,

ecological pyramids, ecological succession, types of ecosystems (marine, pond, river, forest, grassland, desert)

Unit-III: (06 Hrs)

Biodiversity: Levels of Biodiversity, Bio-geographical classification of India, Value of biodiversity, Threats to biodiversity, endangered and endemic species of India, Conservation of biodiversity, global and national efforts.

Unit-IV: (07 Hrs)

Environmental Pollution: Definition, Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution, solid waste management.

Environment Protection Act: Air, water, forest and wildlife Acts, issues in the enforcement of environmental legislation

Unit-V: (06 Hrs)

Social Issues and the Environment: Watershed management and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster Management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle and disaster management in India.

Field Work:

- Visit to a local area to document
- Visit to a local polluted area- market/slum area/Industrial area/traffic area

Text Books:

T1. Deswal S. and Deswal A., A Basic Course on Environmental studies, Dhanpat Rai & Co Pvt. Ltd. 2018. (Unit 1-5)

T2. Perspectives In Environmental Studies, Anubha Kaushik & C.P Kaushik, New Age International Publishers, 6th Edition 2018). (Unit 1–5).

References/ Suggested Reading

R1. Benny Joseph, ―Environmental Studies", Tata McGraw Hill (3rd Edition, 2017).

R2. Suresh K. Dhameja, Environmental Studies, S.K. Kataria & Sons, 2010.

R3. Rajagopalan R., Environmental Studies, Second Edition, Oxford University Press, 2013.

R4. V.K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE, 1999.

R5. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.

Course code	Course Title	Core/ Elective					
4BS251HS	**Applied Physics Lab**	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	3	1.5	40	60

Prerequisite: Higher secondary level Physics

Course Objectives: The objective of this course is to make the student

- Apply the theoretical knowledge in doing practical experiments.
- Acquire skills to handle instruments.
- Understand the behavior of semiconductors and opto-electronic devices.
- Analyze errors in experimental data.
- Plot graphs between different physical parameters.

Course Objectives: After completion of the course, the student will be able to

- **CO251.1**. Develop analytical/experimental skills and impart prerequisite hands on experience for engineering laboratories.
- **CO251.2.** Understand the need for precise measurement practices for data recording.
- **CO251.3.** Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations.
- **CO251.4.** Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics
- **CO251.5** Acquire knowledge in communication skills through working in groups in performing the laboratory experiments and by interpreting the results

LIST OF EXPERIMENTS

1. Determination of wavelength of laser using diffraction grating.
2. Determination of Numerical Aperture (NA) and Acceptance angle of an optical fiber
3. To find the dielectric constant of a given material
4. To draw the I-V characteristics of solar cell and to calculate fill factor.
5. To draw the I-V characteristics of P-N junction diode and to evaluate series resistance in forward and reverse bias conditions.
6. To determine the rigidity modulus of the material of the given wire using Torsional Pendulum.
7. To study the Thermistor characteristics, determine the constants A and B.
8. To find the value of energy gap of a given semiconductor.
9. To draw the curve between the magnetic field and Intensity of magnetization for a given specimen and to find out Coercivity and Retentivity of the specimen.
10. Determination of carrier concentration, mobility and Hall co-efficient in a semiconductor using Hall Effect experiment.

Note: A minimum of eight experiments to be done.

References:

R1. S.L.Gupta and Dr.V.Kumar, “Practical physics with viva voice”, Pragati Prakashan Publishers, Revised Edition, 2009

R2. M.N.Avadhanulu, A.A.Dani and Pokely P.M, “Experiments in Engineering Physics”, S.Chand &Co,2008

Course code	Course Title	Core/ Elective					
4ES253ME	Principles of Mechanical Engineering Lab	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	2	1	40	60

Prerequisite: Mathematical Knowledge, Logical and Analytical Thinking

Course Objectives: The objective of this course is to make the student

- Understand importance of various parts in IC engines
- Understand the working of IC engine.
- Understand the principle of operation of Venture meter and orifice meter
- Understand the working of Hydraulic turbines and pumps
- Understand the process of pattern making for casting process.

Course Outcomes: After completion of the course, the student will be able to

- CO.1.Identify various parts in Internal combustion engines
- CO.2. Evaluate performance of the Internal combustion engines.
- CO.3. Operate the venture meter and orifice meter.
- CO.4. Evaluate performance of hydraulic turbines and pumps.
- CO.5 Develop pattern for a given casting process.

