With effect from the academic year 2022-2023

DEPARTMENT OF COMPUTER SCIENECE AND ENGINEERING

Scheme of Instruction

and

Syllabus of

B.E. (Artificial Intelligence & Machine Learning)

I &II Semesters

2022-23

UNIVERSITY COLLEGE OF ENGINEERING
(Autonomous)
Osmania University
Hyderabad – 500 007, TS, INDIA

INSTITUTE

Vision

The Vision of the institute is to generate and disseminate knowledge through harmonious blending of science, engineering and technology. To serve the society by developing a modern technology in students‟ heightened intellectual, cultural, ethical and humane sensitivities, fostering a scientific temper and promoting professional and technological expertise.

Mission

- To achieve excellence in Teaching and Research
- To generate , disseminate and preserve knowledge
- To enable empowerment through knowledge and information
- Advancement of knowledge in Engineering, Science and Technology
- Promote learning in free thinking and innovative environment
- Cultivate skills, attitudes to promote knowledge creation
- Rendering socially relevant technical services for the community
- To impart new skills of technology development
- To inculcate entrepreneurial talents and technology appreciation programmes
- Technology transfer and incubation

DEPARTMENT

Vision

To be a leading academic department in the area of Computer Science and Information Technology with Learning and research processes of global standards that contribute to innovations in various scientific disciplines and societal needs and also motivate young engineers to face future technological challenges.

Mission

- To achieve excellence in Teaching in the field of Computer Science and Engineering
- To promote learning in free thinking and innovative environment with the state-of-art-technologies
- To cultivate skills to promote information and ccommunication technology
- Advancement of Knowledge in various specializations of Computer Science and Engineering
- To impart skills to develop technical solutions for societal needs and inculcate Entrepreneurial talents

Programme Educational Objectives (PEO):

PEO1	To provide the necessary background in Basic Sciences and Humanities to build creative Engineering solutions.
PEO2	To train students to acquire problem solving skills in the area of Computer Science & Engineering, Artificial Intelligence, Machine Learning and Applications; in order to pursue higher studies and to be successful in their career
PEO3	To expose the students to industry practices for building practical applications using Software Tools, Artificial Intelligence & Machine Learning Pipe Lines
PEO4	To provide students with soft skills, managerial skills, high standards of ethics, and life-long learning capabilities.

Programme Outcomes (PO):

The graduating students of the Computer Science and Engineering program will be able to:

PO1	Apply knowledge of logic, mathematics and computer science & engineering fundamentals.
PO2	Identify, formulate, design, implement, and evaluate a complex computer- based systems, omponents, processes to meet desired user requirements using algorithmic, Artificial Intelligence & Machine Learning approaches.
PO3	Analyze and interpret data in different domains and extract useful insights
PO4	Take up research in a systematic and organized manner and employ critical thinking to obtain meaningful outcomes
PO5	Function effectively as an individual, as a member or leader in diverse & multidisciplinary teams and manage projects.
PO6	Become a professional who can understand contemporary real project challenges and provide an ideal, sustainable, ethical solutions that benefit society and enhance lifelong learning

SCHEME OF INSTRUCTION AND EXAMINATION
B. E (ARTIFICIAL INTELIGENCE & MACHINE LEARNING)

I – Semester

SNo	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1		Induction Program	3 weeks							
2	**BS101 MT**	Engineering Mathematics-I	3	0	-		3	40	60	3
3	**ES101 CS**	Programming for Problem Solving	3	0	-		3	40	60	3
4	**ES101EE**	Basic Electrical Engineering	3	0	-		3	40	60	3
5	**PC 101 CS**	Digital Logic Design	3	0	-		3	40	60	3
6	**HS 101 EG**	Communicative English	3	0	-		3	40	60	3
Practicals										
7	**ES151CS**	Programming for Problem Solving Lab	-	-	3		3	25	50	1.5
8	**ES151EE**	Basic Electrical Engineering Lab	-	-	2		3	25	50	1
9	**HS151EG**	Communicative English Lab	-	-	2		3	25	50	1
		Total	**15**	**0**	**07**			**275**	**450**	**18.5**

BS 101 MT	**ENGINEERING MATHEMATICS – I**					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	To Introduce the Concepts of Sequences, Series and their properties
2	To Study the Concepts of Mean Value Theorems
3	To Introduce the Concepts of Functions of Several Variables and its Applications
4	To Introduce the Concepts of Multiple Integrals and its applications
5	To Study Vector Differential and Integral Calculus.

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Find the Nature of Sequences and Series
CO-2	To Apply the Mean Value Theorem and to Find the Roots of Continues Functions
CO-3	To find the Maximum and Minimum Values of Multiple Variable Functions
CO-4	Use the Knowledge of Multiple Integrals in Finding the Area and Volume of any Region Bounded by Given Curves
CO-5	Apply the Knowledge of Vector Calculus to Find Line, Surface and Volume Integrals.

UNIT – I

Sequences and Series:

Sequences, Series, General properties of series, Series of positive terms, Comparison tests, P-test, tests of Convergence, D'Alembert's ratio test, Cauchy's n^{th} root test, Raabe's test, Integral test, Alternating series, Series of positive and negative terms, Absolute convergence and Conditional convergence.

UNIT – II

Calculus of one variable:

Rolle's Theorem, Lagrange's, Cauchy's mean value theorems (without proof) Taylor's series, Curvature, Radius of curvature, Circle of curvature, Envelope of a family of curves, Evolutes and Involutes,

UNIT– III

Multi variable 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 values of functions two variables, Lagrange's method of multipliers.

