NRI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)
(Accredited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

DEPARTMENT OF MECHANICAL ENGINEERING

STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME

I YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A1100101	Professional Communication	3	0	0	3	30	70	100	3
2	20A1100201	Engineering Mathematics-1	3	1	0	4	30	70	100	4
3	20A1100202	Engineering Physics	3	0	0	3	30	70	100	3
4	20A1101401	Engineering Drawing	1	0	4	5	30	70	100	3
5	20A1105301	Programming and Problem Solving with C	3	0	0	3	30	70	100	3
6	20A1100291	Engineering Physics Lab	0	0	3	3	15	35	50	1.5
7	20A1105391	Programming and Problem Solving with C Lab	0	0	3	3	15	35	50	1.5
Total			**13**	**1**	**10**	**24**	**180**	**420**	**600**	**19**

I YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A1200201	Engineering Mathematics-II	3	0	0	3	30	70	100	3
2	20A1200204	Engineering Chemistry	3	0	0	3	30	70	100	3
3	20A1201401	Engineering Mechanics	3	0	0	3	30	70	100	3
4	20A1202301	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100	3
5	20A1203401	Computer Aided Engineering Drawing	3	0	0	3	30	70	100	3
6	20A1203391	Workshop Practice Lab	0	0	3	3	15	35	50	1.5
7	20A1200293	Engineering Chemistry Lab	0	0	3	3	15	35	50	1.5
8	20A1201391	Basic Electrical & Electronics Engineering Lab	0	0	3	3	15	35	50	1.5
9	20A1200191	Communicative English Lab	0	0	3	3	15	35	50	1.5
10	20A1200801	Environmental Sciences	2	0	0	2	30	70*	100	0
Total			**17**	**0**	**12**	**29**	**240**	**560**	**800**	**21**

*** Internal Evaluation**

L - LECTURE T – TUTORIAL P - PRACTICAL
CIA – Continuous Internal Assessment SEA – Semester End Assessment

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20A1100101: PROFESSIONAL COMMUNICATION
(Common to CE, EEE, ME, ECE, CSE, IT, AIML and DS)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: None

Course Objectives

1. To strengthen the lexical ability of the students in different contexts.
2. To expose the students to various sub-skills and strategies of reading and writing – summarizing and paraphrasing.
3. To help the students develop effective writing skills through paragraph writing.
4. To train the students in fundamentals of grammar required to equip them with fluent English.
5. To enable the students to think critically by exposing them to different socio-cultural contexts through various literary texts.

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

CO1	Build the grammatical structures accurately in their real-time situations in either spoken or written form.
CO2	Extend their ability to use vocabulary from various texts along with GRE and technical vocabulary in written and spoken communication
CO3	Comprehend, analyze and evaluate texts critically. Demonstrate effective writing skills in specific forms of written communication (paragraphs, summaries, email and letters.)
CO4	Apply the strategies of reading various texts and graphs, and describe in prose.
CO5	Relate human values and professional ethics in their academic, professional and social lives.
CO6	Summarize the main events of the literary texts, from different socio-cultural contexts, and interpret them critically.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1										1		2
CO2										1		2
CO3										2		2
CO4										1		2
CO5							1	1				2
CO6												2

UNIT–I

1. **Text: A Drawer full of happiness** from "**Infotech English**", Maruthi Publications
2. **Reading:** Skimming text to get the main idea. Scanning to look for specific pieces of information.
3. **Reading for Writing:** Paragraph Writing (specific topics) using suitable Cohesive Devices; Linkers, Sign Posts and Transition Signals; Mechanics of Writing - Punctuation, Capital Letters.
4. **Vocabulary:** Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal Reasoning and Sequencing of Words.
5. **Grammar:** Content Words and Function Words; Word Forms: Verbs, Nouns, Adjectives and Adverbs; Nouns: Countables and Uncountables; Singular and Plural, Basic Sentence Structures; Simple Question Form - WH- Questions; Word Order in Sentences. Collocations (30 Phrases)

UNIT–II

1. **Text: Nehru's letter to his daughter Indira on her birthday** from "**Infotech English**", Maruthi Publications
2. **Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

3. **Reading for Writing**: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
4. **Vocabulary**: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)
5. **Grammar**: Use of Articles and Zero Article; Prepositions; Connectives (25 words)

UNIT–III

Text: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications

1. **Reading**: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical Reading.
2. **Reading for Writing**: Summarizing - Identifying main ideas and Rephrasing what is read; avoiding Redundancies and Repetitions. Letter Writing-types, Format and Principles of Letter Writing. E-mail Etiquette, Writing CVs.
3. **Vocabulary**: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, Sequencing of Words
4. **Grammar**: Verbs, Phrasal Verbs - Tenses; Subject-Verb Agreement;

UNIT–IV

1. **Text: Liking a Tree, Unbowed: Wangari Maathai-biography** from "**Infotech English**", Maruthi Publications
2. **Reading**: Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicative process or display complicated data.
3. **Reading for Writing**: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.
4. **Vocabulary**: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.
5. **Grammar**: Quantifying Expressions - Adjectives and Adverbs; Comparing and Contrasting; Use of Antonyms; Direct and Indirect Speech, Reporting Verbs for Academic Purposes. Idiomatic Expressions (25 Idioms)

UNIT–V

1. **TEXT: Stay Hungry-Stay foolish** from "**InfoTech English**", Maruthi Publications
2. **Reading**: Reading for Comprehension. RAP Strategy Intensive Reading and Extensive Reading Techniques.
3. **Reading for Writing**: Report writing (Significance, Format and Style of Writing Technical Reports)
4. **Vocabulary**: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, Matching Emotions.
5. **Grammar**: Change of Voice; Editing Short Texts – Identifying and Correcting Common Errors in grammar and usage (Articles, Prepositions, Tenses, Subject-Verb Agreement)

Text Book: "InfoTech English", Maruthi Publications.

