



B. Tech (R20) UCEV (Autonomous) w.e.f 2020-21
DEPARTMENT OF MECHANICAL ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
VIZIANAGARAM-535003, ANDHRA PRADESH, INDIA
B.Tech COURSE STRUCTURE (2020 Admitted batch)

I B.Tech I Semester

S. No	Course Code	Course Title	L	T	P	C
1	R2011BS01	Calculus and Differential Equations	3	0	0	3
2	R2011BS05	Engineering Chemistry	3	0	0	3
3	R2011ES15	Programming for problem solving using C	3	0	0	3
4	R2011ES07	Engineering Graphics	1	0	4	3
5	R2011ES01	Basic Electrical and Electronics Engineering	3	0	0	3
6	R2011ES01A	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
7	R2011BS05A	Engineering Chemistry lab	0	0	3	1.5
8	R2011ES15A	Programming for problem solving using C Lab	0	0	3	1.5

Total = 19.5

Category	Credits
Basic Science Course	7.5
Engineering Science Courses	12
Total Credits	19.5



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B.Tech COURSE STRUCTURE (2020 Admitted batch)

I B.Tech II Semester

S. No	Course Code	Course Title	L	T	P	C
1	R2012BS02	Linear Algebra and Numerical Methods	3	0	0	3
2	R2012BS03	Engineering Physics	3	0	0	3
3	R2012HS01	Communicative English	3	0	0	3
4	R2012ES09	Engineering Mechanics	3	0	0	3
5	R2012ES10	Material Science and Metallurgy	3	0	0	3
6	R2012BS03A	Engineering Physics Lab	0	0	3	1.5
7	R2012HS01A	English Communication Skills Lab	0	0	3	1.5
8	R2012ES11A	Engineering Workshop Practice	0	0	3	1.5
9	R2012MC01	Environmental Science	2	0	0	0

Total= 19.5

Category	Credits
Basic Science Course	7.5
Engineering Science Courses	7.5
Humanities & Social Science	4.5
Total Credits	19.5



University College of Engineering Vizianagaram
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year-I Semester		L	T	P	C
		3	0	0	3
NAME OF THE SUBJECT: CALCULUS AND DIFFERENTIAL EQUATIONS					

(Common to all branches)

Course Objectives:

- (i) This course will illuminate the students in the concepts of calculus.
- (ii) To enlighten the learners in the concept of differential equations and multivariable calculus.
- (iii) 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.

UNIT I: Sequences, Series and Mean value theorems:

(10 hrs)

Sequences and Series: Convergence 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:

(15 hrs)

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form

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- Euler-Cauchy equation and Legendre's equation

Applications: Orthogonal trajectories – Electrical circuits (RL, RC, RLC) – Simple Harmonic motion.

UNIT III: Partial differentiation:

(10 hrs)

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mac Laurin'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).

UNIT IV: Multiple integrals:**(8 hrs)**

Double integrals – Change of order of integration - Double integrals in polar coordinates- Areas enclosed by plane curves- Triple integrals – Volume of solids – Change of variables to polar, spherical and cylindrical co-ordinates.

Applications: Finding Areas and Volumes.

UNIT V: Beta and Gamma functions:**(5 hrs)**

Introduction to Improper Integrals-Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.

Course Outcomes: At the end of the course, the student will be able to

- (i) Utilize mean value theorems to real life problems (L3)
- (ii) Solve the differential equations related to various engineering fields (L3).
- (iii) Familiarize with functions of several variables which are useful in optimization (L3)
- (iv) Apply double and triple integration techniques in evaluating areas and volumes bounded by region (L3)
- (v) Conclude the use of Beta and Gamma functions in evaluating improper integrals (L4)

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.



University College of Engineering Vizianagaram
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year-I Semester		L	T	P	C
		3	0	0	3
NAME OF THE SUBJECT: ENGINEERING CHEMISTRY					

(Common to Mechanical, MET, Civil)

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:

- (i) **Importance** of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- (ii) **Outline** the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- (iii) **Express** the increases in demand as wide variety of advanced materials are introduced; which have excellent engineering properties. Classify and discuss the materials used in major industries like steel industry, metallurgical industries and construction industries and electrical equipment manufacturing industries. Lubrication is also summarized.
- (iv) **Relate** the need of fuels as a source of energy to any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence introduced.
- (v) **Explain** the importance and usage of water as basic material in almost all the industries; **interpret** drawbacks of steam boilers and also how portable water is supplied for drinking purposes.

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.

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).

UNIT III: CHEMISTRY OF MATERIALS

10 hrs

Part- A:

Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]) with example (TiO_2), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Thermal analysis techniques: Instrumentation and applications of thermogravimetric analysis (TGA), differential thermal analysis (DTA), differential scanning calorimetry (DSC).

