JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE

For UG – R20

B. TECH - MECHANICAL ENGINEERING

(Applicable for batches admitted from 2020-2021)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

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COURSE STRUCTURE

I Year – I SEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	BSC-1	Calculus & Differential Equations (M-I)	3	0	0	3
2	BSC-2	Engineering Physics	3	0	0	3
3	ESC-1	Programming for Problem Solving	3	0	0	3
4	HSC-1	Communicative English	3	0	0	3
5	ESC-2	Engineering Drawing	2	0	2	3
6	BSC-L1	Engineering Physics Lab	0	0	3	1.5
7	ESC-L1	Programming for Problem Solving Using C Laboratory	0	0	3	1.5
8	HSC-L1	English Communication Skills Laboratory	0	0	3	1.5
9	MC -1	Environmental Science	2	0	0	0
Total Credits						**19.5**

I Year – II SEMESTER

Sl.No	Course Code	Subjects	L	T	P	Credits
1	BSC-3	Linear Algebra & Numerical Methods (M-II)	3	0	0	3
2	BSC-4	Engineering Chemistry	3	0	0	3
3	ESC-3	Engineering Mechanics	3	0	0	3
4	ESC-4	Basic Electrical & Electronics Engineering	3	0	0	3
5	ESC-5	Thermodynamics	3	0	0	3
6	ESC-L2	Workshop Practice Lab	0	0	3	1.5
7	BSC-L2	Engineering Chemistry Laboratory	0	0	3	1.5
8	ESC-L3	Basic Electrical & Electronics Engineering Lab	0	0	3	1.5
9	MC-2	Constitution of India	2	0	0	0
Total Credits						**19.5**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
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DEPARTMENT OF MECHANICAL ENGINEERING

SUBJECTS FOR B. Tech. (MINOR) in MECHANICAL ENGINEERING

B. Tech. (MINOR) in MECHANICAL ENGINEERING		Pre-requisites
1.	Basic Thermodynamics	NIL
2.	Manufacturing Processes	NIL
3.	Materials Science and Engineering	NIL
4.	Basic Mechanical Design	NIL
5.	Optimization Techniques	NIL
6.	Power Plant Engineering	Basic Thermodynamics
7.	Automobile Engineering	Basic Thermodynamics
8.	Industrial Engineering and Management	NIL
9.	Product Design & Development	NIL
10.	Smart Manufacturing	NIL
11.	Mechanical Measurements	NIL
12.	Industrial Robotics	Engineering Mechanics
13.	Mechatronics	NIL

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

SUBJECTS FOR B. Tech. (HONORS) IN MECHANICAL ENGINEERING

HONORS IN MECHANICAL ENGINEERING		Pre-requisites
POOL – 1 (in II-II)		
1.	Advanced Mechanics of Fluids	Fluid Mechanics
2.	Green Manufacturing	Production Technology
3.	Analysis and Synthesis of Mechanisms	Kinematics of Machinery
4.	Alternative Fuels Technologies	Basic Thermodynamics
5.	Gear Engineering	Kinematics of Machinery
POOL-2 (in III-I)		
1.	Experimental Methods in Fluid Mechanics	Fluid Mechanics
2.	Advanced Optimization Techniques	Operations Research
3.	Micro Electro Mechanical Systems	Nil
4.	Tribology	Nil
5.	Statistical Design in Quality Control	Nil
POOL-3 (in III-II)		
1.	Advanced Computational Fluid Dynamics	Fluid Mechanics
2.	Material Characterization Techniques	Material Science and Metallurgy
3.	Product Design	Nil
4.	Electric & Hybrid Vehicles	Thermal Engineering
5.	Mechanical Vibrations & Acoustics	Nil
POOL-4 (in IV-I)		
1.	Advanced Thermodynamics	Nil
2.	Design for Manufacturing and Assembly	Production Technology
3.	Robotics and Control	Kinematics of Machinery
4.	Turbo Machines	FM&HM
5.	Materials Technology	Nil

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

I Year I Semester		L	T	P	C
		3	0	0	3
CALCULUS & DIFFERENTIAL EQUATIONS-M1					

Course Objectives:
- ☐ To familiarize a variety of well-known sequences and series, with a developing intuition about the behaviour of new ones.
- ☐ To enlighten the learners in the concept of differential equations and multivariable calculus.
- ☐ 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: At the end of the course, the student will be able to
- ☐ utilize mean value theorems to real life problems (L3)
- ☐ solve the differential equations related to various engineering fields (L3)
- ☐ familiarize with functions of several variables which is useful in optimization (L3)
- ☐ apply double integration techniques in evaluating areas bounded by region (L3)
- ☐ students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5)

UNIT – I: 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 – II: Differential equations of first order and first degree: (10hrs)
Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exactform.
Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonaltrajectories–Electrical circuits.

UNIT – III: 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.

Applications: LCR circuit, Simple Harmonic motion.

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 twovariables without constraints and Lagrange'smethod.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

UNIT – V: Multiple integrals: **(8 hrs)**
Double and Triple integrals – Change of order of integration in double integrals – Change of variables topolar, 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

I Year I Semester		L	T	P	C
		3	0	0	3

ENGINEERING PHYSICS

Unit-I: Wave Optics   **12hrs**

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications -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) – Grating - Dispersive power and resolving power of Grating(Qualitative).

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

Unit Outcomes:

The students will be able to

➢ **Explain** the need of coherent sources and the conditions for sustained interference (L2)
➢ **Identify** engineering applications of interference (L3)
➢ **Analyze** the differences between interference and diffraction with applications (L4)
➢ **Illustrate** the concept of polarization of light and its applications (L2)
➢ **Classify** ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics   **10hrs**

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

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

Unit Outcomes:

The students will be able to

➢ **Understand** the basic concepts of LASER light Sources (L2)
➢ **Apply** the concepts to learn the types of lasers (L3)
➢ **Identifies** the Engineering applications of lasers (L2)
➢ **Explain** the working principle of optical fibers (L2)
➢ **Classify** optical fibers based on refractive index profile and mode of propagation (L2)
➢ **Identify** the applications of optical fibers in various fields (L2)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

UNIT III: Engineering Materials   8hrs

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- Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment -Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferrimagnetic materials - Domain concept forFerromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials-Eddy currents- Engineering applications.

Unit Outcomes:
The students will be able to

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- **Classify** the magnetic materials based on susceptibility and their temperaturedependence(L2)
- **Explain** the applications of dielectric and magnetic materials (L2)
- **Apply** the concept of magnetism to magnetic devices (L3)

Unit-IV: Acoustics and Ultrasonics   10hrs

Acoustics: Introduction – requirements of acoustically good hall– Reverberation – Reverberation time– Sabine's formula (Derivation using growth and decay method) - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

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

Unit Outcomes:
The students will be able to

- **Explain** how sound is propagated in buildings (L2)
- **Analyze** acoustic properties of typically used materials in buildings (L4)

- **Recognize** sound level disruptors and their use in architectural acoustics (L2)

- **Identify** the use of ultrasonics in different fields (L3)

Unit-V: Crystallography and X-ray diffraction   8hrs

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

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

Unit Outcomes:
The students will be able to

- **Classify** various crystal systems (L2)
- **Identify** different planes in the crystal structure (L3)
- **Analyze** the crystalline structure by Bragg's X-ray diffractometer (L4)

- **Apply** powder method to measure the crystallinity of a solid (L4)

Text books:
1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering physics – D.K. Battacharya and Poonam Tandon, Oxford University press.
3. Engineering Physics by P.K.Palanisamy SciTech publications.

Reference Books:
1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics – M.R.Srinivasan, New Age Publications
3. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
4. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press

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KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C					

COURSE OBJECTIVES:
The objectives of Programming for Problem Solving Using C are

1) To learn about the computer systems, computing environments, developing of acomputerprogram 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 uniontypes. Tolearn about their usage.
4) To assimilate about pointers, dynamic memory allocation and know the significance ofPreprocessor.
5) To assimilate about File I/O and significance of functions

UNIT I
Introduction to Computers: Creating and running Programs, Computer Numbering System, StoringIntegers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants,Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.
Structure of a C Program: Expressions Precedence and Associativity, Side Effects, EvaluatingExpressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.
Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

UNIT III
Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, MultidimensionalArrays, Programming Example – Calculate Averages
Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code **Enumerated, Structure, and Union:** The Type Definition (Type def), Enumerated Types, Structure,Unions, and Programming Application

UNIT IV
Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value
Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application
Processor Commands: Processor Commands

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

UNIT V
Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion
Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions
Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TEXT BOOKS:
1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson

REFERENCES:
1. Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill
2. Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson
3. Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD

COURSE OUTCOMES:
Upon the completion of the course the student will learn
1) To write algorithms and to draw flowcharts for solving problems
2) To convert flowcharts/algorithms to C Programs, compile and debug programs
3) To use different operators, data types and write programs that use two-way/ multi-way selection
4) To select the best loop construct for a given problem
5) To design and implement programs to analyze the different pointer applications
6) To decompose a problem into functions and to develop modular reusable code
7) To apply File I/O operations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
	COMMUNICATIVE ENGLISH				

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage inactual use of language both in the classroom and laboratory sessions.

Course Objectives

➢ Facilitate effective listening skills for better comprehension of academic lectures and English spokenby native speakers
➢ Focus on appropriate reading strategies for comprehension of various academic texts and authenticmaterials
➢ Help improve speaking skills through participation in activities such as role plays, discussions andstructured talks/oral presentations
➢ Impart effective strategies for good writing and demonstrate the same in summarizing, writing wellorganized essays, record and report useful information
➢ Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use inspeech and writing

Learning Outcomes

At the end of the module, the learners will be able to

➢ understand social or transactional dialogues spoken by native speakers of English and identify thecontext, topic, and pieces of specific information
➢ ask and answer general questions on familiar topics and introduce oneself/others
➢ employ suitable strategies for skimming and scanning to get the general idea of a text and locatespecific information
➢ recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
➢ form sentences using proper grammatical structures and correct word forms

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

Unit 1:

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications

Lesson-2: Deliverance by Premchand from "**The Individual Society",**Pearson Publications.(Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.
Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.
Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign postsand transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20)(Antonyms andSynonyms, Word applications) Verbal reasoning and sequencing of words.
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.
Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**",Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications.(Non- detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.**Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies(20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

Unit 3:

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications.(Non-detailed**)**

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking andwriting.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.FunctionalEnglish:Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific contextclues; strategies to use text clues for comprehension.Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words)(Antonyms and Synonyms, Word applications) Association, sequencingof words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academicpurposes.

Pronunciation: word stress-poly-syllabic words.

Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", MaruthiPublications

Lesson-2:   Telephone   Conversation-Wole   Soyinka   from   "The IndividualSociety",   PearsonPublications**.**(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (onlyaudio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) -asking for and giving information/directions.Functional English: Permissions, Requesting, Inviting.

Reading: Studying   the   use   of   graphic   elements   in   texts   to   convey information,   revealtrends/patterns/relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based oninformation provided in figures/charts/graphs/tables.Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words)(Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees ofcomparison; use of antonyms

Pronunciation: Contrastive Stress

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

Unit 5:

Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications.(Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking andwriting.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPTslides.Functional English: Suggesting/Opinion giving.
Reading: Reading for comprehension. RAP StrategyIntensive reading and Extensive reading techniques.
Reading for Writing: Writing academic proposals- writing research articles: format and style.**Vocabulary**: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words)(Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles,prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words

Prescribed text books for theory for Semester-I:

1. "**Infotech English**", Maruthi Publications. (Detailed)

2. "**The Individual Society",** Pearson Publications.(Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:

1. "**Infotech English**", Maruthi Publications. (with Compact Disc)

Reference Books:
☐ Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
☐ Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2ndEdition, 2018.

☐ Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
☐ Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

I Year - I Semester		L	T	P	C
		2	0	2	3

ENGINEERING DRAWING

Course Objective: Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I
Objective: To introduce the students to use drawing instruments and to drawpolygons, Engg.Curves.
Polygons: Constructing regular polygons by general methods, inscribing and describing polygons oncircles.
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
Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.
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 the planes, determination of true lengths, angle ofinclination and traces.

Unit III
Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.
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
Objective: The objective is to make the students draw the projections of the various types of solids indifferent positions inclined to one of the planes.
Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

Unit V
Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic viewand vice versa.
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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

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, PHIPublishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

Course Outcome: The student will learn how to visualize 2D & 3D objects.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
	ENGINEERING PHYSICS LAB				

(For All Non-Circuital Branches like ME, CE, Chemical etc)
(Any 10 of the following listed experiments)

List of Engineering Physics Experiments

1. Laser: Determination of wavelength using diffraction grating.
2. Young's modulus of given material by Strain gauge method.
3. Study of variation of magnetic field along the axis of a current carrying circular coil byStewart & Gee's method.
4. Determination of ultrasonic velocity in given liquid (Acoustic grating).
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Estimation of Planck's constant using photoelectric effect.
8. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum).
9. Determination of numerical aperture and acceptance angle of an optical fiber.
10. Determination of thickness of thin object by wedge method.
11. Determination of radius of curvature of given plano convex lens by Newton's rings.
12. Determination of wavelengths of different spectral lines in mercuryspectrum using diffraction grating in normal incidence configuration.
13. Determination of dispersive power of the prism.
14. Sonometer: Verification of laws of string.
15. Measurement of magnetic susceptibility by Kundt's tube method.

References:
1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- SChand Publishers, 2017.

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		0	0	3	1.5

PROGRAMMING FOR PROBLEM SOLVING USING C LABORATORY

Course Objectives:
1) Apply the principles of C language in problem solving.
2) To design flowcharts, algorithms and knowing how to debug programs.
3) To design & develop of C programs using arrays, strings pointers & functions.
4) To review the file operations, preprocessor commands.

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.

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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.

Course Outcomes:
By the end of the Lab, the student

1) Gains Knowledge on various concepts of a C language.
2) Able to draw flowcharts and write algorithms.
3) Able design and development of C problem solving skills.
4) Able to design and develop modular programming skills.
5) Able to trace and debug a program

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I Year - I Semester		L	T	P	C
		0	0	3	1.5
	ENGLISH COMMUNICATION SKILLS LABORATORY				

TOPICS

UNIT I:

Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:
Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress (Homographs)

UNIT III:
Stress in compound words,rhythm, intonation,accent neutralisation.

UNIT IV:
Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions in speaking.

UNIT V:
Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

Prescribed text book: "**Infotech English**", Maruthi Publications.

References:
1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

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I Year - I Semester		L	T	P	C
		2	0	0	0
	ENVIRONMENTAL SCIENCE				

Learning Objectives:
The objectives of the course are to impart:
- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplannedanthropogenicactivities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT-I:
Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – 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 - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II:
Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams andother 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. Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT-III:
Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. 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: conservation of biodiversity.

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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.

UNIT – V Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting - Resettlement and rehabilitation of people; its problems and concerns.

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-Issues involved in enforcement of environmental legislation. -Public awareness.**Environmental Management**: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics. The student should Visit an Industry / Ecosystem and submit a report individually on any issues related toEnvironmental Studies course and make a power point presentation.

Text Books:
1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford UniversityPress.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; PearsonEducation, Chennai

Reference:
1. Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age InternationalPublishers, 2014