REFERENCE BOOKS:

1. English Grammar in Use, Raymond Murphy, Cambridge University Press.
2. Oxford Practice Grammar, John Eastwood, Oxford University Press.
3. The Most Common Mistakes in English Usage – Thomas Elliott Berry
4. Essential Communication Skills – Shalini Agarwal, Ane Books Pvt Ltd.
5. Dictionary of Synonyms and Antonyms, Oxford & IBH, III Ed
6. A Practical English Grammar, Agnes V. Martinet and Audrey Jean Thomson, Oxford University Press.
7. English Vocabulary in Use, Michael McCarthy and Felicity O'Dell, Cambridge University Press

E-RESOURCES

1. https://www.grammarbank.com/
2. http://guidetogrammar.org/grammar/index.htm
3. https://writeandimprove.com/
4. https://englishforeveryone.org/
5. http://www.englishvocabularyexercises.com/
6. https://englishplusmagazine.com/

20A1100201 ENGINEERING MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, IT, AIML and DS)

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	30
Credits:	4	**External Marks:**	70

Prerequisites: Fundamentals of matrices, Fundamentals of Trigonometry and Calculus.

Course Objectives:

1. To instruct the concept of Matrices in solving linear algebraic equations
2. To elucidate the different numerical methods to solve nonlinear algebraic equations
3. To disseminate the use of different numerical techniques for carrying out numerical integration.
4. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

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

CO1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6) solve system of linear algebraic equations using Gauss elimination, Gauss Seidel and write Eigen values and eigenvectors of a matrix (L3)
CO2	Write diagonal form and different factorizations of a matrix (L3), to find inverse of a matrix and integral powers of a matrix by Cayley - Hamilton Theorem Identify the nature of a Quadratic form such as positive definite, positive semi definite etc., and use this information to facilitate the calculation of matrix characteristics (L2)
CO3	Evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
CO4	Apply Newton's forward & backward interpolation and Lagrange's formulae for unequal intervals (L3)
CO5	Apply numerical integral techniques to different Engineering problems (L3)
CO6	Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2								
CO2	3	3	2	2								
CO3	3	3	2	2								
CO4	3	3	2	2								
CO5	3	3	2	2								
CO6	3	3	2	2								

UNIT–I

Solving systems of linear equations, Eigen values and Eigen vectors: **(10hrs)**

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non- homogeneous linear equations – Gauss Elimination method – Eigen values and Eigen vectors and properties.

UNIT–II

Cayley–Hamilton theorem and Quadratic forms: **(10hrs)**

Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT–III

Iterative methods: **(8 hrs)**

Introduction– Bisection method – Method of false position– Iteration method Newton-Raphson method (One variable). Gauss-Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT–IV

Interpolation: **(10 hrs)**

Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula.

UNIT–V

Numerical integration and Solution of ordinary differential equations with initial conditions **(10 hrs)**

Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Modified Euler's method – Runge-Kutta method (second and fourth order).

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, 44^{th} Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. David Poole, Linear Algebra- A modern introduction, 4^{th} Edition, Cengage.

REFERENCE BOOKS:

1. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press.

E-RESOURCES:

1. www.nptelvideos.com/mathematics/(Math Lectures from MIT, Stanford, IIT'S
2. nptl.ac.in/courses/1221104017

20A1100202: ENGINEERING PHYSICS
(Common to CE and ME)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Knowledge on fundamental concepts of waves, optics, sound and magnetism

Course Objectives:

1. The course aims at making students to understand the basic concepts of Principles of Physics in a broader sense with a view to lay foundation for the various engineering courses.
2. To develop analytical capability and solve various engineering problems.

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

CO1	Apply the interaction of light with matter through interference, diffraction, polarization and identify these phenomena in different natural optical processes and optical instruments.
CO2	Apply the comprehended knowledge about laser and fibre optic communication systems in various engineering applications.
CO3	Interpret the knowledge of dielectric and magnetic materials with characteristic utility in appliances.
CO4	Apply the principles of acoustics to explain the nature and characterization of acoustic design and to provide a safe and healthy environment.
CO5	Apply the knowledge of non-destructive testing using ultrasonics in various engineering applications.
CO6	Study the Structure-property relationship exhibited by solid crystal materials for their utility.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3				3					3		
CO2	3	3		2	2					3		
CO3	3	3	3		3							
CO4	3				2							
CO5	3											
CO6	3				2							

UNIT–I (12hrs)

Wave Optics

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

Polarization: Introduction-Types of polarization - Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT–II (8hrs)

Lasers and Fiber optics

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

UNIT–III (10hrs)

Magnetic and Dielectric Materials

Magnetic Materials: Introduction - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius- Mossotti equation.

UNIT–IV (10hrs)

Acoustics and Ultrasonic's

Acoustics: Introduction – requirements of acoustically good auditorium– Reverberation – Reverberation time– Sabine's formula - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

Ultrasonic's: Introduction - Properties - Production by magnetostriction and piezoelectric methods – Detection - Non Destructive Testing – pulse echo system through transmission and reflection modes - Applications.

UNIT–V (8hrs)

Crystallography and X-ray diffraction

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattice – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X- ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics by P.K.Palanisamy SciTech publications.

REFERENCE BOOKS:

1. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
2. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press
3. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning

E-RESOURCES:

1. www.doitpoms.ac.uk
2. http://www.itp.uni-hannover.de/~zawischa/ITP/diffraction.html
3. http://www.coherent.com/products/?834/Lasers

20A1101401: ENGINEERING DRAWING

(Common to Civil and Mechanical Engineering)

Lecture – Tutorial:	1 – 4 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

1. Knowledge of basic Mathematics
2. Drawing skills

Course Objectives:

1. To introduce the students the usage of drawing instruments and to draw polygons, Engg. Curves and scales.
2. To introduce the students to use orthographic projections, projection of points & simple lines.
3. To make the students draw the projections of the lines inclined to both the planes.
4. To make the students draw the projections of the plane inclined to both the planes.
5. To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
6. To represent the object in 3D view through isometric views and to convert the isometric view to orthographic view and vice versa.