Part-B:

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, numerical problems, petroleum (refining-cracking), synthetic petrol (Fischer Tropsch and Bergius), petrol knocking, diesel knocking, octane and cetane ratings, anti-knocking agents, Introduction to alternative fuels (Bio-diesel, ethanol, methanol, natural gas, liquefied petroleum gas, compressed natural gas), Flue gas analysis by Orsat apparatus, rocket fuels.

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 related sums, ion exchange process), treatment of industrial waste water, potable water and its specifications, steps involved in purification of water, chlorination, break point chlorination-desalination (reverse osmosis and electro dialysis).

Course Outcomes: *At the end of this unit, the students will be able to*

- (i) **Analyze** the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
- (ii) **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
- (iii) **Synthesize** nanomaterials for modern advances of engineering technology. Summarize the techniques that detect and measure changes of state of reaction. Illustrate the commonly used industrial materials.
- (iv) **Differentiate** petroleum, petrol, synthetic petrol and have knowledge how they are produced. Study alternate fuels and analyse flue gases.
- (v) **Analyze** the suitable methods for purification and treatment of hard water and brackish water.

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. Sessa 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)



B. Tech R20 Syllabus
University College of Engineering Vizianagaram
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I YEAR-I SEMESTER	L	T	P	C
	3	0	0	3
NAME OF THE SUBJECT: PROBLEM SOLVING AND PROGRAMMING USING C				

(Common to all branches)

Course Objectives:

The objectives of this course is to acquire knowledge on the

- To impart adequate knowledge on the need of programming languages and problem-solving techniques and develop programming skills.
- To enable effective usage of Control Structures and Implement different operations on arrays.
- To demonstrate the use of Strings and Functions.
- To impart the knowledge of pointers and understand the principles of dynamic memory allocation.
- To understand structures and unions and illustrate the file concepts and its operations.
- To impart the Knowledge Searching and Sorting Techniques.

UNIT-I

Introduction to Computer Problem Solving: Programs and Algorithms, Computer Problem Solving Requirements, Phases of Problem Solving, Problem. Solving Strategies, Top-Down Approach, Algorithm Designing, Program Verification, Improving Efficiency, Algorithm Analysis and Notations.

UNIT-II

Introduction to C Programming: Introduction, Structure of a C Program. Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements. Operators, Type Conversion.

Control Flow, Relational Expressions: Conditional Branching Statements: if, if-else, if-else— if, switch. Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement.

UNIT-III

Arrays: Introduction, Operations on Arrays, Arrays as Function Arguments, Two dimensional Arrays, Multi dimensional arrays.

Pointers: Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers as Function Arguments, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer, Command Line Arguments,

UNIT-IV

Functions: Introduction, Function Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Variable Storage Classes. Recursion.

Strings: String Fundamentals, String Processing with and without Library

Functions, Pointers and Strings.

UNIT-V

Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type —Enum variables, Using Typedef keyword, Bit Fields.

Data Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

Course Outcomes:

At the end of the Course, Student should be able to:

- i. Illustrate the Fundamental concepts of Computers and basics of computer programming.
- ii. Use Control Structures and Arrays in solving complex problems.
- iii. Develop modular program aspects and Strings fundamentals.
- iv. Demonstrate the ideas of pointers usage.
- v. Solve real world problems using the concept of Structures, Unions and File operations.

Text Books:

- i. How to solve it by Computer, R. G. Dromey, and Pearson Education.
- ii. Computer Programming. Reema Thareja, Oxford University Press
- iii. Let us C , Yaswanth Kanetkar, 16th Edition,BPB Publication.

Reference Books:

- i. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
- ii. Programming In C A-Practical Approach. Ajay Mittal, Pearson.
- iii. C Programming — A Problem Solving Approach, Forouzan, Gilberg, Cengage.
- iv. The C Programming Language, Dennis Richie And Brian Kernighan, Pearson Education.
- v. Programming In C, Ashok Kamthane, Second Edition, Pearson Publication.
- vi.

Web Links:

- <http://www.c4learn.com/>
- <http://www.geeksforgeeks.org/c/>
- <http://nptel.ac.in/courses/122104019/>
- <http://www.learn-c.org/>
- <https://www.tutorialspoint.com/cprogramming/>

B. Tech R20 Syllabus



University College of Engineering Vizianagaram JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year-I Semester		L	T	P	C
		1	0	4	3
NAME OF THE SUBJECT: ENGINEERING GRAPHICS					

Course Objectives:

The objectives of this course is to acquire knowledge on the:

- Use of drawing instruments and to draw orthographic projections of points , projections of lines inclined to one plane and both the planes
- Make the students to draw the projections of the plane objects and inclined to both the reference planes.
- Make the students to draw the projections of the various types of solids in different positions inclined to one plane, inclined to both the planes.
- Make the students to understand the concepts of sections of solids and development of surfaces which are required in designing and manufacturing of the objects.
- Make the students to represent and convert the isometric view to orthographic views and vice versa.

UNIT - I:

Orthographic Projections of Points and Lines: 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 - II:

Polygons: Constructing regular polygons by general methods.

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 - III: Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one plane, Projections of Regular Solids inclined to both planes.