UNIT – IV

Multivariable Calculus (Integration):

Double integrals, Change of order of integration, Triple integrals, Change of variables in integrals and applications-areas and volumes, Beta and Gamma functions.

UNIT –V

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.

Suggested Reading:

1	R.K.Jain & S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publications,4th Edition 2014.
2	Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley, 9th Edition, , 2012.
3	B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition, 2014.
4	G.B.Thomas , Maurice Weir and Joel Hass, *Thomas' Calculus* , Peterson, 12th Edition,2010
5	B.V. Ramana, *Higher Engineering Mathematics*, 23rd reprint, 2015.
6	N.P.Bali and M. Goyal, A text book of Engineering Mathematics, Laxmi Publications 2010
7	H.K. Dass, Er. Rajnish Varma, Higher Engineering Mathematics, Schand Technical Third Edition

ES 101 CS	**PROGRAMMING FOR PROBLEM SOLVING**					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	To introduce the basic concepts of Computing environment, number systems and flowcharts
2	To familiarize the basic constructs of C language – data types , operators and expressions
3	To understand modular and structured programming constructs in C
4	To learn the usage of structured data types and memory management using pointers
5	To learn the concepts of data handling using files

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Explain various functional components in computing environment
CO-2	Develop algorithmic solutions to problems and draw the flow charts
CO-3	Explain and use basic constructs of C in writing simple programs
CO-4	Use standard library functions in C and develop modular programs using user defined functions and structured data types

UNIT – I
Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. **Number Systems**: Binary, Octal, Decimal, And Hexadecimal. **Introduction to C Language -** Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

UNIT – II
Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and Go to statements **Functions:** Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. **Recursion-** Recursive Functions.

Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers

UNIT– III
Preprocessors: Preprocessor Commands **Arrays** - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

UNIT – IV
Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L -value and R-value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments. **Strings** - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions

UNIT –V
Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types. **Input and Output:** Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Suggested Reading:

1	B.A. Forouzan and R.F. Gilberg, "*A Structured Programming Approach in C"* , Cengage Learning, 2007
2	Kernighan BW and Ritchie DM, "*The C Programming Language"*, 2nd Edition, Prentice Hall of India, 2006.
3	Rajaraman V, "*The Fundamentals of Computer"*, 4th Edition, Prentice-Hall of India, 2006.
4	Dromey " *How to Solve it By Computer* , Pearson education, 2006

ES101EE	**BASIC ELECTRICAL ENGINEERING**					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	To understand the fundamentals of DC and AC electrical circuits.
2	To understand the working principles of DC motor, DC generator, Transformers and single phase induction motors.
3	To understand working principles of protection devices used in electrical circuits.

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Analyze the performance of simple electrical circuits exciting with DC and AC excitations.
CO-2	Apply different theorems to solve complicated electrical circuits to obtain the current, voltage and power.
CO-3	Understand the main components, Characteristics, applications of different DC and AC electrical machines used in industry
CO-4	Understand the importance of protective devices and their rating used in electrical circuits
CO-5	Obtain the overall understanding of basic electrical circuits and appliances required for any industry.

UNIT – I
DC Circuits : Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

UNIT – II
AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, and RL, RC, RLC combinations (series only). Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT– III
Transformers and 3-ph Induction Motors **Transformers :** Electromagnetic induction, Faradays laws, Statically induced emf, Lenz law, BH characteristics, ideal and practical transformer, losses and efficiency, Auto-transformer and three-phase transformer connections.

Three Phase Induction motor: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, squirrel cage IM, slip-ring IM, Applications

UNIT – IV

Single-phase induction motor & DC Machines

Single-phase induction motor: Construction and principle of operation, Capacitor start & capacitor run motor, applications

DC Generators: Dynamically induced emf, Flemming's Right hand and Left hand rules, Construction and principle of operation of DC generator, EMF equation, Types of DC Generators, OCC characteristics, applications

UNIT –V

Electrical Installations : Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Reading:

1	J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2002.
2	J.B.Gupta, "Utilization of Electric Power and Electric Traction" S.K.Kataria & Sons Publications,2010
3	Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, " Basic Elactrical Engineering" Tata Mc Graw Hill, Publications,2009
4	Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc.,1995.

PC101CS	**DIGITAL LOGIC DESIGN**					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	To introduce concepts of Boolean logic, Postulates and Boolean Theorems.
2	To understand the logic minimization methods and to solve the Boolean logic expressions
3	To understand how to design the combinational and sequential circuits.
4	To understand the state reduction methods for sequential circuits.

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	To apply the concepts of Boolean logic, Postulates and Boolean Theorems to solve the Boolean expressions.
CO-2	To solve the Complex Boolean logic expressions using Minimization methods.
CO-3	To design the combinational circuits using basic gates
CO-4	To apply state reduction methods to solve sequential circuits.

UNIT – I
Boolean Algebra: Axiomatic definition of Boolean Algebra Operators, Postulates and Theorems, Boolean Functions, Canonical Forms and Standard Forms, Simplification of Boolean Functions Using Theorems and Karnaugh Map Method.

UNIT – II
Minimization of Switching Functions: Quine-McCluskey Tabular Method, Determination of Prime Implicants and Essential Prime Implicants. **Combinational Logic Design:** Single-Output and Multiple-Output Combinational Circuit Design, AND-OR, OR-AND and NAND/NOR Realizations, Exclusive-OR and Equivalence functions.