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

CO1	Understand the simple geometric constructions like polygons, engineering curves and scales.
CO2	Understand the orthographic projections of points and lines
CO3	Understand the orthographic projections of straight lines- inclined to one plane and inclined to both the planes.
CO4	Understand the orthographic projections of planes and Planes inclined to both the planes.
CO5	Understand and draw the projections of the various types of solids in different positions inclined to one of the planes
CO6	Understand the transformation of orthographic views into isometric views and vice versa.

Contribution of Course Outcomes towards achievement of Program Outcomes

(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2								3		1
CO2	3	2								3		1
CO3	3	2								3		1
CO4	3	2			2					3		1
CO5	3	2			2					3		1
CO6	3	2			2					3		1

UNIT–I (14hrs)

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves.

Scales: Plain scales, diagonal scales and vernier scales

UNIT–II (12hrs)

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane. Projections of straight lines inclined to both planes, determination of true lengths, angle of inclination.

UNIT–III (10hrs)

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT–IV **(10hrs)**

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

UNIT–V **(14hrs)**

Isometric Projections: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD.

Note: In the End Examination there will be no question from CAD.

TEXT BOOKS:

1. Engineering Drawing by N.D. Bhatt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

E-RESOURCES:

1. http://nptel.iitm.ac.in/

20A1105301: PROGRAMMING AND PROBLEM SOLVING WITH C
(Common to EEE, ME, ECE, CSE, IT, AIML and DS)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Basic knowledge on computers, Mathematics

Course Objectives: The objectives of Programming for Problem Solving Using C are

1. To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
2. To gain knowledge of the operators, selection, control statements and repetition in C
3. To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage.
4. To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
5. To assimilate about File I/O and significance of functions

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

CO1	Understand the programming terminology and implement various c-tokens & input-output statements to solve simple problems
CO2	Able to compare and differentiate various looping & branching constructs and apply the best looping structure for a given problem
CO3	Identify the necessity of modularity in programming and design various function types
CO4	Understand pointers and implement the programs to directly access memory locations
CO5	Interpret and implement the need of arrays and structure/union to store homogeneous and heterogeneous groups of data
CO6	Contrast the need of using files in programming and implement file operations

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3		1									
CO2		1	3									
CO3		1	3									
CO4	3		1									
CO5			3									
CO6			3									

UNIT–I

Basics And Introduction to C: Basics of Computer, Introduction to C, Machine, Assembly and High level Language, Assembler, Compiler and Interpreter, Structure of a C program, Programming Rules, Executing the C Program, Advantages of C, Header Files, Flow Chart, Algorithm.

The C Declarations: The C-Character set, Delimiters, Types of Tokens, The C keywords, Identifiers, Constants, Variables, C Data types, initialization, type modifiers, type conversions, constant and volatile variables. Properties of Operators, Operator Priority ,comma and conditional operators, arithmetic, relational, assignment operators and expressions, logical , bitwise operators. Input and output in c: Formatted and Unformatted functions

UNIT–II

Decision Statements: if statement, if-else, nested if else, if-else-if ladder, break, continue, goto, Switch statement, nested switch case, Switch case and nested ifs.

Loop Control: for loop, nested for loop, while, do-while, do-while statement with while loop.

Arrays: Array initialization, array terminology, characteristics of an array, 1-D array and its operations, 2-D arrays and operations, Multi -dimensional arrays.

Strings: Declaration and initialization of string, string standard functions, string conversion functions, memory functions, application of strings.

UNIT–III

Functions: Basics, function definition, return statement, types of functions, call by value ,call by reference, function as an argument, Functions with operators, Function and Decision Statements,

Functions and loop Statements, Functions with arrays and Pointers, Recursion-Types of Recursion, Rules for Recursive Function, Recursion versus Iterations, Advantages and Disadvantages of Recursion, Efficiency of Recursion, Library Functions.

Storage Class: Variable Lifetime, Automatic Variables, External Variables, Static Variables, Register Variables.

UNIT–IV

Pointers: Features of pointers, pointers and address, pointer declaration, void pointers, arithmetic operations with pointers, pointers and arrays, array of pointers, pointers to pointers, pointers and strings. Dynamic memory allocation

Preprocessor Directives: The #define Directive, Defining and Undefining a Macros, The #include Directive

UNIT–V

Structure And Union: Features of Structures, Declaration and initialization of Structures, Structure within Structure, Arrays of Structure, Pointer to Structure, Structure and functions, typedef, Bit fields, Enumerated Data Type, Unions and Unions Vs Structures.

Files: Streams and File Types, Steps for File Operations, FILE I/O, Structures Read and Write, Other file function, Command line Arguments.

TEXT BOOKS:

1. Behrouz A. Forouzan & Richard F. Gilberg , —"Computer Science A Structured Programming Approach using C" , CENGAGE Learning, Third Edition.

REFERENCE BOOKS:

2. Kernighan and Ritchie, —"The C programming language" , The (Ansi C Version), PHI, second edition.
3. Yashwant Kanetkar, —"Let us C" , BPB Publications, 2nd Edition 2001.
4. Paul J. Dietel and Dr. Harvey M. Deitel, —"C: How to Program", Prentice Hall, 7 th edition (March 4,2012).
5. Herbert Schildt, —"C:The Complete reference", McGraw Hill, 4th Edition, 2002.
6. K.R.Venugopal, Sundeep R Prasad, —"Mastering C", McGraw Hill, 2nd Edition, 2015

E-RESOURCES:

1. http://cslibrary.stanford.edu/101/EssentialC.pdf
2. http://nptel.ac.in/courses/106104128/
3. http://www.vssut.ac.in/lecture_notes

20A1100291: ENGINEERING PHYSICS LAB
(Common to CE and ME)

Practical:	3 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: Knowledge on vernier callipers, Screw guage, common balance

Course Objectives:

1. The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies.
2. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipments.
3. Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.