LIST OF EXPERIMENTS

1. Performance test on Four-Stroke SI Engine
2. Performance test on Four-Stroke CI Engine
3. To determine coefficient of discharge for Venture meter
4. To determine coefficient of discharge for Orifice meter
5. To determine loss of head due to friction in a given pipe line
6. To determine overall efficiency of Pelton wheel turbine
7. To determine overall efficiency of Francis turbine
8. To determine overall efficiency of Kaplan turbine
9. To determine overall efficiency of Centrifugal pump
10. To determine overall efficiency of Reciprocating pump
11. To Verify Bernoulli's equation
12. To make a pattern for a given casting
13. To prepare a mould cavity for a given casting
14. To demonstrate the cut section model of IC engine

Note: A minimum of ten experiments to be done.

References:

1. Frank ward sterling “Internal combustion engine manual”, NabuPublishers, First Edition, (2010)
2. Mohammed Khaleemuddin “Fluid mechanics”, Oxford publications, First edition (2016)
3. PN Rao “Manufacturing Technology”, Vol-I, McGraw hill publications, Fifth edition(2018)

Course code	Course Title	Core/ Elective					
		Core					
4ES252CE	Engineering Graphics Lab	L	T	P/D	Credits	CIE	SEE
		1	0	4	3	40	60

Prerequisite:

Course Objectives: The objective of this course is to make the student

- To inculcate a good understanding of engineering drawing conventions & their significance.
- To impart skills to make technical drawings.
- To impart capability to identify and draw engineering curves to scale.
- To develop skills of drafting projections of standard geometric entities (points, lines, planes, solids with section).
- To develop 3D visualization skills to understand 2D drawings in 3D space & vice versa

Course Outcomes:

- After completion of the course, the student will be able to
- **CO-1**. Use appropriate instruments and apply the engineering conventions to draw engineering objects to scale on a drawing sheet.
- **CO-2.** Make use of AutoCAD software to draft engineering curves like conics, involutes & cycloids.
- **CO-3.** Make use of AutoCAD software to draft projections of lines, planes, solids and determine unknown lengths & angles in lines.
- **CO-4.** Make use of AutoCAD software to draft sections of solids and development of surfaces.
- **CO-5.** Convert isometric views to orthographic & vice versa.

Sheet No	Description of the Topic	Contact Hours	
		Lecture	Drawing
1.	Principles of Engineering Graphics and their significance, Usage of drawing instruments. Lettering	1	2
2.	Conic Sections – I Construction of ellipse, parabola and hyperbola given focus and eccentricity.	1	2
3.	Conic Sections – II Construction of ellipse (given major and minor axis), parabola (given base and height), rectangular hyperbola.	1	2
4.	Cycloids (cycloid & epicycloid) and	1	2

	Involutes (involute of triangle, square & circle)		
5.	Scales (plain & diagonal scales)	1	2
6.	Introduction to AutoCAD Basic commands and simple drawings.	1	2 + 2
7.	Orthographic Projections - Projections of points placed in different quadrants.	1	2
8.	Projections of straight lines. Lines parallel to both the planes, line perpendicular to or inclined to one reference plane, Line inclined to both the reference planes.	1	2+2
9.	Projections of planes – I: Orthographic projection of planes in different positions	1	2+2
10.	Projections of solids – I: Regular Prism/Pyramids, cylinders & cones, Projections of solids in simple positions.	1	2
11.	Projection of solids – II: Projections of solids when the axes inclined to one or both the reference planes.	1	2
12.	Section of solids – I: When the sectional plane is parallel or perpendicular to one reference plane.	1	2
13.	Section of solids – II: When the sectional plane is inclined to one reference plane.	1	2
14.	Development of surfaces-I Prism and Cylinders	1	2
15.	Development of Surfaces-II Pyramids and Cones	1	2
16.	Isometric projection – I: Conversion of 3D Isometric/oblique views of compound solids to 2D Orthographic views	1	2

17.	Isometric projection – II: Isometric projection of Stacked regular solids" regular solids being prisms, pyramids, spheres & their frustum	1	2

Note: A minimum of Fourteen Drawing Work Sheets to be completed.

Text Books:

T1. Engineering Drawing, ND Bhatt, Charotar Publication, 53rd Edition, 2014 (All sheets)

T2. Engineering Drawing, KL Narayana & P Kannaya, Scitech publications, 3rd Edition, 2013 (All sheets)

References:

R1 Engineering Drawing and Graphic Technology, T.E French et al, Mc Graw Hill International, 14 th Edition, 2012

R2. Engineering Drawing Graphics & AutoCAD, K Venugopal, New Age International, 5 th Edition, 2009

R3: Engineering Drawing with a primer on AutoCAD, AN Siddique et al, Prentice Hall of India Ltd., Eastern Economy Edition, 2004

R4: Engineering Drawing, Basant Agrawal & C M Agrawal, McGraw Hill Publications, Third edition 2019