UNIT– III
Design of Combinational Logic Circuits: Gate Level design of Small Scale Integration (SSI) circuits, Modular Combinational Logic Elements- Decoders, Encoders, Priority Encoders, Multiplexers and De-multiplexers. **Design of Integer Arithmetic Circuits using Combinational Logic**: Integer Adders – Binary Adders: Half adder, Full adder, Subtractors: Half subtractor and Full subtractor

UNIT – IV
Design of Combinational Circuits using Programmable Logic Devices (PLDs): Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs), Programmable Array Logic (PAL) devices. **Introduction to Sequential Circuit Elements:** Latch, Various types of Flip-Flops and their Excitation Tables.

UNIT –V
Models of Sequential Circuits: Moore Machine and Mealy Machine, Analysis of Sequential Circuits, State Table and State Transition Diagrams. **Design of Sequential Circuits**: Counters, Methods for Reduction of State Tables and State Assignments.

Suggested Reading:

1	M Morris Mano, *Digital logic and Computer Design*, Pearson Education India, 2016.
2	M Morris Mano and Michael D Ciletti, *Digital Design*, Prentice Hall of India, Sixth Edition, 2018

HS101EG	**COMMUNICATIVE ENGLISH**					
Pre-requisite	English proficiency above B1 level as per the CEFR (Common European Framework of Reference) for languages		**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40Marks	

Course Objectives :	
1	Communicate clearly, accurately and appropriately using correct grammar and vocabulary
2	Write an effective paragraphs and essay using devices of coherence & cohesion
3	Write business letters and emails
4	Demonstrate the ability to employ a range of critical to inferential reading.
5	Employ active and passive voice in engineering and scientific contexts to compile technical reports

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Heighten the awareness of correct usage of English grammar and vocabulary in writing and speaking besides improving their fluency and comprehensibility
CO-2	Develop their ability as critical readers and writers and will produce paragraphs independently on any context with coherence
CO-3	Draft effective business letters and emails
CO-4	Exercise critical reading skills by enhancing the quality of life and to support lifelong learning.
CO-5	Will produce short reports using the drafting process

UNIT - I
Importance of listening, Importance of reading, Importance of communication, types of communication, Discourse markers & linking words, Homonyms, Homophones, Homographs , Concord

UNIT - II
Types of listening, Reading skills-skimming, scanning, intensive and extensive reading, Communication barriers, Paragraph & Precise writing, One word substitutes, Tenses

UNIT - III
Dos and don'ts of listening, Types of comprehension questions, Styles of communication Essay writing, Root words, Active and Passive voice

UNIT- IV
Listening for specific purposes, Critical reading passages, Proverb expansion through JAM, Letter writing, Email writing, Synonyms, Antonyms, Common errors-I

UNIT - V
Listening to various texts –contd…(in language laboratory) Inferential reading passages, Effective presentations, Report writing , Idioms & Phrases, Common Errors-II

Suggested Reading

1	Ashraf, M Rizvi. Effective Technical Communication. Tata McGraw-Hill, 2006
2	Languageand LifeASkillsApproach,OrientBlackSwan,2018
3	MichaelSwan, PracticalEnglishUsage. OUP,1995.
4	Meenakshi Raman and Sangeetha Sharma. Technical Communication: Principles and Practice 2nd Edition, Oxford University Press, 2011
5	Singer F L. (1975). *Engineering Mechanics Statics and Dynamics*, 3rd Edition, Harper Collins International Edition.

ES151CS	**PROGRAMMING FOR PROBLEM SOLVING LAB**					
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	2	1
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives :	
1	To use tools available under LINUX for C programming
2	To gain hands-on experience on basic constructs of C programming
3	To formulate problems and implement algorithmic solutions in C
4	To write modular programs in C using structure programming techniques and data files.

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Write, compile and debug C programs in Linux environment
CO-2	Write simple programs using control structures, user defined functions and data manipulation using arrays
CO-3	Use standard C library functions to develop modular programs in C

1. Introducing to programming Environment(Linux commands, editing tools such as vi editor, sample program entry, compilation and execution)
2. Write programs using arithmetic, logical, bitwise and ternary operators.
3. Write programs simple control statements : Roots of a Quadratic Equation, extracting digits of integers, reversing digits ,finding sum of digit ,printing multiplication tables, Armstrong numbers, checking for prime, magic number,
4. Sin x and Cos x values using series expansion
5. Conversion of Binary to Decimal, Octal, Hexa and Vice versa
6. Generating a Pascal triangle and Pyramid of numbers
7. Recursion: Factorial, Fibonacci, GCD
8. Finding the maximum, minimum, average and standard deviation of given set of numbers using arrays
9. Reversing an array ,removal of duplicates from array
10. Matrix addition , multiplication and transpose of a square matrix .using functions
11. Bubble Sort, Selection Sort ,
12. Programs on Linear Search and Binary Search using recursion and iteration

13. Functions of string manipulation**:** inputting and outputting string , using string functions such as strlen( ),strcat( ),strcpy( )……etc
14. Writing simple programs for strings without using string functions.
15. Finding the No. of characters, words and lines of given text file
16. File handling programs : student memo printing
17. Create linked list, traverse a linked list, insert a node, delete a node, reversing list .

ES151EE	**BASIC ELECTRICAL ENGINEERING LAB**					
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	2	1
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives :	
1	To understand the fundamentals of DC and AC electrical circuits.
2	To understand the working principles of DC motor, DC generator, Transformers and single phase induction motors.
3	To understand working principles of protection devices used in electrical circuits.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Get an exposure to common electrical components and their ratings. Make electrical connections by wires of appropriate ratings.
CO-2	Understand the usage of common electrical measuring instruments.
CO-3	Analyze the performance of AC and DC circuits with appropriate operating conditions.
CO-4	Understand the basic characteristics of transformers and electrical machines.
CO-5	Obtain the overall understanding of basic electrical circuits and appliances required for any industry.