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

CO1	Understand principle, concept, working of an instrument and can compare results with theoretical calculations.
CO2	Analyze the physical principle involved in the various instruments; also relate the principle to new application.
CO3	Understand design of an instrument with targeted accuracy for physical measurements.
CO4	Develop skills to impart practical knowledge in real time solution.
CO5	The various experiments in the areas of optics, mechanics and thermal physics will nurture the students in all branches of Engineering..
CO6	Think innovatively and also improve the creative skills that are essential for engineering.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3											
CO2	3	3		3					3			
CO3	3	3	1	3					3			
CO4	3	3		3								
CO5	3											
CO6	3	3	2	3								

LIST OF EXPERIMENTS

1. Study of variation of magnetic field along the axis of a current carrying circular coil by Stewart & Gee's method.
2. Determination of numerical aperture and acceptance angle of an optical fiber.
3. Determination of thickness of thin object by wedge method.
4. Determination of radius of curvature of given plano convex lens by Newton's rings.
5. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
6. Determination of dispersive power of the prism.
7. Sonometer: Verification of laws of string.
8. Study of I/V Characteristics of Semiconductor diode.
9. I/V characteristics of Zener diode.
10. Melde's experiment-Longitudinal and Transverse mode.
11. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
12. Estimation of Planck's constant using photoelectric effect.
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect
14. Determination of wavelength of Laser light using diffraction grating.
15. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum).

Note: Any 8 experiments out of 15 should be done in the laboratory and 2 experiments in virtual lab.

TEXT BOOKS:

S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

REFERENCE BOOKS:

Engineering Physics / Applied Physics Lab Manual – Spectrum Publications
E-RESOURCES: 1. www.vlab.co.in

20A1105391: PROGRAMMING AND PROBLEM SOLVING WITH C LAB
(Common to EEE, ME, ECE,CSE, IT, AIML and DS)

Practical:	3 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites:

Course Objectives:

1. To make the student learn a programming language.
2. To learn problem solving techniques.
3. To teach the student to write programs in C and to solve the problems

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

CO1	Understand basic Structure of the C-PROGRAMMING, declaration and usage of variables.
CO2	Exercise conditional and iterative statements to inscribe C programs.
CO3	Exercise user defined functions to solve real time problems.
CO4	Inscribe C programs using Pointers to access arrays, strings and functions.
CO5	Inscribe C programs using pointers and allocate memory using dynamic memory management functions.
CO6	Exercise user defined data types including structures, unions and files to solve problems.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1		3									
CO2			2									
CO3			3									
CO4			2									
CO5			3									
CO6		2	3									

LIST OF EXERCISES

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

TEXT BOOKS:

1. Behrouz A. Forouzan & Richard F. Gilberg , —"Computer Science A Structured Programming Approach using C" , CENGAGE Learning, Third Edition.

REFERENCE BOOKS:

2. Kernighan and Ritchie , —"The C programming language" , The (Ansi C Version), PHI, second edition.
3. Yashwant Kanetkar , —"Let us C" , BPB Publications, 2nd Edition 2001.
4. Paul J. Dietel and Dr. Harvey M. Deitel, —"C: How to Program", Prentice Hall, 7 th edition (March 4,2012).
5. Herbert Schildt, —"C:The Complete reference", McGraw Hill, 4th Edition, 2002.
6. K.R.Venugopal, Sundeep R Prasad, —"Mastering C", McGraw Hill, 2nd Edition, 2015

E-RESOURCES:

1. http://cslibrary.stanford.edu/101/EssentialC.pdf
2. http://nptel.ac.in/courses/106104128/
3. http://www.vssut.ac.in/lecture_notes

20A120001: ENGINEERING MATHEMATICS-II
(Common to All Branches)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Fundamentals of matrices, Fundamentals of Trigonometry and Calculus.

Course Objectives:

1. To familiarize a variety of well-known sequences and series, with a developing intuition about the behavior of new ones.
2. To enlighten the learners in the concept of differential equations and multivariable calculus.
3. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

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

CO1	Find the General/Particular solutions of first order and first degree ordinary differential equations by apply different methods (L3), know the applications of Newton's law of cooling, natural growth and decay problems and find orthogonal trajectories of the given family of curves. (L3)
CO2	Identify the essential characteristics of linear differential equations with constant coefficients. (L2)solve the linear differential equations with constant coefficients by appropriate method (L3)
CO3	Find convergence (or) divergence of a series (L3)
CO4	Utilize mean value theorems to real life problems(L3)
CO5	Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies. (L4)acquire the Knowledge maxima and minima of functions of several variable (L1) Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)
CO6	Find length of the arc, volume of solid of revolution and surface area of solid of revolution(L3)

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2								
CO2	3	3	2	2								
CO3	3	3	2	2								
CO4	3	3	2	2								
CO5	3	3	2	2								
CO6	3	3	2	2								

UNIT–I

Differential equations of first order and first degree: (10hrs)

Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonal trajectories.

UNIT–II

Linear Differential equations of higher order: (10hrs)

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.

UNIT–III

Sequences, Series and Mean value theorems: (10hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series– Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

UNIT–IV

Partial differentiation: (10hrs)

Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's multiplied method.