UNIT-IV

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

Development of Surfaces for Right Regular Solids: Right regular solids of Prism, Cylinder, Pyramid, Cone and their parts.

UNIT-V

Conversion of isometric views to orthographic views and Conversion of orthographic views to isometric views.

Course Outcomes:

The students should be able to:

- i. Apply the orthographic projections to points, lines in different positions with reference planes.
- ii. Prepare the drawings for construction of regular polygons and the projection of the planes inclined to both the planes.
- iii. Prepare the drawings for the projections of the various types of solids in different positions inclined to one plane and both the planes
- iv. Apply the concepts of sections of solids and development of surfaces.
- v. Use the concepts of isometric view to orthographic views and vice-versa.

Text Books:

- i. Engineering Drawing by N.D. Bhatt, Chariot Publications
- ii. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

Reference Books:

- i. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
- ii. Engineering Graphics for Degree by K.C. John, PHI Publishers
- iii. Engineering Graphics by PI Varghese, McGrawHill Publishers
- iv. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age



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I Year –I Semester		L	T	P	C
		3	0	0	3
NAME OF THE SUBJECT: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING					

(Common to CIVIL, MECH, MET Engg.)

Course objectives:

The objectives of this course is to acquire knowledge on the

- i. principle of operation and construction details of DC machines & Transformers.
- ii. principle of operation and construction details of alternator and 3-Phase induction motor.
- iii. PN junction diode, half wave, full wave rectifiers and zener diode.
- iv. PNP and NPN transistors and various amplifiers.

UNIT - I

Electrical Circuits

Basic definitions – types of network elements – Ohm’s Law – Kirchoff’s Laws – inductive networks – capacitive networks – series – parallel circuits – Numerical Problems.

UNIT - II

DC Machines

Principle of operation of DC generator- types of DC machines - EMF equation- OCC & Load characteristics- principle of operation of DC Motor—torque equation – applications – three point starter – speed control methods of DC motor – Swinburne’s Test and Brake Test.

UNIT - III

AC Machines & Transformers

Transformers:

Principle of operation and construction of single phase transformers – EMF equation – OC & SC tests – losses & efficiency.

AC Machines

Principle of operation of 3-Phase induction motor– slip-torque characteristics – Brake Test - efficiency – applications - principle of operation and construction of alternators – types of alternators - principle of operation of synchronous motor.

UNIT IV

Diodes and Rectifiers

Classification of Semiconductors–intrinsic-extrinsic-PN junction diode-Forward bias & Reverse Bias- V-I Characteristics- diode as rectifier-half wave and bridge rectifier (with and without filter)- Zener diode-characteristics, applications.

UNIT V

Transistors

Transistors, transistor as an amplifier–CE & CB connections-characteristics, Basic principles of Feedback Amplifiers-Types, Basic principle and characteristics of operational amplifiers (OP-AMP) – application of OP-AMPs (inverting, non-inverting, integrator and differentiator).

Course Outcomes:

The student should be able to:

- i. understand the basics of series and parallel electrical circuits.
- ii. understand the operation and performance of DC machines and testing of DC shunt motor by swinburne's test and brake test.
- iii. principle of operation, construction and performance of AC machines (transformers, synchronous machines and 3-phase & 1-phase induction motors)
- iv. understand the concept of semiconductor diodes, operation of half wave, full wave bridge rectifiers, characteristics and applications of Zener diode.
- v. analyze the concept of transistors and amplifiers.

Text Books:

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

Reference Books:

- i. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor & Francis Group
- ii. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
- iii. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition.
- iv. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition.
- v. Industrial Electronics by G.K. Mittal, PHI.



B. Tech R20 Syllabus
University College of Engineering Vizianagaram
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year – I semester	L	T	P	C
	0	0	3	1.5
NAME OF THE LAB: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB				

(Common to CIVIL, MECH, MET Engg.)

Course objectives:

The objectives of this course is to acquire knowledge on the

- i. efficiency of dc shunt machine, transformer and 3-phase induction motor by conducting direct/indirect tests.
- ii. speed control methods of DC shunt motor
- iii. characteristics of various basic semiconductor devices.

Any Five Experiments are to be conducted from each section.

Section A: Electrical Engineering:

1. Verification of Kirchhoff's Laws (Kirchhoff's Current Law and Kirchhoff's Voltage Law).
2. Swinburne's test on D.C. Shunt machine (predetermination of efficiency of a given D.C. shunt machine working as motor and generator).
3. Speed control of D.C. Shunt motor by
 - a) Armature Voltage control b) Field flux control method
4. Brake test on D.C. Shunt Motor.
5. Magnetisation characteristics on DC Shunt generator
6. Load characteristics on DC Shunt generator
7. OC and SC tests on single phase transformer (predetermination of efficiency at given power factors).
8. Brake test on 3-phase Induction motor (determination of performance characteristics)

Section B: Electronics Engineering:

1. Static characteristics of PN junction diode
2. V-I characteristics of Zener-diode
3. Half and full wave rectifier with and without filters.
4. Transistor CB characteristics (input and output)
5. Transistor CE characteristics (input and output)
6. Study of amplifiers.
7. OP- Amp applications (inverting, non-inverting, integrator and differentiator)

Course Outcomes:

The student should be able to:

- i. compute the efficiency of DC shunt machine with/without loading the machine.
- ii. Estimate the efficiency at different load conditions and power factors for single phase transformer with OC and SC tests.
- iii. analyze the performance characteristics of 3-Phase induction motor.
- iv. control the speed of dc shunt motor using armature voltage and field flux control methods.
- v. analyze the characteristics of PN junction diode, transistor and determine the ripple factor of half wave and full wave rectifiers.

Text books:

- i. Principles of Electrical Machines by V.K. Mehta & Rohit Mehta, S.Chand publications
- ii. Theory & performance of Electrical Machines by J.B.Guptha, S.K.Kataria & Sons
- iii. Electrical Machinery by P.S. Bhimbra, Khanna Publishers.

Reference books:

- i. Basic Electrical Engineering by M.S.Naidu & S.Kamakshiah, TMH Publications.
- ii. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition.
- iii. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition.



University College of Engineering Vizianagaram
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I Year-I/II Semester		L	T	P	C
		0	0	3	1.5
NAME OF THE LAB: ENGINEERING CHEMISTRY LAB					

(Common to Mechanical, MET, Civil)

Course Objectives:

The objectives of this course is to acquire knowledge on the

- (i) Normality, molarity, theory of indicators used in different volumetric and chemical analysis.
- (ii) Alkalinity and hardness of water by EDTA method.
- (iii) Volumetric analysis Red- Ox titrations of different chemical compounds.
- (iv) Determination of concentration of acids and bases using conductometer and potentiometer
- (v) Determination of P^H and color metric analysis

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} present in 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).
18. Determination of Lead in drinking water.
19. Determination of percentage of copper in Brass.

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

Course Outcomes:

- (i) Student is exposed to volumetric titrations acquires some volumetric skills.
- (ii) Student is able to analyze hard and soft water.
- (iii) Student is exposed to volumetric skills of red-ox titrations with different indicators
- (iv) Students can handle the instruments like conductometer, potentiometer in determining the concentrations of acids and bases.
- (v) Student is able to analyze the different chemical concentrations using colorimeter and P^{H} meter.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co. Latest edition



B. Tech R20 Syllabus

University College of Engineering Vizianagaram JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I YEAR-I SEMESTER		L	T	P	C
		0	0	3	1.5
NAME OF THE LAB: PROBLEM SOLVING AND PROGRAMMING USING C LAB					

(Common to all branches)

Course Objectives:

The objectives of this course is to acquire knowledge on the

- To impart knowledge on basic Linux commands, various Editors, Raptor.
- To make the students understand the concepts of C programming.
- To nurture the students on Control Structures and develop different operations on arrays.
- To make use of String fundamentals and modular programming constructs.
- To implement programs using dynamic memory allocation.
- To explain the concepts of Structure, Unions and files for solving various problems.

List of Experiments:

1. Introduction to Algorithms and Flowcharts

- 1.1) Implement Algorithm Development for Exchange the values of Two numbers.
- 1.2) Given a set of n student's examination marks (in the range 0-100) make a count of the number of students that passed the examination. A Pass is awarded for all of 50 and above.
- 1.3) Given a set of n numbers design an algorithm that adds these numbers and returns the resultant sum. Assume N is greater than or equal to zero.

2. Introduction to C Programming

- 2.1) Basic Linux Commands.
- 2.2) Exposure to Turbo C, Vi, Emacs, Code Blocks IDE, Dev C++.
- 2.3) Writing simple programs using printf(), scanf() .

3. Raptor

- 3.1) Installation and Introduction to Raptor.
- 3.2) Draw a flow chart to find the Sum of 2 numbers.
- 3.3) Draw a flow chart to find Simple interest.

4. Basic Math

- 4.1) Write a C Program to convert Celsius to Fahrenheit and vice versa.
- 4.2) Write a C Program to find largest of three numbers using ternary operator.
- 4.3) Write a C Program to Calculate area of a Triangle using Heron's formula.

5. Control Flow- I

- 5.1) Write a C Program to Find Whether the Given Year is a Leap Year or not.
- 5.2) Write a C program to find the roots of a Quadratic Equation.
- 5.3) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using Switch...case.

6. Control Flow- II

- 6.1) Write a C Program to Find Whether the Given Number is Prime number or not.
- 6.2) Write a C Program to Find Whether the Given Number is Armstrong Number or not.
- 6.3) Write a C program to print Floyd Triangle.

7. Control Flow- III

- 7.1) Write a C program to find the sum of individual digits of a positive integer.
- 7.2) Write a C program to check whether given number is palindrome or not.
- 7.3) Write a C program to read two numbers, x and n, and then compute the sum of the geometric progression $1+x+x^2+x^3 + \dots + x^n$.

8. Arrays

- 8.1) Write a C program to search an element in the given array (Linear Search).
- 8.2) Write a C program to perform matrix addition.
- 8.3) Write a C program to perform matrix multiplication.

9. Pointers

- 9.1) Write a C Program to Perform Addition, Subtraction, Multiplication and Division of two numbers using Command line arguments.
- 9.2) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
- 9.3) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

10. Functions, Array & Pointers

- 10.1) Write a C Program to demonstrate parameter passing in Functions.
- 10.2) Write a C Program to find Fibonacci, Factorial of a number with recursion and without recursion.
- 10.3) Write a C Program to find the sum of given numbers with arrays and pointers.

11. Strings

- 11.1) Implementation of string manipulation operations with library function:
 - a. copy
 - b. concatenate
 - c. length
 - d. compare

I 1.2) Implementation of string manipulation operations without library function:

- a. copy
- b. concatenate
- c. length
- d. compare

12. Structures

12.1) Write a C Program to Store Information of a book Using Structure.

12.2) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function.

13. Files

13.1) Write a C program to open a file and to print the contents of the file on screen.

13.2) Write a C program to copy content of one file to another file.

13.3) Write a C program to merge two files and store content in another file.

14. Application

Creating structures to capture the student's details save them in file in proper record format. search and prints the student details requested by the user.

Note: Draw the flowcharts using Raptor from Experiment 3 to Experiment 6.

Course Outcomes:

- Implement basic programs in C and design flowcharts in Raptor.
- Use Conditional and Iterative statements to solve real time scenarios in C.
- Implement the concept of Arrays and Modularity and Strings.
- Apply the Dynamic Memory Allocation functions using pointers.
- Develop programs using structures, and Files.

Text Books:

- i. Let us C , Yaswanth Kanetkar, 16th Edition,BPB Publication.
- ii. How to solve it by Computer, R. G. Dromey, and Pearson Education.
- iii. Computer Programming. Reema Thareja, Oxford University Press

Reference Books:

- i. Programming in C A-Practical Approach Ajay Mittal. Pearson Education.
- ii. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.
- iii. Problem solving using C , K Venugopal,3'd Edition,TMG Publication.

Web Links:

1. <https://www.hackerrank.com/>
2. <https://www.codechef.com/>
3. <https://www.topcoder.com/>
4. <https://code-cracker.github.io/>
5. <https://raptor.martincarlisle.com/>
6. <https://npte1.ac.in/courses/106105055/2>



University College of Engineering Vizianagaram
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year-II Semester		L	T	P	C
		3	0	0	3
NAME OF THE SUBJECT: LINEAR ALGEBRA AND NUMERICAL METHODS					
(Common to all branches)					

Course Objectives:

The objectives of this course is to acquire knowledge on the

- (i) To instruct the concept of Matrices in solving linear algebraic equations
- (ii) To elucidate the different numerical methods to solve nonlinear algebraic equations
- (iii) To disseminate the use of different numerical techniques for carrying out numerical integration.
- (iv) 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

UNIT – I: Systems of linear equations, Eigen values and Eigen vectors: (10 hrs)

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

Applications: Free vibration of a two-mass system.

UNIT – II: Cayley-Hamilton theorem and Quadratic forms: (10 hrs)

Cayley-Hamilton theorem (without proof) – Finding 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.

Singular values of a matrix, singular value decomposition (Ref. Book – 1).

UNIT – III: Iterative methods: (8 hrs)

Introduction– Solutions of algebraic and transcendental equations : Bisection method–Secant method – Method of false position– Iteration method – Newton-Raphson method (One variable and simultaneous Equations)

Solutions of system of equations - Jacobi and Gauss-Seidel methods

Evaluation of largest eigenvalue –eigenvector using Power Method.

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– Newton’s divide difference formula.

UNIT–V: Numerical integration and solution of differential equations with initial conditions:

(10 hrs)

Trapezoidal rule– Simpson’s $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule– Solution of differential equations with initial conditions by Taylor’s series– Picard’s method of successive approximations– Euler’s method – Runge-Kutta method (second and fourth order) – Milne’s Predictor and Corrector Method.

Course Outcomes: The student will be able to

- (i) Develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- (ii) Solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- (iii) Evaluate approximating the roots of polynomial and transcendental equations by different algorithms (L5)
- (iv) Apply Newton’s forward & backward interpolation and Lagrange’s formulae for equal and unequal intervals (L3)
- (v) Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations (L3)

Text Books:

- (i) **B. S. Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
- (ii) **B. V. Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

- (i) **David Poole**, Linear Algebra- A modern introduction, 4th Edition, Cengage.
- (ii) **Steven C. Chapra**, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
- (iii) **M. K. Jain, S. R. K. Iyengar and R. K. Jain**, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
- (iv) **Lawrence Turyn**, Advanced Engineering Mathematics, CRC Press.



University College of Engineering Vizianagaram
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year-I / II Semester		L	T	P	C
		3	0	0	3
NAME OF THE SUBJECT: ENGINEERING PHYSICS (Common to CE, ME & MET)					

Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
- ii. Understand the mechanism for emission of light, utility of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
- iii. Open new avenues of utility for dielectric and magnetic materials as potential sources for micro devices.
- iv. Familiarize the concepts of theoretical acoustics for their practical utility in engineering acoustics.
Explanation for the significance of ultrasound and its application in NDT application.
- v. Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law – Learning the structural analysis through X-ray diffraction

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 - resolving power of Grating(Qualitative).

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

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-Numerical Aperture-Classification of optical fibers based on refractive index profile and modes – Block diagram of fiber optics communication.

UNIT III: Dielectric and Magnetic 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.

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 for Ferromagnetism (Qualitative) - Hysteresis - soft and hard magnetic materials.

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-Transducers – pulse echo system through transmission and reflection modes - Applications.

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.

X-ray diffraction: Bragg’s law - X-ray Diffractometer– crystal structure determination by Laue’s powder method-XRD pattern of amorphous, crystalline, and nanomaterials.

Course Outcomes:

The students should be able to

- i. **understand** the concepts of physical optics through the wave nature of light and **discuss** the phenomenal differences between interference, diffraction and polarization.
- ii. **describe** the basic laser physics, working of lasers, and principle of propagation of light in optical fibers.
- iii. **explain** the basics of dielectric and magnetic materials to synthesize new materials as per needs of engineering applications.
- iv. **apply** the knowledge of Ultrasonic to understand non destructive testing and **analyze** acoustic properties of typically used materials in buildings
- v. **recognize** various planes in a crystal and describe the structure determination using x-rays.

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



University College of Engineering Vizianagaram
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year-I/ II Semester		L	T	P	C
		3	0	0	3
NAME OF THE SUBJECT: COMMUNICATIVE ENGLISH					

(Common to all branches)

Course Objectives

- (i) Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- (ii) Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- (iii) Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- (iv) Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- (v) Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

UNIT I:

A Drawer full of happiness

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 II:

Nehru's letter to his daughter Indira on her birthday

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 III:

Stephen Hawking-Positivity 'Benchmark'

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 IV:

Liking a Tree, Unbowed: Wangari Maathai-biography

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.

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

Pronunciation: Contrastive Stress

UNIT V:

Stay Hungry-Stay foolish

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 Strategy Intensive 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

Course Outcomes:

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

- (i) Understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- (ii) Ask and answer general questions on familiar topics and introduce oneself/others
- (iii) Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- (iv) Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- (v) Form sentences using proper grammatical structures and correct word forms

Prescribed text books:

- (i) “**Infotech English**”, Maruthi Publications. (Detailed)

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012
5. Martin Hewings , *Advanced English Grammar*, Cambridge university press
6. William Strunk JR. and E B White, *Elements of Style*, 4th Edition, Pearson
7. *Language and Life: A Skills Approach* Board of Editors, Orient Black Swan Publishers, India. 2018.
8. *Practical English Usage*, Michael Swan. OUP. 1995.
9. *Remedial English Grammar*, F.T. Wood. Macmillan.2007
10. *On Writing Well*, William Zinsser. Harper Resource Book. 2001
11. *Study Writing*, Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
12. *Communication Skills*, Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
13. *Exercises in Spoken English*, Parts. I-III. CIEFL, Hyderabad. Oxford University Press.
14. *Advanced English Grammar*, Martin Hewings. Cambridge University Press. 2016
15. *Elements of Style*, William Strunk and EB White. Pearson. 1999.

B. Tech R20 Syllabus



University College of Engineering Vizianagaram JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year-II Semester		L	T	P	C
		3	0	0	3
NAME OF THE SUBJECT: ENGINEERING MECHANICS (Common to ME, CE and MET)					

Course Objectives:

The objectives of this course is to acquire knowledge on the

- The students are to be exposed to the concepts of force and friction, direction and its application.
- The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.
- The students are to be exposed to concepts of centre of gravity. The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.
- 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.
- The students are to be exposed to rigid motion kinematics and kinetics.

UNIT – I

Introduction to Engineering 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 Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses.

UNIT – III

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

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, Products of Inertia, Transfer Formula for Product of Inertia. **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- D'Alembert's Principle, 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.

Course Outcomes:

The students should be able to:

- i. To learn the principles (Axioms) of statics, able to find resultant & resolution of system of forces and resultant force.
- ii. Explore the concepts of constraints, free body diagram and action-reaction.
- iii. Estimate the geometric parameters like centroid, center of gravity and moment of inertia and identify their application.
- iv. Learn the analysis of frames and trusses and know the importance of friction.
- v. Able to determine solution to dynamic problems through D'Alembert equilibrium equations, Impulse-Momentum and work- energy method

Text Book:

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.
2. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
3. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.

Reference Books:

1. Engineering Mechanics , statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
2. Engineering Mechanics , dynamics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics , statics and dynamics – I.H.Shames, – Pearson Publ.
4. Mechanics For Engineers , statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
5. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston –5th Edn Mc Graw Hill Publ.
6. Engineering Mechanics , Fedinand . L. Singer , Harper – Collins.
7. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications
8. Engineering Mechanics, Tayal. Umesh Publ.

B. Tech R20 Syllabus



University College of Engineering Vizianagaram JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year-II Semester		L	T	P	C
		3	0	0	3
NAME OF THE SUBJECT : MATERIAL SCIENCE & METALLURGY					

Course Objectives:

The objectives of this course is to acquire knowledge on the

- Basic fundamentals of Material science and Physical metallurgy.
- Basic concepts to be taught will help for the improvement, proper selection and effective utilization of materials which is essential to satisfy the ever increasing demands of the society.

UNIT – I

Structure of Metals and Constitution of alloys: Bonds in Solids, Metallic bond, crystallization of metals, Packing Factor for cubic structures - SC, BCC, FCC-line density, plane density. Grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size. Imperfections – point, line, Surface and volume. Slip and Twinning.

Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds

Equilibrium Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni and Fe-Fe₃C.

UNIT –II

Cast Irons and Steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT – III

Non-ferrous Metals and Alloys: Structure and properties of Copper and its alloys, Aluminium and its alloys, Titanium and its alloys, Magnesium and its alloys, Super alloys.

Heat treatment of Alloys: Effect of alloying elements on Fe-Fe₃C system, Annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT – IV

Powder Metallurgy: Basic processes- Methods of producing metal powders- milling atomization-Granulation-Reduction-Electrolytic Deposition. Compacting methods – Sintering - Methods of manufacturing sintered parts. Sintering Secondary operations-Sizing, coining, machining -Factors determining the use of powder metallurgy-Application of this process.

UNIT – V

Ceramics and composite materials: Crystalline ceramics, glasses, cermets, abrasive materials
Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites. Nano materials – definition, properties and applications.

Course Outcome: The student will be able to:

- i. Analyze the basic fundamentals of metals, alloys.
- ii. Understand the properties and classification of cast irons and steels.
- iii. Analyze properties and applications of non ferrous metals and understand the stability of phases, various heat treatment and strengthening processes.
- iv. Understand the concepts of powder metallurgy.
- v. Understand the concepts of ceramics, composite materials and nano materials.

TEXT BOOKS:

1. Introduction to Physical Metallurgy - Sidney H. Avener - McGrawHill
2. Essential of Materials science and engineering - Donald R. Askeland - Cengage.

REFERENCES :

Material Science and Metallurgy – Dr. V.D.kodgire- Everest Publishing House
Materials Science and engineering - Callister & Baalashubrahmanyam- Wiley Publications
Material Science for Engineering students – Fischer – Elsevier Publishers
Material science and Engineering - V. Rahghavan-PHI Publishers
Introduction to Material Science and Engineering – Yip-Wah Chung CRC Press
Material Science and Metallurgy – A V K Suryanarayana – B S Publications
Material Science and Metallurgy – U. C. Jindal – Pearson Publications



University College of Engineering Vizianagaram
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year- I / II Semester	L	T	P	C
	0	0	3	1.5
NAME OF THE LAB : ENGINEERING PHYSICS LAB (Common to CE, ME & MET)				

Course Objectives:

The objectives of this course is to acquire knowledge on the

- i. To **impart skills** in measurements with accurate error propagation.
- ii. To **plan** the experimental procedure, **design** and to record and **analysis** results.
- iii. To reach nontrivial conclusions of significant of the experiments.
- iv. To **develop** the skills to handle different instruments without taking erroneous readings and ability to enhance the skills to fabricate engineering and technical equipments.

List of experiments:

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

Course outcomes:

The students will be able to

- i. **Describe** the methodology of science and the relationship between observation and theory.
- ii. **Develop** scientific problem solving skills, including organization of given information, identification and application of pertinent principles, quantitative solutions, interpreting results, and evaluating the validity of results.
- iii. **Discover** of physics concepts in other disciplines such as mathematics, computer science, engineering, and chemistry.
- iv. **Learn** to minimize contributing variables and recognize the limitations of equipment.
- v. **Apply** conceptual understanding of the physics to general real-world situations.

vi. **Develop** interpersonal and communication skills including communicating in small groups, writing, working effectively with peers.

Reference Books:

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



University College of Engineering Vizianagaram
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year-I/ II Semester		L	T	P	C
		0	0	3	1.5
NAME OF THE LAB: ENGLISH COMMUNICATION SKILLS LAB					
(Common to all branches)					

Course Objectives

- (i) To impart grammar as well as communication through pronunciation. By introduction, pure vowels, consonants, diphthongs, phonetic transcription, common errors in pronunciation.
- (ii) To impart better knowledge on Stress. Stress of kinds- mono syllabic, di syllabic, poly syllabic, strong and weak forms of stress along with contrastive stress.
- (iii) To impart learner grammar as well as communication through compound words, rhythm, intonation and accent neutralization
- (iv) To impart learner grammar as well as communication through listening, by identifying the context and specific pieces of information to answer a series of questions in speaking
- (v) To improve the spoken skills of students by making them read news papers in order to understand and identify key terms context they read .

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.

Course Outcomes:

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

- (i) The learner will improve phonetic understanding, transcription, common errors both in pronunciation and written English.
- (ii) The learner will improve syllabic division, and how to use right stress in their pronunciation.
- (iii) The learner will improve speaking skills with right intonation and rhythm and intonation and how to reduce mother tongue influence in English.
- (iv) The learner will Improve speaking skills as well as listening skills by listening through the audio clips prescribed.
- (v) The learner will Improve speaking skills along with reading skills.

Prescribed text book:

- (i) “**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.



B. Tech R20 Syllabus

University College of Engineering Vizianagaram JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year-II Semester		L	T	P	C
		0	0	3	1.5
NAME OF THE LAB: ENGINEERING WORKSHOP PRACTICE					

(Common to ME, CE and MET)

Course Objectives:

The objectives of this course is to acquire knowledge on the

- To impart hands-on practice on Carpentry trade and skills.
- To impart hands-on practice on Fitting trade and skills
- To impart hands-on practice on Black Smithy trade and skills
- To impart hands-on practice on House Wiring trade and skills
- To impart hands-on practice on Tin Smithy trade and skills

Note: At least two exercises to be done from each trade.

Trade:

- 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

Course Outcomes:

The students should be able to:

- i. Understand and practice Carpentry tools and trade.
- ii. Apply various types of Fitting tools and practice the trade
- iii. Understand and practice Black Smithy tools and trade
- iv. Apply concepts of House Wiring trade
- v. Analyze working of various tools of Tin Smithy trade
- vi. Understand the basic hardware of computer

B. Tech R20 Syllabus



University College of Engineering Vizianagaram JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

I Year-I/II Semester		L	T	P	C
		2	0	0	0
NAME OF THE SUBJECT: ENVIRONMENTAL SCIENCE					

(Common to All branches)

Course Objectives:

The objectives of this course is to acquire knowledge on the

(i)The natural resources and their sustenance of the life and recognize the need to conserve the natural resources.

(ii)The concepts of ecosystem and its functions in the environment. The need for protecting the producers and consumers and their role in the food web.

(iii)The biodiversity of India and the threats to biodiversity, and the conservation practices to protect the biodiversity.

(iv)Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management.

(v)Social issues both rural and urban environment and the possible means to combat the challenges.

UNIT - I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES 7hrs

Definition, Scope and Importance - Need for public Awareness.

Natural Resources : Renewable and non-renewable 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 -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 agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

UNIT - II: ECOSYSTEMS, BIODIVERSITY AND ITS CONSERVATION 7hrs

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 the ecosystems.

Biodiversity and its Conservation : Definition: genetic, species and ecosystem diversity – Bio geographical classification of India - Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels - India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT - III Environmental Pollution and solid waste Management 6hrs

Environmental pollution: Definition, Cause, effects and control measures of: Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, nuclear hazards.

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution, Disaster management: floods, earthquake, cyclone and landslides.

UNIT - IV: SOCIAL ISSUES AND THE ENVIRONMENT**6hrs**

Social Issues and the Environment: From Unsustainable to Sustainable development - 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 - Climate change, global warming, acid rain and ozone layer depletion, Wasteland reclamation – Consumerism and waste products. - Environment Protection Act. - Air (Prevention and Control of Pollution) Act. -Water (prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act.

UNIT - V: HUMAN POPULATION AND THE ENVIRONMENT**6hrs**

Human population and the Environment: Population growth, variation among nations' Population explosion - Family Welfare programme. - Environment and human health - Human Rights - Value Education - HIV/AIDS - Women and Child Welfare - Role of information Technology in Environment and human health.

Field Work: Visit to a local area to document environmental assets River/forest Grassland/hill/mountain - Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds - river, hill slopes.

Course Outcomes:

The students should be able to:

- (i) Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
- (ii) Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities.
- (iii) Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century.
- (iv) Influence their society in proper utilization of goods and services, Recognize the interconnectedness of human dependence on the earth's ecosystems.
- (v) Learn the management of environmental hazards and to mitigate disasters and have a clear understanding of environmental concerns and follow sustainable development practices.

Text Books:

- (i) Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
- (ii) Environmental Studies by Palaniswamy - Pearson education.
- (iii) Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company.

Reference Books:

- (i) Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
- (ii) Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
- (iii) Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
- (iv) Environmental sciences and engineering - J. Glynn Henry and Gary W. Heinke – Prentice hall India Private limited.
- (v) A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House.
- (vi) Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P.Ela - Prentice hall of India Private limited.