Suggested List of Laboratory Experiments/Demonstrations:

I - Cycle

Demonstration: Basic safety and precautions - Introduction and use of measuring Instruments

Exp 1. Verification of Kirchhoff's Laws

Exp 2. Verification of Thevenin's & Norton's Theorems

Exp 3. Steady-state and transient time-response of R-C circuit to a step change in voltage.

Exp 4. Sinusoidal steady state response of R-L and R-L-C circuits- impedance calculation and verification

Exp 5. Measurement of three-phase power in balanced three-phase circuits using Two-Wattmeter method

II - Cycle

Demonstration: cut-out sections of machines: DC machine, induction machine, synchronous machine and single-phase machine

Exp 6. Load test on single phase transformer: Measurement of primary and secondary voltages, currents and power

Exp 7. Three-phase Transformer: Star and Delta connections. Voltage and current relationship

Exp 8. Torque-speed characteristics of separately excited DC motor

Exp 9. Synchronous speed of two-pole and four-pole, three-phase induction motor, Speed reversal by change of phase-sequence

Exp 10. Magnetization curve of a separately excited DC Generator

Suggested Reading:

1	J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2002
2	J.B.Gupta, "Utilization of Electric Power and Electric Traction" S.K.Kataria & Sons Publications,2010
3	Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, " Basic Electrical Engineering" Tata McGraw Hill, Publications, 2009
4	Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc.,1995.

HS151EG	**COMMUNICATIVE ENGLISH LABORATORY**					
Pre-requisites	English proficiency above B1 level as per the CEFR (Common European Framework of Reference) for languages.		**L**	**T**	**P**	**C**
			2	-	-	1
Evaluation	**SEE**	50 Marks	**CIE**		2 5 Marks	

Course Objectives :	
1	Learn IPA and the transcription; using dictionary to decode phonetic transcription overcome the difficulties with sounds of English; self learning through CALL
2	Demonstrate use of English speech sounds, stress and intonation in day-to-day Situations/conversations/interactions
3	Introducing oneself in various contexts : Social, Academic and Professional
4	Improve listening and understand various accents – GIE, RP and GenAm
5	Learn to participate in various contexts – extempore, Group Discussion, and presentations

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Sensitize the nuances of English speech sounds with computer-assisted individualized and independent language learning
CO-2	Use better pronunciation and right accent and intonation
CO-3	Use functional English
CO-4	Listen and speak effectively by understanding various accents
CO-5	Increase possibilities of job prospects and communicate confidently

I
English Sound system: Sounds of English, Vowels, Consonants, using dictionary to decode phonetic transcription, transcription exercises with the help of CALL (Computer Aided Language Lab)

II
Stress and Intonation: Syllable, Word stress and its importance, Intonation-falling and rising tone

III
Introductions and Presentation skills: In social, formal, academic and professional contexts; JAM, Picture description/perception; Role plays: use of dialogues in various situations and settings; Occasions to give various presentations with emphasis on visual aids and body language.

IV
Listening Comprehension: Listening to various accents, listening practice and exercises.

V
Group Discussions: Types of group discussions; case studies; dos and don'ts of group discussion-intensive practice.

Suggested Reading/Software:

1	T.Bala subramanian. A Text book of English Phonetics for Indian Students. Macmillan,2008.
2	J. Sethi et al., A Practical Course in English Pronunciation (with CD). Prentice Hall of India, 2005.
3	Hari Mohan Prasad. How to Prepare for Group Discussions and Interviews. Tata McGraw Hill, 2006
4	English for Engineers and Technologists (Combined edition , Vol. 1 and 2) Orient Blackswan 2010.
5	**Software:** 1. Sky Pronunciation Suite 2. Study Skills 3. English Pronunciation Dictionary –CALD

SCHEME OF INSTRUCTION AND EXAMINATION
B. E (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
II – Semester

SNo	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory										
1	**BS201MT**	Engineering Mathematics-II	3	0	-		3	40	60	3
2	**BS201PH**	Applied Physics	3	0	-		3	40	60	3
3	**BS201 CH**	Engineering Chemistry	3	0	-		3	40	60	3
4	**PC201CS**	*Discrete Mathematics*	3	0	-		3	40	60	3
Practicals										
5	**BS251PH**	Applied Physics Lab	-	-	3		3	25	50	1.5
6	**BS251CH**	Engineering Chemistry Lab	-	-	3		3	25	50	1.5
7	**ES251CE**	Engineering Graphics	2	-	4		3	25	50	4
8	**ES251ME**	Workshop Practice	-	-	6		3	25	50	3
		Total	**14**	**0**	**16**			**260**	**440**	**22**

BS201MT	**ENGINEERING MATHEMATICS-II**					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	To sstudy Matrix Algebra and its use in solving System of Linear Equations and ssolving Eigen Value Problems
2	To study the First Order Linear and Non-Linear Ordinary Differential Equations
3	To study the Higher Order Linear Ordinary Differential Equations with Variable and Constant Coefficients
4	To introduce the Concept of Functions of Complex Variable and their Properties
5	To sstudy the Values of Improper Integers using Residue Theorem.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Solve System of Linear Equations and Eigen Value Problems
CO-2	Find the solution of First Order Ordinary Differential Equations
CO-3	Identify the solution of Higher Order Ordinary Differential Equations
CO-4	Determine the Analyticity and Integrals of Complex Functions
CO-5	Evaluate Complex and Real Integrals Using Residue Theorem.