UNIT–V

Multiple integrals: (8hrs)

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates. Applications: Finding Areas and Volumes

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw HillEducation.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14thEdition, Pearson.
3. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press, 2013.
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

E-RESOURCES:

1. www.nptel videos.com/mathematics/(Math Lectures from MIT,Stanford,IIT'S
2. nptl.ac.in/courses/1221104017

20A1200204 : ENGINEERING CHEMISTRY
(Common to CE and ME)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Fundamentals of Polymers and Electro Chemical cells.

Course Objectives: **Upon successful completion of the course, the student will be able to**

1. Engineering Chemistry is an applied manifestation of Chemistry and its thorough knowledge in fundamental aspects, essential for Civil and Mechanical to understand chemical structure and other aspects of materials.
2. The study of applied concepts of Chemistry endeavored in this course namely; Polymer technology, electrochemistry, corrosion, Chemistry of materials, fuels and water treatment helps the student in comprehending their engineering applications with right aptitude and ability in predicting the results under given conditions.

Course Outcomes:

CO1	Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
CO2	Predict potential complications from combining various chemicals and metals in engineering setting
CO3	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena
CO4	Apply Nano chemistry, Refractories, Lubricants, cement in engineering processes
CO5	Discuss the various petroleum products and alternate fuels
CO6	Examine the water quality and select appropriate purification technique for intended problem

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	1								
CO2	3	3	2	1								
CO3	3	2	2	1								
CO4	3	3	2	2								
CO5	3	2	2	1								
CO6	3	3	2	1								

UNIT–I

Polymer Technology **(10 hrs)**

Polymerisation: Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Thermoplastic-thermosetting Compounding, fabrication (compression, injection, transfer and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers: Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes). **Composite materials:** Fiber reinforced plastics, conducting polymers, biodegradable polymers,

UNIT–II

Electrochemical Cells And Corrosion **(10 hrs)**

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, batteries (Dry cell, liquid Li ion battery), fuel cells (H2-O2).

Corrosion:-Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, galvanic series, factors influencing rate of corrosion, corrosion control methods-Protective coatings (Galvanizing, tinning electroplating and electroless plating [nickel]),

UNIT–III

Chemistry Of Materials **(10 hrs)**

Nano materials:- Introduction, sol-gel method, characterization by transmission electron microscopy [TEM]) , carbon nanotubes (types, preparation and applications)

Refractories: - Definition, classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories.

Lubricants: - Definition, mechanism of lubricants, properties (definition and importance).

Cement: - Constituents, manufacturing, parameters to characterize the clinker formation: lime saturation factor (LSF), silica ratio (SR) and alumina ratio (AR), chemistry of setting and hardening, deterioration of cement.

UNIT–IV

Fuels **(10 hrs)**

Introduction, calorific value, higher calorific value, lower calorific values, problems using Dulong's formula, proximate and ultimate analysis of coal sample and their significance, petroleum (refining-cracking), synthetic petrol (Fischer Tropsch), petrol knocking, diesel knocking, octane and cetane ratings, anti-knocking agents, Introduction to alternative fuels (Bio-diesel, natural gas, liquefied petroleum gas, compressed natural gas), Flue gas analysis by Orsat apparatus.

Unit–V

Water Technology **(8 hrs)**

Hardness of water, determination of hardness by complexometric method, boiler troubles (priming and foaming, scale formation, boiler corrosion, caustic embrittlement), internal treatments, softening of hard water (zeolite process and ion exchange process), potable water and its specifications, steps involved in purification of water, chlorination, break point chlorination-desalination (reverse osmosis and electro dialysis).

TEXT BOOKS:

1. P.C. Jain and M. Jain "Engineering Chemistry", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "Engineering Chemistry", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

REFERENCE BOOKS:

1. K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India Edn.
2. O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology", University press (latest edition)

E-RESOURCES:

1. https://en.wikipedia.org >wiki> Water treatment
2. https://en.wikipedia.org >wiki> Conductive polymers
3. www.sae.org/fuel cells/fuelcells-types.htm
4. https://en.wikipedia.org >wiki> Nanomaterials
5. https://en.wikipedia.org >wiki> Electrochemical cell
6. https:// www.britancia.com>technology>cement-building-material

20A1203301: ENGINEERING MECHANICS

(Mechanical Engineering)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

1. Engineering Physics
2. Engineering Mathematics

Course Objectives:

1. To introduce the concepts of force and friction, direction and its application to the students.
2. To make the students expose to the application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.
3. To introduce the concepts of centre of gravity, concepts of moment of inertia and polar moment of inertia including transfer methods and their applications to the students.
4. The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion
5. The students are to be exposed to rigid body motion kinematics and kinetics

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

CO1	Compute the resultant of forces and moments using free body diagrams and able to apply the concepts of friction.
CO2	Analyze plane truss (Frame) by method of joints and method of sections.
CO3	Identify the Centroid and Centre of Gravity of the simple and composite figures and bodies, also to determine the area and mass moment of inertia of the composite figures and bodies.
CO4	Understand the fundamental concepts of Rectilinear and curvilinear motion of a particle.
CO5	Understand the fundamental concepts of kinematics and kinetics of rigid body.
CO6	Able to apply the work energy and Impulse momentum principle to analyze the simple, practical problems.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2										
CO2	3	2										
CO3	3	2										
CO4	3	2										
CO5	3	2										
CO6	3	2										

UNIT–I

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT–II

Equilibrium of Systems of Forces: Free Body Diagrams, , Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for beams, Analysis of plane trusses.

UNIT–III

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT–IV

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics- Work Energy method and applications to particle motion- Impulse momentum method.

UNIT–V

Rigid body Motion: Kinematics and kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse momentum method.

TEXT BOOKS:

1. Engineering Mechanics - S.Timoshenko & D.H.Young., 4^{th} Edition - , Mc Graw Hill publications.

REFERENCE BOOKS:

1. Engineering Mechanics by S S Bhavikatti, New age International
2. Engineering Mechanics by R K Bansal, Laxmi Publications

20A1202301: BASIC ELECTRICAL & ELECTRONICS ENGINEERING (MECHANICAL ENGINEERING)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:
This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines and electronic components to perform well in their respective fields.

