JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY:: KAKINADA
DEPARTMENT OF ELECTRONICS AND COMMUNICATION 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 in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- ➢ Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- ➢ Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- ➢ Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- ➢ Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- ➢ Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech 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 the context, 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 locate specific information
- ➢ recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- ➢ form sentences using proper grammatical structures and correct word forms

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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 posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, 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

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Unit 3:

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

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

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, sequencing of words

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

Pronunciation: word stress-poly-syllabic words.

Unit 4:

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

Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.**(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); 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, reveal trends/patterns/relationships, communicative process or display complicated data.
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.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

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

Pronunciation: Contrastive Stress

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 and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.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; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

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		3	0	0	3
MATHEMATICS-I					

Course Objectives:
- This course will illuminate the students in the concepts of calculus.
- 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: (10 hrs)
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.

UNIT II: Differential equations of first order and first degree: (10 hrs)
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 – Electrical circuits.

UNIT III: Linear differential equations of higher order: (10 hrs)
Non-homogeneous 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 $x^n V(x)$ – Method of Variation of parameters.
Applications: LCR circuit, Simple Harmonic motion.

UNIT IV: Partial differentiation: (10 hrs)
Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.
Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

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UNIT V: Multiple integrals: (8 hrs)
Double and Triple integrals – Change of order of integration – Change of variables.
Applications: Finding Areas and Volumes.

Text Books:
1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

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

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I Year - I Semester		L	T	P	C
		3	0	0	3
	APPLIED CHEMISTRY				

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

COURSE OBJECTIVES
- *Importance* of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- *Outline* the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- *Explain* the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- *Recall* the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- *Outline* the basics of computational chemistry and molecular switches

UNIT I: POLYMER TECHNOLOGY   **8 hrs**
Polymerisation:- Introduction, methods of polymerization (emulsion and suspension), mechanical properties.
Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).
Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).
Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.
   Course Outcomes: *At the end of this unit, the students will be able to*
- *Analyze* the different types of composite plastic materials and *interpret*the mechanism of conduction in conducting polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION   **10 hrs**
Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2-O_2, CH_3OH-O_2, phosphoric acid and molten carbonate).
*Corrosion:-*Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).
   Course Outcomes: *At the end of this unit, the students will be able to*
- *Utilize* the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and *categorize* the reasons for corrosion and study methods to control corrosion.

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UNIT III: MATERIAL CHEMISTRY **10 hrs**
Part I *: Non-elementalsemiconducting materials:-* Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).
Insulators &magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.
Part II:
Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)
Liquid crystals:- Introduction-types-applications.
*Super conductors:-*Type –I, Type II-characteristics and applications

Course Outcomes: *At the end of this unit, the students will be able to*
- *Synthesize* nanomaterials for modern advances of engineering technology.
- *Summarize the* preparation of semiconductors; analyze the applications of liquid crystals and superconductors.

UNIT IV:
SPECTROSCOPIC TECHNIQUES &NON-CONVENTIONAL ENERGY SOURCES
10 hrs
Part A: **SPECTROSCOPIC TECHNIQUES**
Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR [instrumentation and differentiation of sp, sp^2, sp^3 and IR stretching of functional groups (alcohols, carbonyls, amines) applications], magnetic resonance imaging and CT scan (procedure & applications).
Part B*:* NON-CONVENTIONAL ENERGY SOURCES
Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.
Course Outcomes: *At the end of this unit, the students will be able to*
- *Analyze* the principles of different analytical instruments and their applications.
- *Design* models for energy by different natural sources.