UNIT – I

Matrices :

Elementary row and column operations, Rank of a matrix, Echelon form, System of linear equations, Linearly dependence and independence of vectors, Linear transformation, Orthogonal transformation, Eigen values, Eigenvectors, Properties of Eigen values, Cayley-Hamilton theorem, Quadratic forms, Diagonalization of Matrices, Reduction of quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms.

UNIT – II

First Order Ordinary Differential Equations:

Exact first order differential equations , Integrating factors, Linear first order equations, Bernoulli's , Riccati's and Clairaut's differential equations ,Orthogonal trajectories of a given family of curves.

UNIT– III
Differential Equations of Higher Orders : Linear Independence and Dependence, Solutions of Second and Higher Order Linear Homogeneous Equations with Constants Coefficients, Method of Reduction of order for the Linear Homogeneous Second Order Differential Equations with Variable Coefficients , Solutions of Non- Homogeneous Linear Differential Equations, Method of Variation of Parameters, Solution of Euler-Cauchy Equation, Simultaneous Linear Differential Equations.

UNIT – IV
Functions of a Complex Variable: Limits and Continuity of a Function, Differentiability and Analyticity, Elementary Analytic Functions, Necessary and Sufficient Conditions for a Function to be Analytic, Cauchy-Riemann Equations in Polar form, Harmonic Functions, Complex Integration, Cauchy's Integral Theorem, ExtensionofCauchy'sIntegralTheoremformultiplyconnectedregions,Cauchy'sIntegral Formula, Cauchy's Formula for Derivatives.

UNIT –V
Residue Calculus: Power Series, Taylor's Series, Laurent's Series, Zeros and Singularities, Residues, Residue Theorem, Evaluation of Real Integrals Using Residue Theorem, Bilinear Transformations **(All Theorems without Proof).**

Suggested Reading:

1	R.K. Jain & S.R.K. lyengar, *Advanced Engineering Mathematics*, Narosa Publications, 4th Edition, 2014.
2	Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley , 9th Edition, 2012.
3	Dr.B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition, 2014.
4	Dr.M.D.Raisinghania, *Ordinary and Partial differential equations*, S.CHAND, 17thEdition 2014.
5	James Brown, R.V Churchill, *Complex Variables and applications*, Mc Graw Hill 9th Edition 2013
6	N. Bali, M.Goyal, A text book of *Engineering Mathematics*, Laxmi publications, 2010
7	H.K. Dass, Er. Rajnish Varma, *Higher Engineering Mathematics*, Schand Technical Third Edition

BS201 PH	**Applied Physics**					
	(Basic Science)					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	Understand the basic concepts of matter waves and experimental implications. To understand Schrodinger's wave equation and its implications.
2	Appraise significance of stimulated emission and laser light production. Subsequently propagation of laser light through waveguides.
3	Understand the formation of energy bands and classification of the solids based on the band theory. To understand the concept of superconductors.
4	Understand implications of basic laws of electricity and magnetism to know the significance of techniques of Modern Optics.
5	Sensitize towards nanomaterial and appraise the various characterization

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Enrich and ***understand*** concepts and real time applications of mater waves and implications of matter waves as quantum mechanics evolution.
CO-2	Understand construction and working of the laser systems and ***apply*** them to propagate through fiber optical cable as cutting edge application.
CO-3	***Analyze*** semiconducting materials, superconducting materials, basic laws of electricity and magnetism to know the significance of techniques of Modern
CO-4	***Evaluate*** the different material characterization techniques.
CO-5	Appreciate significance of nanomaterials and ***create*** desired properties by using various methods of synthesis processes.

UNIT – I
Matter waves: de-Broglie hypothesis – properties of matter waves – Davison and Germer's experiment – G.P. Thomson experiment – Uncertainty principle.
Quantum Mechanics: Physical significance of wave function – Schordinger's time independent and time dependent wave equation – Particle in 1-D box – Wave function, Probability function, energy level.

UNIT – II
Electromagnetic Theory: Basic laws of electricity and magnetism – Derivation of Maxwell's equations in integral and differential forms - Conduction and displacement current – modification of Ampere's law - Relation between Displacement Current (D), Electric Intensity (E) and Polarization (P) - Equation of plane wave in free space – Poynting theorem.
Modern Optics: Interference – Newton's Rings by reflected light – Experimental arrangement – Types of diffraction – diffraction grating (Conditions of maxima and minima) – Resolving power of grating –Types of polarized light – Polarization by reflection – Malus

law – Double refraction – Nicol's Prism. – Optical activity and polarimeter.

UNIT – III
. **Lasers:** Characteristics of lasers – Absorption of radiation, spontaneous and stimulated emission of radiation - Einstein's coefficients and their relation - Population inversion– Types of lasers - Ruby laser, Helium-Neon laser and Semiconductor laser – Applications of lasers.
Fibre Optics: Construction of an optical fiber – Propagation of light through an optical fiber - Acceptance angle - Numerical aperture – Types of optical fibers (Based on number of modes and refractive index profile) – Fibre drawing process (double crucible method) - Applications of optical fibers.