Course Objectives:

1. To learn the basic principles of electrical circuital law's and analysis of networks.
2. To understand principle of operation and construction details of DC machines.
3. To understand principle of operation and construction details of transformers, alternator and 3- Phase induction motor.
4. To study operation of PN junction diode, half wave, full wave rectifiers and OP-AMPs.
5. To learn operation of PNP and NPN transistors and various amplifiers.

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

CO1	Analyze various electrical networks.
CO2	Understand operation of DC generators,3-point starter
CO3	Understand operation of DC machine testing by Swinburne's Test and Brake test.
CO4	Analyze performance of single-phase transformer and acquire proper knowledge and working of 3-phase alternator and 3-phase induction motors.
CO5	Analyze operation of half wave, full wave bridge rectifiers and OP-AMPs.
CO6	Understanding operations of CE amplifier and basic concept of feedback amplifier.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	1								
CO2	3	3	2	1								
CO3	3	2	2	1								
CO4	3	3	2	2								
CO5	3	2	2	1								
CO6	3	3	2	1								

UNIT–I

Electrical Circuits
Basic definitions – types of network elements – Ohm's Law – Kirchhoff's Laws – inductive networks – capacitive networks – series – parallel circuits – star-delta and delta-star transformations.-Numerical Problems.

UNIT–II

DC Machines
Principle of operation of DC generator – EMF equation – types of DC machines – torque equation characteristics of DC motors – applications – three point starter – speed control methods of DC motor – Swinburne's Test-Brake test on DC shunt motor-Numerical problems.

UNIT–III

AC Machines:
Transformers
Principle of operation and construction of single phase transformers – EMF equation – Losses – OC & SC tests – efficiency and regulation-Numerical Problems.
AC Rotating Machines
Principle of operation and construction of alternators – types of alternators Regulation of alternator by synchronous impedance method – principle of operation of synchronous motor – principle of operation of 3-Phase induction motor – slip-torque characteristics – efficiency – applications- Numerical Problems

UNIT–IV

Rectifiers & Linear ICs

PN junction diodes – diode applications (half wave and bridge rectifiers). Characteristics of operation amplifiers (OP-AMP) – application of OP-AMPs (inverting, non-inverting, integrator and differentiator)-Numerical Problems.

UNIT–V

Transistors

PNP and NPN junction transistor, transistor as an amplifier– frequency response of CE amplifier – Basic concepts of feedback amplifier-Numerical problems.

TEXT BOOKS:

1. Electrical Technology by Surinder Pal Bali, Pearson Publications.
2. Electronic Devices and Circuits by R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

REFERENCE BOOKS:

1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group
2. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications,2nd edition
4. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications,2nd edition
5. Industrial Electronics by G.K. Mittal, PHI

20A120340: COMPUTER AIDED ENGINEERING DRAWING

(Mechanical Engineering)

Lecture – Practical:	2 - 2 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

1. Knowledge of basic Mathematics
2. Drawing skills
3. Engineering Drawing

Course Objectives:

1. To draw the projections of solids and to enhance the skills they already acquired in their earlier course in drawing of projection.
2. To Design and Manufacture the objects from the knowledge of sections of solids and development of surfaces.
3. To learn the methods of Isometric and Perspective views.
4. To introduce various commands in AutoCAD, to draw the geometric entities and to create 2D and 3D wire frame models.
5. To understand the concept of View Points and View Ports.
6. To know the geometrical model of simple solids, machine parts and display the same as an Isometric, Orthographic or Perspective projection.

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

CO1	Understand the projections of solids which are essential in 3D modeling and animation.
CO2	Understand the sections of solids and development of surfaces for designing and manufacturing of the objects.
CO3	Understand the hidden details of machine components with the help of sections and interpenetrations of solids.
CO4	Understand the various commands in AutoCAD and to draw the geometric entities and to create 2D and 3D wire frame models.
CO5	Understand the modeling commands for generating 2D and 3D objects using computer aided drafting tools.
CO6	Understand the concept of computer aided solid modeling

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2								3		1
CO2	3	2								3		1
CO3	3	2								3		1
CO4	3	2			3					3		1
CO5	3	2			3					3		1
CO6	3	2			3					3		1

UNIT–I

Projections Of Solids: Projections of Regular Solids inclined to both planes – Auxiliary Views.

UNIT–II

Sections Of Solids: Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

Development And Interpenetration Of Solids: Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid, Cone and their parts.

UNIT–III

Interpenetration Of Right Regular Solids: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

Perspective Projections: Perspective View: Points, Lines, Plane Figures and Simple

Solids, Vanishing Point Methods (General Method only).

In part B computer aided drafting is introduced

UNIT–IV

Introduction To Computer Aided Drafting: Generation of points, lines, curves, polygons, dimensioning. Types of modeling: object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.

UNIT–V

View Points And View Ports: view point coordinates and view(s) displayed, examples to exercise different options like save restore, delete, joint, single option.

UNIT–VI

Computer Aided Solid Modeling: Isometric projections, orthographic projections of isometric projections, Modeling of simple solids, Modeling of Machines & Machine Parts.

TEXT BOOKS:

1. Engineering drawing by N.D Bhatt , Charotar publications.
2. Engineering Graphics, K.C. john, PHI Publications

REFERENCE BOOKS:

1. Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura, Sybex
2. Auto CAD 2013 fundamentals- Elisemoss, SDC Publ.
3. Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan, vikas
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age
5. Engineering Drawing – RK Dhawan, S Chand
6. Engineering Drawing – MB Shaw, BC Rana, Pearson
7. Engineering Drawing – KL Narayana, P Kannaiah, Scitech
8. Engineering Drawing – Agarwal and Agarwal, Mc Graw Hill
9. Engineering Graphics – PI Varghese, Mc Graw Hill
10. Text book of Engineering Drawing with auto-CAD , K.venkata reddy/B.S . publications.
11. Engineering Drawing with Auto CAD/ James D Bethune/Pearson Publications
12. Engineering Graphics with Auto CAD/Kulkarni D.M, Rastogi A.P, Sarkar A.K/PHI Publications.

Note: End Semester examination shall be conducted for* Four *hours with the following pattern

a) Two hours-Conventional drawing
b) Two hours – Computer Aided Drawing

20A1200801: ENVIRONMENTAL SCIENCE
(Common to CE, EEE, ME and ECE)

Lecture:	2 Hours	**Internal Marks:**	30
Credits:	---	**External Marks:**	70

Prerequisites:
1. Engineering chemistry.
2. Engineering physics.

Course Objectives:

1. Overall understanding of the natural resources.
2. Basic understanding of the ecosystem and its diversity.
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
4. An understanding of the environmental impact of developmental activities.
5. Awareness on the social issues, environmental legislation and global treaties.

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

CO1	Illustrate the importance of sustainability in the progress of a nation. (L2)
CO2	Infer the existence of ecosystems in maintaining ecological balance. (L2)
CO3	Recall the importance of biodiversity and its conservation. (L1)
CO4	Summarize the role of natural resources for the sustenance of life on earth and recognize the need to conserve them. (L2)
CO5	Identify the environmental pollutants and the abatement devices to be used. (L3)
CO6	Interpret environmental related acts and social issues. (L2)

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2			2	3	2			2	2
CO2	3	2	2			2	3	2			2	2
CO3	3	2	2			2	3	2			2	2
CO4	3	2	2			2	3	2			2	2
CO5	3	2	2			2	3	2			2	2
CO6	3	2	2			2	3	2			2	2

UNIT–I

Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Food chains, food webs and ecological pyramids- Ecological succession. **(6hrs)**

UNIT–II

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social value. India as a mega diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. Endangered and endemic species of India – Conservation of biodiversity. **(4hrs)**

UNIT–III

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate

energy sources. Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles. **(7hrs)**

UNIT–IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management. **(5hrs)**

UNIT–V

Social Issues and the Environment: Urban problems related to energy, rain water harvesting. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act. Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS. Ecotourism, Green Campus – Green business and Green politics. **(6hrs)**

TEXT BOOKS:

1. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014
2. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
4. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai.

REFERENCE BOOKS:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi.

E-RESOURCES:

1. http://nptel.ac.in/courses.php.
2. http://jntuk-coeerd.in/

20A1200191: COMMUNICATIVE ENGLISH LAB
(Common to All Branches (CE, EEE, MECH, ECE, CSE, IT, AIML, DS)

Practical:	3 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites:
1. English grammar
2. Word pronunciations

Course Objectives:
1. To learn the sound systems of English and understand word stress of English.
2. To train the students in the art of conversation and discussion
3. To equip the students with good communication skills.
4. To emphasize the need of English in the technical world.
5. To improve their presentation and participation skills
6. To prepare them for interviews and future job environments.

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

CO1	Demonstrate better understanding of the nuances of spoken English to put into use in various situation and events.
CO2	Apply the rules of phonetics–pronunciation, accent and intonation– in their everyday communication
CO3	Relate their understanding of the importance of spoken skills and the need for life-long learning in day-to-day communication.
CO4	Construct strategies like critical and analytical skills to participate effectively in group discussions and debates.
CO5	Demonstrate their ideas accurately and effectively in presentations.
CO6	Build responses to the questions by listening to short audio texts and identify the context and specific pieces of information.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1										1		2
CO2										1		2
CO3												2
CO4									1	1		2
CO5										2		2
CO6										1		2

UNIT–I
1. Making Inquiries on the phone, Thanking and Responding to Thanks, Responding to Requests and Asking for Directions
2. Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation

UNIT–II
1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating, Apologising, Advising, Suggesting, Agreeing and Disagreeing
2. Word stress – Di-Syllabic Words, Poly-Syllabic Words, Weak and Strong Forms, Contrastive Stress (Homographs)

UNIT–III
1. Debating
2. Stress in Compound Words, Rhythm, Intonation, Accent Neutralization.

UNIT–IV
1. Group Discussions

2. Listening to Short Audio Texts, and Identifying the context and specific pieces of information to answer a series of questions in speaking.
UNIT–V 1. Presentation Skills and Interview Skills 2. Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.
Lab Manual: "Infotech English", Maruthi Publications.
Software: k-van solutions Multimedia language lab
REFERENCE BOOKS:
Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL. English Pronunciation in use - Mark Hancock, Cambridge University Press. English Phonetics and Phonology-Peter Roach, Cambridge University Press. English Pronunciation in use- Mark Hewings, Cambridge University Press. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications
E-RESOURCES
https://learnenglish.britishcouncil.org/ https://rachelsenglish.com/ https://www.bbc.co.uk/learningenglish/ https://www.engvid.com/ https://bbclearningenglish.com

20A1200203: ENGINEERING CHEMISTRY LAB
(Common to CE and ME)

Practical:	3 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: Knowledge on Volumetric analysis.

Course Objectives:

1. To provide knowledge of chemistry practical's.
2. It enables the students to analyze the different parameters of water sample like hardness and alkalinity and different volumetric titrations.
3. It makes the students to obtain basic knowledge of instrumentation based on different Engineering applications.