UNIT V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY **8 hrs**
Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies
*Molecular switches***:** characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor
Course Outcomes: *At the end of this unit, the students will be able to*
- *Obtain* the knowledge of computational chemistry and molecular machines

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Standard 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:
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)

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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
- To learn about the computer systems, computing environments, developing ofacomputer program and Structure of aCProgram
- To gain knowledge of the operators, selection, control statements and repetition inC
- To learn about the design concepts of arrays, strings, enumerated structure andunion types. To learn abouttheirusage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significanceoffunctions

UNIT I
Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, 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, Evaluating Expressions, 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,ArrayApplication, Two DimensionalArrays, Multidimensional Arrays, Programming Example –CalculateAverages
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

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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, McGrawHill
2. Programming in C, Ashok N. Kamthane, AmitKamthane,Pearson
3. Computer Fundamentals and Programming in C, PradipDey, ManasGhosh,OXFORD

COURSE OUTCOMES:
Upon the completion of the course the student will learn
- To write algorithms and to draw flowcharts forsolvingproblems
- To convert flowcharts/algorithms to C Programs, compile anddebugprograms
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for agivenproblem
- To design and implement programs to analyze the differentpointerapplications
- To decompose a problem into functions and to develop modularreusablecode
- To apply FileI/Ooperations.

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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 draw polygons, Engg. Curves.

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

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 of inclination and traces.

Unit III

Objective: The objective is to make the students draw the projections of the plane inclined toboth 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 in different 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 view and 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

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

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TEXT BOOKS:
1. Engineering Drawing by N.D. Butt, 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

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

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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 toanswer 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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		0	0	3	1.5
	APPLIED CHEMISTRY LAB				

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn^{+2} using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Cu^{+2} using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe^{+3} by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of Mg^{+2} presentin an antacid.
13. Determination of $CaCO_3$ present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

     Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books
1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

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I Year - I Semester		L	T	P	C
		0	0	3	1.5

PROGRAMMING FOR PROBLEM SOLVING USING C LAB

Course Objectives:
1) Apply the principles of C language inproblemsolving.
2) To design flowcharts, algorithms and knowing how todebugprograms.
3) To design & develop of C programs using arrays, strings pointers&functions.
4) To review the file operations,preprocessorcommands.

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 andfourcharacters.
2. Write a C program to compute the perimeter and area of a rectangle with a heightof 7 inches and width of5inches.
3. Write a C program to displaymultiplevariables.

Exercise 2:
1. Write a C program to calculate the distance between thetwopoints.
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 "Wrongvalues".

Exercise 3:
1. Write a C program to convert a string to alonginteger.
2. Write a program in C which is a Menu-Driven Program to compute the area of the variousgeometricalshape.
3. Write a C program to calculate the factorial of agivennumber.

Exercise 4:
1. Write a program in C to display the n terms of even natural number andtheirsum.
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 numberornot.

Exercise 5:
1. Write a program in C to print all unique elements inanarray.
2. Write a program in C to separate odd and even integers inseparatearrays.
3. Write a program in C to sort elements of array inascendingorder.

Exercise 6:
1. Write a program in C for multiplication of two squareMatrices.
2. Write a program in C to find transpose of agivenmatrix.

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 inreverseorder.

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KAKINADA – 533 003, Andhra Pradesh, India

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Exercise 8:
1. Write a program in C to compare two strings without using string libraryfunctions.
2. Write a program in C to copy one string toanotherstring.

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 intheprogram.

Exercise 10:
1. Write a program in C to demonstrate the use of & (address of) and *(value at address)operator.
2. rite a program in C to add two numbersusingpointers.

Exercise 11:
1. Write a program in C to add numbers using callbyreference.
2. Write a program in C to find the largest element using DynamicMemoryAllocation.

Exercise 12:
1. Write a program in C to swap elements using callbyreference.
2. Write a program in C to count the number of vowels and consonants in a string using apointer.

Exercise 13:
1. Write a program in C to show how a functionreturningpointer.
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 abovetwoprograms
2. Write a program in C to convert decimal number to binary number usingthefunction.

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 usingthefunction.

Exercise 16:
1. Write a program in C to append multiple lines at the end of atextfile.
2. Write a program in C to copy a file inanothername.
3. Write a program in C to remove a file fromthedisk.

Course Outcomes:

By the end of the Lab, the student
1) Gains Knowledge on various concepts of aClanguage.
2) Able to draw flowcharts andwritealgorithms.
3) Able design and development of C problemsolvingskills.
4) Able to design and develop modularprogrammingskills.
5) Able to trace and debugaprogram