UNIT – IV
Semiconductor Physics: Classification of materials based on band theory - Kronig-Penney model (qualitative treatment) - Energy band formation in solids - Intrinsic and Extrinsic semiconductors - Concept of a hole - Carrier concentration and conductivity in intrinsic semiconductors – Formation of P-N junction diode, Zener diode, Light Emitting Diode and their I-V characteristics – Thermistor and its characteristics - Hall effect and its applications.
Superconductivity: Introduction - General properties of super conductors - Meissner effect - Type I and Type II superconductors - BCS theory (qualitative) – Introduction to High T_c superconductors - Applications of superconductors.

UNIT – V
Nanomaterials: Introduction - Properties of materials at reduced size - Surface to volume ratio – Quantum confinement effect – Classification of nanomaterials - Preparation of nanomaterials: bottom–up methods (e.g., Sol Gel method and Chemical Vapor Deposition method), Top-down methods (e.g., Ball milling method) - Basic ideas of carbon nanotubes – Applications of nanomaterials and their health hazards.
Techniques for Characterization: Morphological studies of materials – X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM). Spectroscopic studies of materials – Fourier Transform Infrared (FTIR), Beer's law, UV-Visible and Raman spectroscopy.

Suggested Reading:

1	M.S. Avadhanulu and P.G. Kshirasagar - Engg. Physics, S.Chand & Co.
2	C.M. Srivastava and C. Srinivasan - Science of Engg. Materials, New Age International.
3	R.K. Gour and S.L. Gupta – Engg. Physics, Dhanpat Rai Publications.
4	B.K. Pandey and S.Chaturvedi – Engineering Physics, Cengage Learning.
5	A.K Bhandhopadhya - Nano Materials, New Age International.
6	S.K. Sharma, et al., Hand book of Material Characterization – Springer.

BS201CH	**ENGINEERING CHEMISTRY**					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	Understand the fundamentals of application of water chemistry in industry and applications of principles of corrosion to minimize corrosion and associated problems.
2	Gain the knowledge of application of Electrochemical principles to construct the electrodes for various purposes and the criterion for determination of feasibility of processes.
3	Analyze and interpret the structure of molecules by applying basic principles of spectroscopy.
4	Acquire knowledge of biopolymers used for medical purposes with various applications.
5	Grasp the latest application of nanotechnology in various industries and manufacturing different kinds of batteries.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Attains knowledge about the disadvantages of hard water for domestic and industrial purposes. Also teaches the techniques of softening of hard water and treatment of water for drinking purpose and throws light on prevention of corrosion
CO-2	Rationalize bulk properties and processes using thermodynamic considerations.
CO-3	Distinguishes the ranges of electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
CO-4	Analyze the basic methods of reactions of organic molecules and study their properties.
CO-5	Knowing about different batteries, fuel cells and their applications of nanomaterials.

UNIT – I

WATER CHEMISTRY AND CORROSION (10L):

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 and Reverse Osmosis methods. Boiler troubles-scales and sludges formation-causes, effects and prevention. Numerical problems. Specifications of potable water. Water treatment for drinking purpose-coagulation, sedimentation, filtration, sterilization by Chlorination.

Corrosion-causes and its effects. Types of corrosion-Dry or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism. Electrochemical corrosion and its types. Factors influencing rate of corrosion.

Corrosion control methods: Cathodic protection methods- Sacrificial anodic and impressed current cathodic protection methods. Surface coating methods: Hot dipping-Galvanizing and Tinning.

UNIT – II

THERMODYNAMICS AND ELECTRO CHEMISTRY(10L):

Thermodynamics: Terminology of Thermodynamics, thermodynamic processes, Work done in Reversible isothermal and adiabatic processes, efficiency of heat engine by Carnot cycle, concept of entropy, physical significance of entropy, Work function, Gibbs free energy and their significance, variation of free energy with temperature and pressure, criteria of spontaneity in terms of entropy and free energy-Numerical.

Electrochemistry: Electrochemical cells- Electrolytic and Galvanic cells-notation, cell reaction and cell potentials. Types of electrodes-Calomel, Quinhydrone and Glass electrodes. Determination of P^H of a solution by using Quinhydrone electrode. Thermodynamics of emf of cells-Nernst equation and its derivation. Application of Nernst equation to electrode potential and emf of cells. Numericals.

Principles and applications of Potentiometric titrations.

UNIT– III

MOLECULAR STRUCTURES AND SPECTROSCOPY (10L):

Molecular Orbital Theory. Linear Combination of Atomic Orbital's (LCAO).Molecular Orbital energy level diagrams of diatomic molecules-O_2,N_2 and NO.

Description of Electromagnetic spectrum.

Principles of UV-Visible Spectroscopy: Statement of Beer-Lambert Law. Absorption and intensity shifts: Bathochromic, Hypsochromic, Hyper chromic and Hypo chromic shifts with one example each. Principle and applications of UV Sensors.

IR Spectroscopy: Principle of IR Spectroscopy.IR active and IR inactive molecules (two examples each). Principle and applications of IR Sensors.

NMR Spectroscopy: Principle of H^1-NMR Spectroscopy. Multiplicity, Chemical Shift.

Principle and Applications of MRI.