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

CO1	Apply polymers and plastic technologies to solve the problems of the society.
CO2	Utilize knowledge of cells and sensors in many instruments like batteries and fuel cells.
CO3	Understand electrochemical cells corrosion along with the methods of controlling to budding engineers.
CO4	Understand water and its hardness, boiler troubles and problems associated with the environment and its sustainability.
CO5	Understand fuels and energy, their advantages & disadvantages.
CO6	Design and analysis of complex problems of the society.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	1	1								
CO2	3	3	1									
CO3	3	2	2									
CO4	3	1		1								
CO5	3	2	2	1								
CO6	3	1	1	1								

LIST OF EXPERIMENTS

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Determination of HCl using standard Na_2CO_3 solution.
3. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
4. Determination of $KMnO_4$ using standard Oxalic acid solution.
5. Determination of total hardness of water using standard EDTA solution.
6. Determination of Iron using standard $K_2Cr_2O_7$ solution
7. Estimation of vitamin C
8. Determination of Iron by a Colorimetric method using thiocyanates as reagent.
9. Conductometric titration between strong acid and strong base.
10. Potentiometric titration between strong acid and strong base.
11. Preparation of Bakelite.
12. Determination of pH of water sample.

EQUIPMENT REQUIRED: PH meters, Potentiometers, Conductometers, colorimeters.

APPARATUS: Burettes, Pipettes, Conical flask, Beakers, Volumetric flask.

REFERENCE BOOKS:

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuri (2012) Laboratory Manual of engineering chemistry-II, VGSTechno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mukkanti (2009) Practical Engineering Chemistry, B.S. Publication.

20A1203391: WORKSHOP PRACTICE LAB

(Mechanical Engineering)

Practical:	3 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites:

1. Knowledge of Engineering Drawing

Course Objectives:

To impart hands-on practice on basic engineering trades such as Carpentry, Fitting, Tin-Smithy, Black smithy, House wiring and Assembly & Disassembly of Computer.

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

CO1	Acquire skills in basic engineering trades like Carpentry, Fitting, Tin smithy, House wiring, Black smithy etc.,
CO2	Apply the knowledge of basic engineering trades in their day – to – day activities.
CO3	Fabricate small components using the knowledge of basic engineering trades.
CO4	Select appropriate tools and consumables for getting an object of required shape and size.
CO5	Configure the components and peripherals of PC.
CO6	Assemble and disassemble the PC components.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2								2		
CO2	3	2								2		
CO3	3	2								2		
CO4	3	2			3					2		
CO5	3	2	2	2	3					2		
CO6	3	2	2	2	3					2		

LIST OF EXPERIMENTS

Trade wise:

1. Carpentry

1) T-Lap Joint
2) Cross Lap Joint
3) Dovetail Joint
4) Mortise and Tenon Joint

2. Fitting

1) Vee Fit
2) Square Fit
3) Half Round Fit
4) Dovetail Fit

3. Black Smithy

1) Round rod to Square
2) S-Hook
3) Round Rod to Flat Ring

4) Round Rod to Square headed bolt

4. House Wiring

1) Parallel / Series Connection of three bulbs

2) Stair Case wiring

3) Florescent Lamp Fitting

4) Measurement of Earth Resistance

5. Tin Smithy

1) Taper Tray

2) Square Box without lid

3) Open Scoop

4) Funnel

6. IT Workshop

1) Assembly & Disassembly of Computer

Note: At least two Jobs to be done from each trade (Excluding IT Workshop).

REFERENCE BOOKS:

1. Elements of Workshop Technology vol.-1 & vol.-2 by A. K. Hajra Choudhury, S. K. Hajra Choudhury, Nirjhar Roy
2. Workshop Manual , P.Kannaih,K.L. Narayana , Scitech Publishers
3. Workshop Manual by Dept. of Mechanical Engg., NRIIT
4. Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance, K.L. James, Eastern Economy Edition.

20A1201391: BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

(Mechanical Engineering)

Practical:	3 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: Basics of various electrical circuits, operation of various electrical machines and electronic components to perform well in their respective fields.

Course Objectives:

1. To predetermine the efficiency of dc shunt machine using Swinburne's test.
2. To predetermine the efficiency and regulation of 1-phase transformer with O.C and S.C tests.
3. To obtain performance characteristics of DC shunt motor &3-phase induction motor.
4. To find out regulation of an alternator with synchronous impedance method.
5. To control speed of dc shunt motor using Armature voltage and Field flux control methods.
6. To find out the characteristics of PN junction diode & transistor, ripple factor of half wave & full wave rectifiers.

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

CO1	Compute the efficiency of DC shunt machine without actual loading of the machine.
CO2	Estimate the efficiency and regulation at different load conditions and power factors for single phase transformer with OC and SC tests.
CO3	Analyze the performance characteristics and to determine efficiency of DC shunt motor &3- Phase induction motor.
CO4	Pre-determine the regulation of an alternator by synchronous impedance method.
CO5	Control the speed of dc shunt motor using Armature voltage and Field flux control methods.
CO6	Draw the characteristics of PN junction diode & transistor, Determine the ripple factor of half wave & full wave rectifiers.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2								2		
CO2	3	2								2		
CO3	3	2								2		
CO4	3	2			3					2		
CO5	3	2						3		2		
CO6	3	2		3						2		

LIST OF EXPERIMENTS

Section A: Electrical Engineering

The following experiments are required to be conducted as compulsory experiments:

1. Swinburne's test on D.C. Shunt machine (predetermination of efficiency of a given D.C. shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (predetermination of efficiency and regulation at given power factors).
3. Brake test on 3-phase Induction motor (determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method
6. Brake test on D.C. Shunt Motor.

Section B: Electronics Engineering

The following experiments are required to be conducted as compulsory experiments:

1. PN junction diode characteristics a) Forward bias b) Reverse bias (Cut in voltage and resistance calculations)
2. Transistor CE characteristics (input and output)
3. Half wave rectifier with and without filters.
4. Full wave rectifier with and without filters.
5. CE amplifiers.
6. OP- amp applications (inverting, non inverting, integrator and differentiator)