UNIT – IV
Organic Reactions: Introduction to Addition, Substitution and Elimination reactions. Addition to C=C and C=O, Nucleophilic substitution in aliphatic system: SN^1 and SN^2 mechanism, Elimination reactions: E^1 and E^2 mechanism.
Polymers: Introduction, Classification of polymers -Plastics, Fibres and Elastomers. Preparation, properties and engineering applications of the following polymers: Plastics: PVC and Bakelite Fibers: Nylon 6:6, and Dacron. Elastomers: Buna-S and Butyl Rubber. **Conducting polymers**: Introduction. Mechanism of conduction in polymers. Intrinsic conducting polymers: Poly-acetylene and poly-aniline. Applications of conducting polymers

UNIT –V
Energy Sources and Nanomaterials (8L) **Batteries:** Primary batteries-Zn carbon battery. Secondary batteries-Pb- Acid battery and Ni-Cd battery. Lithium-ion batteries- advantages and applications. **Fuel cells**: Concept of fuel cells and their advantages. Construction and working of H_2-O_2 and methanol-Oxygen fuel cells. **Solar cells**: Concept of solar energy conversion, photovoltaic cells.
Nanomaterials: Introduction. Properties of nanomaterials. Synthesis of nanomaterials-Top down, Bottom up approach and Sol-gel method. Applications of nanomaterials.

Suggested Reading:

1	Jain & Jain, *Engineering chemistry,* Dhanpat Rai publishing Co.,16th Edition
2	B.L.Tembe,Kamaluddin and M.S.Krishnan, Engineering Chemistry(NPTELWeb-book)
3	Prashanth Rath, Engineering Chemistry, Cengage Learning.
4	M.J.Sienko and R.A.Plane, Chemistry: Principles and Applications, MGH Publishers.
5	B.H.Mahan, University Chemistry, Pearson Publishing Co., 4th Edition.
6	C.N. Banwell, *Fundamentals of Molecular Spectroscopy*, TMH

PC201CS	DISCRETE MATHEMATICS					
Pre-requisites			**L**	**T**	**P**	**C**
			3	-	-	3
Evaluation	**SEE**	60 Marks	**CIE**		40 Marks	

Course Objectives :	
1	Use mathematically correct terminology and notation.
2	Construct correct direct and indirect proofs.
3	Use division into cases in a proof.
4	Use counterexamples.
5	Apply logical reasoning to solve a variety of problems

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives
CO-2	For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference
CO-3	For a given a mathematical problem, classify its algebraic structure
CO-4	Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
CO-5	Develop the given problem as graph networks and solve with techniques of graph theory.

UNIT – I

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic

UNIT – II

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination, generating functions.

UNIT– III
Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. **Proof Techniques**: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

UNIT – IV
Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation,Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups,

UNIT –V
Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

Suggested Reading:

1	Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw –Hill
2	Susanna S. Epp, Discrete Mathematics with Applications, 4th edition, Wads worth Publishing Co. Inc
3	CL Liu and DP Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw –Hill.

BS251PH	**Applied Physics Lab**					
	(Basic Science)					
Pre-requisites	Strength of Materials		**L**	**T**	**P**	**C**
			-	-	3	1.5
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives :	
The course is taught with the objectives of enabling the student to:	
1	Demonstrate an ability to make physical measurements and understand the limits of precision in measurements.
2	Demonstrate the ability to use experimental statistics to determine the precision of a series of measurements.
3	Demonstrate the ability to understand optical / Semiconducting / dielectric properties of materials.
4	Demonstrate the ability to understand the construction and working of different experiments.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Recognize the transformation concepts into practicals.
CO-2	Use a best fit to create a graph from a series of data points. Students can extrapolate and interpolate.
CO-3	Appreciate the mathematical abilities to meaningful physical conclusions.
CO-4	Develop skills to impart practical knowledge in real time solution and learn to design new instruments with practical knowledge.
CO-5	Understand the link between theory and practicals.

Experiment - I
To calculate the Numerical aperture (NA), acceptance angle of a given optical fibre

Experiment - II
Determination of wavelength of LASER using diffraction grating.

Experiment - III
Verification of Beer’s law.

Experiment - IV
To determine specific rotatory power of a given solution by using Laurent’s Half shade polarimeter.

Experiment - V
To Estimate Radius of curvature of given lens by forming Newton's rings.

Experiment - VI
To determine resolving power of plane grating.

Experiment - VII
Determination of carrier concentration, Mobility and Hall Coefficient of Ge Crystal using Hall Effect Experiment.

Experiment - VIII
To draw the I-V Characteristics of P-N Junction diode and to evaluate the value of potential barrier of the diode.

Experiment - IX
To find the values of Electrical conductivity and energy gap of Ge crystal by Four probe method.

Experiment – X
To determine the constants of A, B and α of given Thermistor.

Experiment - XI
To study V-I characteristics of Light Emitting Diode.

Experiment - XII
To draw the I-V characteristics of Zenor diode.

BS251CH	**ENGINEERING CHEMISTRY LABORATORY**					
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	2	1
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives :	
1	Determination of hardness of water by Complexometry.
2	Estimation of HCL by conductometry and Potentiometry.
3	Verification of Beers law and estimation of $KMnO_4$ by colorimetry.
4	To determine the rate constant of reactions from concentration as a function of Time
5	Synthesis of organic compounds.

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Estimate the strength of acids and ions present in unknown solution by conductometry and potentiometry.
CO-2	Estimate the concentration of ions present in unknown solution from the absorbance by colorimetric analysis.
CO-3	Conduct experiment to estimate hardness of industrial water.
CO-4	Estimate the rate constants of reactions from concentration of reactants/products as a function of time.
CO-5	Synthesize small drug molecules.

SYLLABUS:

Experiment - I
1.Estimation of HCL by Conductometry.

Experiment – II
Estimation of Acetic Acid by Conductometry.

Experiment - III
Estimation of HCL by Potentiometry.

Experiment - IV
Estimation of $KMnO_4$ by Potentiometry.

Experiment – V
Verification of Beer's law. and Estimation of $KMnO_4$ by colorimetry.

Experiment – VI
Verification of Beer's law. and Estimation of $CuSO_4$ by colorimetry.

Experiment - VII
Determination of Partition Coefficient of Acetic acid in BuOH and water.

Experiment - VIII
Synthesis of Acetyl Salicylic Acid (Aspirin).

Experiment - IX
Estimation of Total hardness of water by Complexometry.

Experiment – X
Estimation of Permanent and Temporary hardness of water by Complexometry.

Experiment - XI
Determination of Chloride content of water by Precipitation method.

Experiment - XII
Determination of Order of Acid catalysed Hydrolysis of Methyl acetate reaction.

Suggested Reading:

1	Senior practical Physical chemistry by BD Khosla, A.Ghulati, VC.Garg., ,R.Chand and Co., New Delhi 10^{th} ed. 2001.
2	Laboratory Manual in Engineering Chemistry, S.K. Bhasin and Sudha Rani Dhanpath Rai Publishing Co.,

ES251CE	**ENGINEERING GRAPHICS**					
Pre-requisites			**L**	**T**	**P**	**C**
			2	-	4	4
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives :	
1	Introduction to fundamentals and need of AUTOCAD software drawings
2	Knowledge about various 2D command of AUTOCAD drawing applicable for drawing and printing options.
3	Inputs on basic concepts of engineering drawing, lettering formats for analyzing various topics via. Conic Sections, Involutes.
4	Awareness towards the various types of projections and the drawings of 2D and 3D views.
5	Introduction to fundamentals and need of AUTOCAD software drawings

Course Outcomes :	
On completion of this course, the student will be able to :	
CO-1	Knowledge on the fundamentals of AUTOCAD 2D commands
CO-2	Application of basic principles of drawing and scales for representation of prototype objects
CO-3	Relate the logic of projections to points, straight lines and various views of 2D and 3D objects
CO-4	Capability to imagine and project the developed surface and truncated portion of 3D solids
CO-5	Assimilation of visualization process to efficiently communicate ideas graphically and provide editable solutions

UNIT – I
Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering. Geometrical Constructions (General method only), Conic sections (General and special method); Cycloid, Epicycloid, Hypocycloid and Involute (line, triangle, square, circle, Regular Polygons), Construction of Tangent and Normal to all General methods of Conic sections, Cycloid,
Epicycloid, Hypocycloid and Involutes.

UNIT – II
Overview of Computer Graphics: Listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning, Snap to objects manually and automatically; Drawings straight lines using various coordinate

input entry methods, Applying various ways of drawing circles.

UNIT– III
Commands, initial settings, Drawing basic entities, Modify commands, Text and Dimensioning, Blocks Applying dimensions to objects, applying annotations to drawings. Setting up and use of Layers, Create, edit and use customized layers; Changing line lengths through modifying existing lines (Extend/Lengthen); Printing Options

UNIT – IV
Scales – Reduced and Enlarged scales, Representative Fraction, Problems - Plain, Diagonal and Vernier Scales, Projections of Points – projection when placed in different quadrants Projection of Straight lines– Projections when parallel to one plane, perpendicular to one plane, inclined to one plane and inclined to both planes.

UNIT –V
Projections of Planes – Projections when parallel to one plane, perpendicular to one plane, inclined to one plane and inclined to both planes. Projections of Regular Solids – Projections covering those parallel to one plane, perpendicular to one plane, inclined to one plane and inclined to both planes. Sections of Solids - sectional Views of Right regular solids covering Prism, Cylinder, Pyramid, and Cone Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone.

Suggested Reading:

1	Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2	Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3	Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4	Jeyapoovan T. (2015). *Engineering Graphics Using Autocad*, Vikas Publishing House Pvt. Ltd., Noida, 7th Edition
5	S.N. Lal., Engineering Drawing (2018), M/S. Cengage Learning India Pvt. Ltd., Pratap Gunj, Delhi

ES251ME	**WORKSHOP PRACTICE**					
Pre-requisites			**L**	**T**	**P**	**C**
			-	-	6	3
Evaluation	**SEE**	50 Marks	**CIE**		25 Marks	

Course Objectives :	
1	To learn about different tools used in workshop.
2	To understand the different manufacturing processes.
3	To learn about fabrication of components using different materials.

Course Outcomes :	
On completion of this course, the student will be able to:	
CO-1	Study and practice on tools and their operations of different trades.
CO-2	Practice on manufacturing of components using workshop trades including carpentry, fitting, foundry, smithy, sheet metal &welding
CO-3	Select suitable tools for machining process including facing, turning &knurling
CO-4	Attain basic electrical knowledge for house wiring practice

LIST OF EXPERIMENTS:

1. Carpentry shop

Making of Cross lap joint with Wood,
Making of End Lap/Tee Lap Joint with wood

2. Fitting shop

Making of Step cut with Mild Steel flat,
Making of semicircular and V-cut with Mild Steel flat

3. Sheet metal shop

Making of Funnel with GI Sheet,
Making of Rectangular box with GI Sheet

4. House wiring

Making of Cleat wiring,
Making of casing wiring

5. Welding shop

Making of Butt joint using Arc Welding,
Making of Lap Joint using Arc Welding

6. Machine shop

Making of Step turning on MS cylindrical rod,
Making of Taper turning on MS cylindrical rod

7. Foundry shop

Preparation of casting using single piece pattern,
Preparation of casting using core pattern

8. Smithy shop

Forging of square shape peg from cylindrical work piece,
Forging of square shape L- bend peg from cylindrical work piece

Suggested Reading:

1	Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology",Vol.I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai