JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF MATHEMATICS
I B.TECH – I SEMESTER (R19)
(Common to all Branches of Engineering)
(THEORY)

Subject Code	Title of the Subject	L	T	P	C
	Linear Algebra and Calculus	3	0	-	3

COURSE OBJECTIVES	
1	This course will illuminate the students in the concepts of calculus and linear algebra.
2	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	
CO1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications
CO2	Utilize mean value theorems for real life problems
CO3	Familiarize with functions of several variables which is useful in optimization
CO4	Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2 and 3- dimensional coordinate systems.
CO5	Students will learn the utilization of special functions.

SYLLABUS

Unit I: Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by echelon form, Normal form, solving system of non-homogeneous and homogeneous linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalization of a matrix.

Unit II: Infinite seriesand Mean Value Theorems

Infinite series:

Series, Convergence and divergence, Geometric series, Integral test, P- series, comparison test, ratio test, root test.

Mean Value Theorems:

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem (without proof).Expansions of functions: Taylor's and Maclaurin's series, indeterminate forms and L-Hospital rule (Limits).

Unit III: Multivariable calculus

Functions of several variables – Limit and Continuity, Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers for three variables.

Unit IV: Multiple Integrals

Double integrals, change of order of integration, areas enclosed by plane curves, Triple Integrals, Volume of solid as double integral and as triple integral, change of variables in double integral and Triple integral.

Unit V: Special Functions- Beta and Gamma functions

Beta and Gamma functions and their properties, relation between beta and gamma functions.Derichlet's integral and its applications (Areas and Volumes of solids).

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

References:

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc-Grawhill publishing company Ltd., New Delhi.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.

PYTHON PROGRAMMING

SEMESTER - I **L-T-P-C: 3-1-0-4**

Course Objectives:

1. To introduce programming through Visual programming tool - Scratch
2. To teach problem solving through Flow charting tool - Raptor
3. To elucidate problem solving through python programming language
4. To introducefunction-oriented programming paradigm through python
5. To train in development ofsolutions using modular concepts
6. To teach practical Pythonic solution patterns

Unit – 1: Computer Fundamentals: What is a Computer? , Introduction to Operating systems, and Operational overview of a Central Processing Unit.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming,Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Classification of Programming languages,Structured programming concept, Algorithms,Pseudo-code,Flowcharts,Strategyfordesigningalgorithms,Tracinganalgorithmto depict logic, Specification for converting algorithms into programs.

Learning Outcomes: Student should be able to

1. Know the basics of Computers and programming languages
2. Solve Computational problems
3. Apply Algorithmic approach to solving problems

Unit – 2: Flowchart design through Raptor

Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems(section 1) – Finding maximum of 3 numbers, Unit converters, Interestcalculators,multiplicationtables,GCDof2numbers,Factorialofanumber,sumofeven and sum of odd numbers between 1 to n.

Example problems (section 2) - Fibonacci number generation, prime number generation. Minimum, Maximum and average of n numbers, linear search, Binary Search.

Learning outcomes: Student should be able to

1. Select flowchart symbols for solving problems.
2. Develop basic flowcharts for performing Input, Output and Computations
3. Solve numerical problems using Raptor
4. Analyze problems by modular approach using Raptor

Text Book:

https://raptor.martincarlisle.com/

1. Download and Install Raptor software
2. Use the tool to draw flowcharts for the problems given.

Unit – 3: Introduction to Python

Python – Numbers, Strings, Variables, operators, expressions, statements, String operations, Math function calls, Input/Output statements, Conditional If, while and for loops, User defined Functions, parameters to functions, recursive functions.

Learning outcomes

1. Interpretnumbers,strings,variables,operators,expressionsandmathfunctionsusing Python Interactive Mode.
2. Solve simple problems using control structures, input and output statements.
3. Develop user defined functions (recursive and non-recursive).
4. Build Python programs for section 1 raptor flowcharts.
5. Develop Python programs for creating various graphical shapes using turtle graphics.

Text Book:

http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

Unit – 4: Data Structures and Idiomatic Programming in Python

Lists,Tuples,Dictionaries,Strings,Filesandtheirlibraries.Beautifulidiomaticapproachto solve programming problems.

Learning outcomes: Student should be able to

1. Summarize the features of lists, tuples, dictionaries, strings and files.
2. Demonstrate best practices of "Beautiful Idiomatic Python".
3. Build Python programs for section 2 raptor flowcharts.

http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

Unit – 5: Event driven Programming

TurtleBarChart,EventDrivenprogramming,Keypressevents,Mouseevents,timerevents, Turtle Graphics.

Learning outcomes: Student should be able to

1. Develop python programs to draw bar charts using turtle graphics.
2. Apply event driven programming and timers using Python

Text Books:

1. "IntroductiontoPythonProgramming"byY.DanielLiang,GeorgiaSouthernUniversity, Pearson Education, 2013.
2. "ComputerFundamentalsandProgramminginC"byProf.P.ChennaReddy,JNTUA,BSP Publications.
3. https://raptor.martincarlisle.com/
4. "APracticalIntroductiontoPythonProgramming"byBrianHeinold,MountStMary's University 2012.
5. "IntroductiontoComputationandProgrammingUsingPython:withapplicationsto understanding Data" by John. V. Guttag, 2nd Edition, the MIT Press.

"HowtoThinklikeaComputerScientist:LearningwithPython3documentation"byPeter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, 3rd Edition, 2012.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF PHYSICS
I B.TECH – I SEMESTER (common to CIVIL&MECH)
(THEORY)

Subject Code	Title of the Subject	L	T	P	C
	Engineering Physics	3	0	-	3

COURSE OBJECTIVES	
1	Understand the basic concepts of mechanicsand oscillations in correlation to engineering application.
2	To familiarize the concepts of theoretical acoustics to practical use in engineering field. To explain the significance of ultrasound and its application in NDT for diversified engineering application.
3	To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications.
4	To understand the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light wave through optical fibresalong with engineering applications.
5	To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices Considering the significance of micro miniaturization of electronic devices and significance of low dimensional materials, the basic concepts of nanomaterials, their properties and applications in modern emerging technologies are to be elicited.

COURSE OUTCOMES	
CO1	**Identify**forces and moments in mechanical systems using scalar and vector techniques (L3). **Interpret** the equation of motion of a rigid rotating body (torque on a rigid body),Simple harmonic oscillators, Damped harmonic oscillator, Heavy, Forced oscillations ,Resonance for consideration in designing technological applications. (L3)
CO2	**Explain**sound waves and its is propagation /interaction with construction material in design of buildings (L2). **Analyze** acoustic parameters of typically used materials in buildings (L4). **Recognize** sound level disruptors and their application in architectural acoustics (L2). **Identify** the use of ultrasonics in diversified fields of engineering (L3)
CO3	**Explain**the need of coherent sources and the conditions for sustained interference (L2). **Identify** engineering applications of interference including homodyne and heterodyne detection (L3). **Analyze** the differences between interference and diffraction with applications (L4). **Illustrate** the concept of polarization of light and its applications (L2). **Classify** ordinary polarized light and extraordinary polarized light (L2)The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics.
CO4	**Explain** various types of emission of radiation (L2). **Identify** the role of laser in engineering applications (L3). **Describe** the construction and working principles of various types of lasers (L1). **Explain** the working principle of optical fibers (L2). **Classify** optical fibers based on refractive index profile and mode of propagation (L2). **Identify** the applications of optical fibers in medical, communication and other fields (L2). **Apply** the fiber optic concepts in various fields (L3).
CO5	**Explain** the concept of dielectric constant and polarization in dielectric materials (L2). **Summarize** various types of polarization of dielectrics (L2). **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics (L2). **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2). **Explain** the

	applications of dielectric and magnetic materials (L2). **Apply** the concept of magnetism to magnetic devices (L3) **Identify** the nano size dependent properties of nanomaterials (L2). **Illustrate** the methods for the synthesis and characterization of nanomaterials (L2). **Apply** the basic properties of nanomaterials in various Engineering branches (L3).

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS OF ENGINEERING PHYSICS

Unit-I: Introduction to Mechanics and Oscillations

Introduction to Mechanics and Oscillations-Basic laws of vectors and scalars-Rotational frames-Conservative forces – F=- grad V, torque and angular momentum – Simple harmonic oscillators-Damped harmonic oscillator-Heavy, critical and under damping- Energy decay in damped harmonic oscillator- Forced oscillations – Resonance.

Unit-II: Acoustics and Ultrasonics

Acoustics: Reverberation – Reverberation time– Sabine's formula (Qualitative) - Absorption coefficient and its determination –Factors affecting acoustics of buildings and their remedies.

Ultrasonics: Properties and Production by magnetostriction& piezoelectricmethods - acoustic grating -Non Destructive Testing – pulse echo system through transmissionand reflection modes - A,B and C – scan displays, Medical applications

Unit-III: Wave Optics

Interference-Principle of superposition –Interference of light – Conditions for sustained interference-interference in thin films- Colors in thin films-Newton's Rings-Determination of wavelength and refractive index- Applications

Diffraction- Fresnel and Fraunhofer diffraction-Fraunhofer diffraction due to single slit and double slit – Diffraction grating- Grating spectra-Applications

Polarization-**Polarization by double refraction-Nicol's Prism--Half wave and Quarter wave plates- Applications.**

Unit-IV: Lasers and Fiber optics

Lasers: Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients – Population inversion – Pumping mechanisms – Nd:YAG laser – He-Ne laser – CO_2Laser, Applications of lasers.

Fiber optics- Total Internal Reflection-Critical angle of propagation-Acceptance Angle-Numerical Aperture-Classification of fibers based on refractive index profile –Propagation of electromagnetic wave through optical fibers – Modes -Importance of V-number-Fiber optic sensors (Pressure/temperature/chemical change)

UNIT V:Engineering Materials

Dielectric Materials: Dielectric polarization- Dielectric constant- Types of polarizations: Electronic, Ionic and Orientation Polarizations (Qualitative) - Lorentz (Internal) field- Clausius-Mosotti equation-Applications of Dielectrics: Ferroelectricity and Piezoelectricity.

Magnetic Materials: Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials-Hysteresis - Soft and hard magnetic materials-Applications.

Nanomaterials: Surface area and quantum confinement –Physical properties: electrical and magnetic properties- Synthesis of nanomaterials: Top-down: Ball Milling, Bottom-up: Chemical Vapour Deposition – Applications of nanomaterials.

Prescribed 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.

Reference Books:

1. Engineering Physics –K.Thyagarajan, MacGraw Hill Publishers, 2016
2. Introduction to modern optics – Grant R Fowles
3. A text book on Optics – Brijlal&Subramanyam
4. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
5. Introduction to Nanotechnology – C P Poole and F J Owens, Wiley
6. Engineering Physics – M.R.Srinivasan, New Age Publications
7. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
8. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press

Engineering Physics – M. Arumugam, Anuradha Publications

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
I YEAR I SEMESTER
ENGINEERING GRAPHICS (19AME01)
(Common to CE, MECH & CSE)

L	T	P	C
1	0	3	2.5

Course Objectives:

- To bring awareness that Engineering Drawing is the Language of Engineers.
- To familiarize how industry communicates technical information.
- To teach the practices for accuracy and clarity in presenting the technical information.
- To develop the engineering imagination essential for successful design.
- To instruct the utility of drafting & modeling packages in orthographic and isometric drawings.

UNIT – 1: Introduction to Engineering Graphics **8 Hrs**

Principles of Engineering Graphics and their significance – Conventions in drawing – Lettering – BIS conventions.

a) Conic sections including the rectangular hyperbola – general method only.
b) Cycloids, Epicycloids and Hypocycloids.
c) Involutes

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand basic principles of engineering graphics (L2)
- Identify the various BIS conventions (L3)
- Draw conic sections used in engineering graphics (L3)
- Draw cycloids and involutes (L3)

UNIT – II: Projection of Points, Lines and Planes **8 Hrs**

Projection of points in any quadrant, Lines inclined to one and both planes, Finding true lengths, Angle made by line. Projections of regular plane surfaces.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basics of projections. (L2)
- Find the true lengths of line when the line inclined to both the planes. (L5)
- Draw projections of regular plane surfaces (L3)

UNIT – III: Projections of Solids & Sections of Solids **8 Hrs**

Projections of Solids : Projections of regular solids inclined to one and both planes by rotational and auxiliary views method.

Sections of Solids: Section planes and sectional view of right regular solids – Prism, Cylinder, Pyramid and Cone. True shapes of the sections.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify 2D projections of regular solids (L1)
- Draw projections of regular solids when inclined to both the planes. (L3)
- Use section plane to show the sectional view of regular solids. (L3)

UNIT – IV: Development of Surfaces **7 Hrs**

Development of surfaces of right regular solids – Prism, Cylinder, Pyramid, Cone and their sectional parts

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand basics of development of surfaces (L1)
- Draw development of surface of prism and cylinder(L3)
- Draw development of surface of cone and their sectional parts(L3)

UNIT – V: Orthographic Projections & Isometric Projections 20 Hrs

Orthographic Projections: Systems of projections, Conventions and Application to Orthographic Projections.

Isometric Projections: Principles of Isometric Projection – Isometric scale, Isometric views – Lines, Planes, Figures, Simple and Compound Solids.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the types of projections in engineering drawing(L1)
- Draw orthographic projections of a given isometric view(L3)
- Convert isometric view into orthographic projections (L6)
- Draw isometric projections of simple and compound solids(L3)

Text Books:

1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009.
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009.
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000.
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013.
5. Basant Agarwal &C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Course Outcomes:

At the end of this Course the student will be able to

- Draw various curves applied in engineering. (L3)
- Show projections of Lines, planes and solids. (L1)
- Draw the sections of solids and development of surfaces of solids. (L3)
- Use computers as a drafting tool. (L3)
- Draw isometric and orthographic drawings. (L3)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
I YEAR I SEMESTER
ENGINEERING WORKSHOP (19AME02)
(Common to CE, MECH & CSE)

L	T	P	C
0	0	3	1.5

Course Objectives:

- To bring awareness about workshop practices for Engineers.
- To familiarize how wood working operations can be performed.
- To teach the practices for sheet metal operations.
- To develop the technical skills related to fitting and electrical wiring.

Section 1 : Wood Working

Familiarity with different types of woods and tools used in wood working and make following joints

a) Half – Lap joint
b) Mortise and Tenon joint
c) Corner Dovetail joint or Bridle joint

Section 2 : Sheet Metal Working

Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets

a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing

Section 3 : Fitting

Familiarity with different types of tools used in fitting and do the following fitting exercises

a) V-fit b) Dovetail fit c) Semi-circular fit
d) Bicycle tire puncture and change of two wheeler tyre

Section 4 : Electrical Wiring

Familiarities with different types of basic electrical circuits and make the following connections

a) Parallel and series b) Two way switch c) Godown lighting d) Tube light
e) Three phase motor f) Soldering of wires

Text Books:

1. K.Venkata Reddy., Workshop Practice Manual, 6/e BS Publications.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2/e, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2/e, PHI 2010.

Course Outcomes:

At the end of this Course the student will be able to

- Apply wood working skills in real world applications. (L6)
- Apply fitting operations in various applications. (L6)
- Build different parts with metal sheets in real world applications. (L5)
- Demonstratesoldering and brazing. (L4)
- Apply basic electrical engineering knowledge for house wiring practice. (L6)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
****** DEPARTMENT OF PHYSICS ******
I B.TECH – I SEMESTER(common to CIVIL & MECH)
(ENGINEERING PHYSICS LAB)

Subject Code	Title of the Lab	L	T	P	C
	Engineering Physics lab	-	-	3	1.5

COURSE OBJECTIVES	
1	To make the students gain practical knowledge to co-relate with the theoretical studies. To develop practical applications of engineering materials and use of principle in the right way to implement the modern technology

COURSE OUTCOMES	
CO1	**Operate** optical instruments like microscope and spectrometer (L2)
CO2	**Estimate**the desired physical parameters by performing the concerned experiments (L2)
CO3	**Plot** the concerned physical parameter to know their related variations (L3)
CO4	**Identify**the role of various physical phenomenon in relation with the experimental concepts (L3)

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												

LIST OF EXPERIMENTS

Any TEN of the following experiments has to be performed during the SEMESTER

1. Determination of wavelength using diffraction grating using laser.
2. Determination of Particle size using laser.
3. Determination of spring constant of springs using Coupled Oscillator
4. Determination of ultrasonic velocity in liquid (Acoustic grating)
5. Determination of dielectric constant and Curie temperature of a ferroelectric material.
6. Study of B-H curve of ferromagnetic material
7. Study of variation of magnetic field along the axis of a current carrying coil - Stewart-Gee's Method
8. Rigidity modulus of material of a wire by dynamic method (Torsional pendulum)
9. Determination of numerical aperture and acceptance angle of an optical fiber.
10. Determination of thickness of thin object by wedge method.
11. Determination of radius of curvature of lens by Newton's rings.
12. Determination of wavelengths of different spectral lines of mercury lights using diffraction grating in normal incidence method.
13. Determination of dispersive power of the grating.
14. Measurement of magnetic susceptibility by Kundt's tube method.
15. Determination of Temperature/Pressure variations using optical fibre sensors.

References:

1. S. Balasubramanian, M.N. Srinivasan “A Text book of Practical Physics”- S Chand Publishers, 2017
2. R. Padma Suvarna, K. Thyagarajan “Engineering Physics Practicals” – NU Age Publishing House.

PYTHON PROGRAMMING LABORATORY

SEMESTER - I **L-T-P-C: 0-0-3-1.5**

1. Download and install the Python IDLE.
2. Construct flowcharts to
    a. Calculate the maximum, minimum and average of N numbers
    b. Developacalculatortoconverttime,distance,area,volumeandtemperaturefrom one unit to another
3. Construct flowcharts with separate procedures to
    a. calculate simple and compound interest for various parameters specified by theuser
    b. calculatethegreatestcommondivisorusingiterationandrecursionfortwonumbers as specified by the user
4. Construct flowcharts with procedures to
    a. generate first N numbers in the Fibonacci series
    b. generate N Prime numbers
5. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)
6. ***DesignaflowcharttoperformBinarysearchonlistofNsortednumbers(Iterative and recursive)
7. Design a flowchart to determine the number of characters and lines in a text file specified by the user
8. DesignaPythonscripttoconvertaBinarynumbertoDecimalnumberandverifyifitisa Perfect number.
9. Design a Python script to determine if a given string is a Palindrome using recursion
10. Design a Python script to sort numbers specified in a text file using lists.
11. ***DesignaPythonscripttodeterminethedifferenceindateforgiventwodatesin YYYY:MM:DDformat(0<=YYYY<=9999,1<=MM<=12,1<=DD<=31)

following the leap year rules.

12. DesignaPythonScripttodeterminetheSquareRootofagivennumberwithoutusing inbuilt functions in Python.
13. *** Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)
14. ***DesignaPythonScripttofindthevalueof(Sine,Cosine,Log,PI,*e*)ofagiven number using infinite series of the function.
15. *** Design a Python Script toconvert a given number to words
16. *** Design a Python Script to convert a given number to roman number.
17. *** Design a Python Script to generate the frequency count of words in a text file.
18. *** Design a Python Script to print a spiral pattern for a 2 dimensional matrix.
19. *** Design a Python Script to implement Gaussian Elimination method.
20. *** Design a Python script to generate statistical reports(Minimum, Maximum, Count,Average, Sum etc) on public datasets.

21. *** Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorizing them into distinction, first class, second class, third class and failed.

Text Book:

http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

Course outcomes: Student should be able to

1. Create interactive visual programs using Scratch. (L4)
2. Develop flowcharts using raptor to solve the given problems. (L4)
3. Develop Python programs for numerical and text based problems (L4)
4. Develop graphics and event based programming using Python (L4)

Develop Python programs using beautiful Pythonic idiomatic practices (L4)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF MATHEMATICS
I B.TECH – II SEMESTER (R19)
(Common to all Branches of Engineering)
(THEORY)

Subject Code	Title of the Subject	L	T	P	C
	Differential Equations and Vector Calculus	3	0	-	3

COURSE OBJECTIVES	
1	To enlighten the learners in the concept of differential equations and vector calculus
2	To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

COURSE OUTCOMES	
CO1	Solve the linear differential equations related to various engineering fields
CO2	Solve the differential equations reducible to linear, and finds the relevant applications.
CO3	Identify solution methods for partial differential equations that model physical processes
CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence
CO5	Estimate the work done against a field, circulation and flux using vector calculus and also to establish the relations between them using vector integral theorems.

SYLLABUS

UNIT I: Differential Equations

First order and first degree differential equations – Formation, Exact, Linear and Bernoulli equations.Applications to Newton's law of cooling and law of natural growth and decay.

Non-homogeneous Linear Differential Equations of second Higher Order with constant coefficients with RHS terms of the type $e^{ax+b}, \sin(ax+b), \cos(ax+b)$, polynomials in x, $e^{ax}V(x), xV(x)$ where $V(x)$ is a function of x, Method of variation of parameters.

UNIT II: Equations Reducible to Linear Differential Equations with constant coefficients and Applications

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients.

Applications: Mass spring system and L-C-R Circuit problems.

UNIT III: Partial Differential Equations

Linear partial differential equations of first order, non-linear PDEs of first order (standard forms). Solutions to homogenous linear partial differential equations with constant coefficients, Rules for finding the complementary function and the particular integral.

UNIT IV: Vector differential Calculus

Scalar and vector point functions, Del applied to scalar point functions: Gradient, Del applied to vector point functions: Divergent and Curl and their properties.

Del applied to twice to point functions and Del applied to products of point functions (Identities).

UNIT V: Vector integral Calculus

Line integral- Circulation -work done - potential function, Surface integral-flux, volume integral.

Vector integral theorems: Green's theorem in the plane, Stoke's theorem, Gauss Divergence theorem (all theorems without proof) and related problems.

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

References:

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc-Grawhill publishing company Ltd., New Delhi.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.

Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF CHEMISTRY
I B.TECH – II SEMESTER (common to CE& ME)
(THEORY)

Subject Code	Title of the Subject	L	T	P	C
	Engineering Chemistry	3	0	-	3

COURSE OBJECTIVES	
1	To familiarize engineering chemistry and its applications
2	To impart the concept of soft and hard waters, softening methods of hard water
3	To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement

COURSE OUTCOMES	
CO1	**list**the differences between temporary and permanent hardness of water, **explain** the principles of reverse osmosis and electrodialysis. **compare** quality of drinking water with BIS and WHO standards. **illustrate** problems associated with hard water - scale and sludge**. explain** the working principles of different Industrial water treatment processes
CO2	**apply** Nernst equation for calculating electrode and cell potentials, **apply** Pilling Bedworth rule for corrosion and corrosion prevention, **demonstrate** the corrosion prevention methods and factors affecting corrosion, **compare** different batteries and their applications
CO3	**explain** different types of polymers and their applications, **Solve the numerical problems based on Calorific value, select** suitable fuels for IC engines, **explain** calorific values, octane number, refining of petroleum and cracking of oils
CO4	explain the constituents of Composites and its classification Identify the factors affecting the refractory material, Illustrate the functions and properties of lubricants, demonstrate the phases and reactivity of concrete formation, identify the constituents of Portland cement, enumerate the reactions at setting and hardening of the cement
CO5	**summarize** the applications of SEM, TEM and X-ray diffraction in surface characterization, **explain** the synthesis of colloids with examples, **outline** the preparation of nanomaterials and metal oxides **identify** the application of colloids and nanomaterials in medicine, sensors and catalysis

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Unit 1: Water Technology (8 hrs)

Introduction –Causes and types of hardness of water, Estimation of hardness of water by EDTA Method - Boiler troubles , Industrial water treatment (Ion exchange process,Internal treatment of

water) specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

Unit 2: Electrochemistry and Applications(10 hrs)

Electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations.

Primary cells – Zn-MnO_2 (Leclanche cell), Li Battery.Secondary cells – lead acid and lithium ion batteries- working of the batteries including cell reactions.

Fuel cells- Basic Principles and Working Principles of hydrogen-oxygen, methanol -oxygen fuel cells, Applications of Fuel cells.

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry corrosion, Pilling Bedworthrule and uses, Factors affecting corrosion, Corrosion Control -cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

Unit 3: Polymers and Fuel Chemistry:(12 hrs)

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth and coordination polymerization,

Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of PVC and Bakelite, Biodegradable polymers

Fuels – Types of fuels, calorific value, numerical problems based on calorific value; Analysis of coal, Liquid Fuels refining of petroleum, fuels for IC engines, knocking and anti-knock agents, Octane and Cetanenumbers, cracking of oils; alternative fuels- propane, methanol and ethanol, bio fuels.

UNIT-4 Basic Engineering Materials(8Hrs)

(i)Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications

(ii)Refractories- Classification, Properties, Factors affecting the refractory materials and Applications

(iii)Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils and Applications

(iv)Building materials- Portland Cement, constituents, phases and reactivity of clinker, Setting and Hardening of cement.

Unit 5: Surface Chemistry and Applications (10 hrs)

Introduction to surface chemistry, colloids, micelle formation, synthesis of colloids (any two methods with examples), chemical and electrochemical methods (not more than two methods) of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, solid-gas interface, solid-liquid interface, adsorption isotherm, applications of colloids and nanomaterials – catalysis, medicine, sensors.

Text Books:

1. Engineering Chemistry by GVSubba Reddy , KNJayaveera, and C. Ramachandraiah, McGraw Hill Higher Education, First Edition, New Delhi
2. A Text Book of Engineering Chemistry, Jain and Jain, Dhanapathi Rai Publications, New Delhi

References:

1. 1.A Text book of Engineering Chemistry by K. SeshaMaheswaramma and MridulaChugh, Pearson's Publications Pvt. Ltd., (PAN India Title)

2.A Text book of Engineering Chemistry by SS Dhara, S. Chand Publications, New Delhi

3. Engineering Chemistry by K.B.ChandraSekhar, UN.Das and Sujatha Mishra, SCITECH Pubblications India Pvt Limited.

4. A Text book of Engineering Chemistry by PrasantaRath, B. Rama Devi, Ch.Venkata Ramana Reddy and SubhenduChakroborty, Cengage learning India Pvt.Ltd.

5. Chemistry of Engineering Materials, C.V.Agarwal, C.Parameswaramurthy and Andranaidu

6. Text Book of Engineering Chemistry, Shashichawla, Dhanapathirai Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA - 516390, A.P, INDIA.HUMANITIES & SOCIAL SCIENCES DEPARTMENT

==========

COMMUNICATIVE ENGLISH - 1

Subject Code	Title of the Subject	L	T	P	C
	Communicative English - 1	2	0	0	2

COURSE OBJECTIVES	
1	Facilitates effective listening skills for better comprehension of academic lectures and English spoken by native speakers.
2	Helps to improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations.
3	Imparts effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information.
4	Provides knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.

COURSE OUTCOMES	
CO1	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
CO2	Apply grammatical structures to formulate sentences and correct word forms
CO3	Analyze discourse markers to speak clearly on a specific topic in informal discussions
CO4	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
CO5	Create a coherent paragraph interpreting a figure/graph/chart/table

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.

Unit 1

Lesson: On the Conduct of Life: William Hazlitt

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.**Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Reading for Writing :**Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. **Grammar and Vocabulary:** Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

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

Unit 2

Lesson: The Brook: Alfred Tennyson

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.**Speaking:** Discussion in pairs/small groups on specific topics followed by short structured talks. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. **Grammar and Vocabulary:** Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Learning Outcomes

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

- comprehend short talks on general topics

- participate in informal discussions and speak clearly on a specific topic using suitable discourse markers
- understand the use of cohesive devices for better reading comprehension
- write well structured paragraphs on specific topics
- identify basic errors of grammar/ usage and make necessary corrections in short texts

Unit 3

Lesson: The Death Trap: Saki

Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.**Writing:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. **Grammar and Vocabulary:** Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Learning Outcomes

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

7. comprehend short talks and summarize the content with clarity and precision
8. participate in informal discussions and report what is discussed
9. infer meanings of unfamiliar words using contextual clues
10. write summaries based on global comprehension of reading/listening texts
11. use correct tense forms, appropriate structures and a range of reporting verbs in speech and writing

Unit4

Lesson: Inspiration: ChinduYellamma

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Learning Outcomes

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

- infer and predict about content of spoken discourse
- understand verbal and non-verbal features of communication and hold formal/informal conversations
- interpret graphic elements used in academic texts

- produce a coherent paragraph interpreting a figure/graph/chart/table
- use language appropriate for description and interpretation of graphical elements

Unit 5

Lesson: Politics and the English Language: George Orwell

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.**Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides.**Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences. **Grammar and Vocabulary:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Learning Outcomes

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

10. take notes while listening to a talk/lecture and make use of them to answer questions
11. make formal oral presentations using effective strategies
12. comprehend, discuss and respond to academic texts orally and in writing
13. produce a well-organized essay with adequate support and detail
14. edit short texts by correcting common errors

Prescribed Text:

1. **English All Aound**: Communication Skills for Undegurdation Learners Vol. I, Orient BlackSwanPublisers, First Edition 2019.
2. **Language and Life**: A Skills Approach- I Edition 2019, Orient Black Swan

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.

Oxford Learners Dictionary, 12th Edition, 2011.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF CIVIL ENGINEERING
I B.TECH – II SEMESTER (R19)

Subject Code	Title of the Subject	L	T	P	C
	STRENGTH OF MATERIALS-I	2	1	--	3

OBJECTIVE: *The subject provides the knowledge how toresolve forces and moments in a given system, analyze various types of friction for moving bodies, determine the centroid and second moment of area, simple stress strains flexural stresses in members, shear stresses and deflection in beams so that the concepts can be applied to the Engineering problems.*

COURSE OUTCOMES	
CO1	Understand the frictional forces on bodies
CO2	Determine the centroid and moment of inertia for different cross-sections
CO3	Understand the concepts of stress, strain, generalized Hooke's law, elastic moduli and strain energy.
CO4	Develop shear force and bending moment diagrams for different load cases.
CO5	Compute the flexural stresses for different load cases and different cross-sections.

UNIT-I

Introduction to Mechanics: Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial systems- Analysis of trusses by Method of Joints & Sections- **Friction**: Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions - Motion of Bodies.

UNIT-II

Centroid and Center of Gravity: Introduction – Centroids of rectangular, circular, I, L and T sections - Centroids of built up sections. **Area moment of Inertia**: Introduction – Definition of Moment of Inertia of rectangular, circular, I, L and T sections - Radius of gyration. Moments of Inertia of Composite sections.

UNIT – III

Simple Stresses and Strains:

Types of stresses and strains – Hooke's law – Stress – strain diagram for mild steel – working stress – Factor of safety – lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of Varying section – Composite bars – Temperature stresses. Strain energy – Resilience – Gradual, Sudden, impact and shock loadings – simple applications.

UNIT – IV

Shear Force and Bending Moment:

Definition of beam – types of beams – Concept of Shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and over changing beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads – point of contra flexure – Relation between S.F, B.M and rate of loading at section of a beam.

UNIT – V

Flexural Stresses:

Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/Y = E/R – Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hallow), I, T, Angle and Channel Sections – Design of simple beam sections.

TEXT BOOKS:

1. R.K Bansal, Engineering Mechanics, Lakshmi Publications.
2. R. Subramanian, Strength of Materials, Oxford University Press.

REFERENCES:

1. Shesagiri Rao, Engineering Mechanics, Universities Press, Hyderabad.
2. S. Timoshenko, D.H. Young and J.V. Rao, Engineering Mechanics, Tata McGraw-Hill Company.
3. R. K. Bansal, Strength of Materials, Lakshmi Publications House Pvt. Ltd.

Sadhu Singh, Strength of Materials, Khanna Publishers 11th edition 2015.

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DEPARTMENT OF CIVIL ENGINEERING
I B.TECH – II SEMESTER (R19)

Subject Code	Title of the Subject	L	T	P	C
	BUILDING MATERIALS AND CONSTRUCTION	3	0	--	3

OBJECTIVES: *To give the students a basic idea about the traditional and modern construction materials a brief knowledge on building components and its construction methodologies.*

COURSE OUTCOMES	
CO1	Identify and characterize the properties of various building materials.
CO2	Be aware of various Traditional, Organic and Modern building materials emerging materials in the field of civil engineering construction.
CO3	Understand the manufacturing process of various building materials like stones, Bricks, Ceramics, Glass and Plastic.
CO4	Understand the basic principles of low-cost, Alternate and Sustainable materials and capable to practice Eco friendly Civil engineering materials.
CO5	Analyze and design the masonry buildings using IS-code provisions.

UNIT – I
INTRODUCTION TO BUILDING MATERIALS
Traditional & OrganicBuilding Materials – Stone – Dressing of Stones – Modern Building Materials – Bricks – Manufacturing process – Ceramic Products – Manufacturing Process – Building Materials for Low Cost Housing – Utilisation of Wastes for Alternative Building Materials – Sustainable Materials in Construction, Concepts of energy efficient building envelopes as per ECBC – National Standards.

UNIT – II
GLASS:
Introduction to Fenestration- Functions of Glass in Buildings – Constituents and Classification of Glass – Manufacturing Process –Properties of Glass – Common Types of Glass – Special Glass – Advantages and Disadvantages of Glass – National Standards such as ECBC.
PLASTIC:
Introduction – Polymerisation – Classification of Plastics – Commonly Used Plastics – Moulding and Fabricating for Plastic Products – Applications – Advantages – Disadvantages – Intelligent Use of Plastics in Buildings – National Standards such as ECBC.

UNIT – III
INSULATING MATERILAS
Thermal Insulating Materials: Introduction – Thermal Insulation – Heat Transfer Fundamentals – Thermal Properties of Insulating Materials – Selection of Insulating Materials – Classification of Insulation materials – Reflective Insulation Systems – Commonly Used Building Insulation Materials – Insulation that Should not be Used – National Standards such as ECBC.
Sound Insulating Materials: Introduction – Basics of Acoustics – Sound Absorption or Insulation – Green Insulation – Cool Roof, Green Roof, Power Roof – National Standards such as ECBC.

UNIT – IV
STRUCTURAL COMPONENTS:–
Foundations – classification of Foundations – consideration in selection of foundation types –
Masonry – Brick and block walls – Cavity walls – Damp–proof courses and membranes – Mortars – Arches and openings – Windows – Glass and glazing –Doors – Stairs – Types and Applications – Cladding to external walls – Flat roofs – Dormer windows – Formwork & Scaffolding – Precast concrete frames – Portal frames – Types – components – Framed structures – Components – Construction Procedure – Panel walls – National Standards such as ECBC.

UNIT – V
INTERNAL CONSTRUCTION AND FINISHES
Internal elements – Internal walls – Construction joints – Internal walls, fire protection –separating walls – Partitions – Plasters and plastering – Domestic floors and finishes – Sound insulation – Timber, concrete and metal stairs–Internal doors – Door sets – Fire resisting doors – Plasterboard ceilings – Suspended ceilings –Paints and painting – Components of Paints – Types of Paint – Considerations in Selecting Paints – Cement Paints – Oil Paints –Emulsion Paints – Whitewash and Colourwash – Application of Paints –Distempers – Varnishes – Safety –Joinery production – Composite boarding – National Standards such as ECBC.

TEXT BOOKS:
1. Building Material by S K Duggal – New Age International Publishers; Second Edition
2. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
3. A Textbook on Building Construction by S.K.Sharma, S.ChandPubilishers.
4. Building Materials by M.L.Gambhir, TMH Pubilishers.
5. ECBC (Energy Conservation Building Code).

REFERENCES:
1. Building construction by W.B.Mckay, Vol.I, II, III & IV Pearson Publications, 2013 edition.
2. R.Chudly “Construction Technology – Volumes I and II” 2nd Edition, Longman, UK, 1987.
3. Building materials by S.C.Rangawala, CharotarPubilishing House, Anand- INDIA.
4. Building Construction by S.C.Rangawala, CharotarPubilishing House, Anand- INDIA
5. Building Construction by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi.

BEE (Bureau of Energy Efficiency) Manuals on Energy efficient building envelope concepts.

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HUMANITIES AND SOCIAL SCIENCES DEPARTMENT

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COMMUNICATIVE ENGLISH - 1 LAB

Subject Code	Title of the Subject	L	T	P	C
	Communicative English - 1 Lab	0	0	2	1

COURSE OBJECTIVES	
1	To expose the students to variety of self-instructional, learner friendly modes of language learning.
2	To help the students cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.
3	To enable them to learn better pronunciation through stress, intonation and rhythm.
4	To train them to use language effectively to face interviews, group discussions, public speaking.
5	To initiate them into greater use of the computer in resume preparation, report writing, format making etc.

COURSE OUTCOMES	
CO1	To remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills.
CO2	To apply communication skills through various language learning activities.
CO3	To analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
CO4	To evaluate and exhibit acceptable etiquette essential in social and professional settings.
CO5	To create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

UNIT 1

1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. Describing objects/places/persons

Learning Outcomes

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

- understand different accents spoken by native speakers of English
- employ suitable strategies for skimming and scanning on monitor to get the general idea of a text and locate specific information
- learn different professional registers and specific vocabulary to describe different persons, places and objects

Unit 2

1. JAM
2. Small talks on general topics
3. Debates

Learning Outcomes

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

- produce a structured talk extemporarily
- comprehend and produce short talks on general topics
- participate in debates and speak clearly on a specific topic using suitable discourse markers

Unit 3

1. Situational dialogues – Greeting and Introduction
2. Summarizing and Note making
3. Vocabulary Building

Learning Outcomes

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

12. Learn different ways of greeting and introducing oneself/others
15. summarize the content with clarity and precision and take notes while listening to a talk/lecture and make use of them to answer questions
13. replenish vocabulary with one word substitutes, homonyms, homophones, homographs to reduce errors in speech and writing

Unit4

1. Asking for Information and Giving Directions
2. Information Transfer
3. Non-verbal Communication – Dumb Charade

Learning Outcomes

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

- Learn different ways of asking information and giving directions
- Able to transfer information effectively
- understand non-verbal features of communication

Unit 5

1. Oral Presentations
2. Précis Writing and Paraphrasing
3. Reading Comprehension and spotting errors

Learning Outcomes

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

16. make formal oral presentations using effective strategies
17. learn different techniques of précis writing and paraphrasing strategies
18. comprehend while reading different texts and edit short texts by correcting common errors

Suggested Software

- Young India Films
- Walden Infotech
- Orell

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.

A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF CHEMISTRY
I B.TECH – I SEMESTER (common to CE& ME)
(ENGINEERING CHEMISTRY LAB)

Subject Code	Title of the Lab	L	T	P	C
19A53103	Engineering Chemistry lab	-	-	4	2

COURSE OBJECTIVES	
1	Verify the fundamental concepts with experiments

COURSE OUTCOMES	
CO1	**determine** the cell constant and conductance of solutions (L3)
CO2	**prepare** advanced polymer materials (L2)
CO3	**determine** the physical properties like surface tension, adsorption and viscosity (L3)
CO4	**estimate** the Iron and Calcium in cement (L3)
CO5	**calculate** the hardness of water (L4)

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

LIST OF EXPERIMENTS

1. Determination of Hardness of a groundwater sample.
2. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base
3. Determination of cell constant and conductance of solutions
4. Potentiometry - determination of redox potentials and emfs
5. Determination of Strength of an acid in Pb-Acid battery
6. Preparation of a polymer
7. Determination of percentage of Iron in Cement sample by colorimetry
8. Estimation of Calcium in port land Cement
9. Adsorption of acetic acid by charcoal
10. Determination of percentage Moisture content in a coal sample
11. Determination of Viscosity of lubricating oil by Red Wood Viscometer 1
12. Determination of Flash and Fire points of fuels
13. Determination of Calorific value of gases by Junker's gas Calorimeter

TEXT BOOKS:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al, PearsonEducation.

2. Chemistry Practical – Lab Manual by Chandra Sekhar, GV Subba Reddy and Jayaveera

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF CIVIL ENGINEERING
I B.TECH – II SEMESTER (R19)

Subject Code	Title of the Subject	L	T	P	C
	Civil Engineering Workshop	0	0	3	1.5

1) Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape only.

2) Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape and cross staff.

3) Construct a wall of height 50 cm and wall thickness 1½ bricks using English bond (No mortar required) - corner portion – length of side walls 60 cm.

4) Construct a wall of height 50 cm and wall thickness 2 bricks using English bond (No mortar required) - corner portion – length of side walls 60 cm.

5) Computation of Centre of gravity and Moment of inertia of a given rolled steel section by actual measurements.

6) Installation of plumbing and fixtures like Tap, T-Joint, Elbow, Bend, Threading etc;

7) Plastering and Finishing of wall

8) Application of wall putty and painting a wall

9) Application of base coat and laying of Tile flooring of one square meter

10) Preparation of soil cement blocks for masonry and testing for compressive strength

11) Casting and testing of Fly ash Blocks

12) Preparation of cover blocks for providing cover to reinforcement

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DEPARTMENT OF CIVIL ENGINEERING
I B.TECH – II SEMESTER (R19)

Subject Code	Title of the Lab	L	T	P	C
	STRENGTH OF MATERIALS LAB	0	0	3	1.5

OBJECTIVE: *The object of the course to make the student to understand the behavior of materials under different types of loading for different types structures.*

COURSE OUTCOMES	
CO1	To acquire the knowledge and behavior in finding the properties of different materials
CO2	An ability to understand the testing procedure of mild steel, HYSD specimens.
CO3	To know the hardness number of different materials
CO4	To know the shear resistance capacity, torsion resistance of mild steel specimens
CO5	Ability to know how to test the strength of wood specimen.

LIST OF EXERCISES:

1. Tension test.
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test.
5. Hardness test.
6. Spring test.
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges.
12. Continuous beam – deflection test.

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L	T	P	C
2	0	0	0

Constitution of India

Course Objectives:

1. To Enable the student to understand the importance of constitution.
2. To understand the structure of executive, legislature and judiciary.
3. To understand philosophy of fundamental rights and duties.
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
5. To understand the central and state relation financial and administrative.

UNIT-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning Outcomes:

At the end of this unit students will be able to:

1. Understand the concept of Indian constitution.
2. Apply the knowledge on directive principle of state policy.
3. Analyze the History, features of Indian constitution.
4. Evaluate Preamble Fundamental Rights and Duties.

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

Learning Outcomes:

At the end of this unit students will be able to:

1. Understand the structure of Indian government.
2. Differentiate between the state and central government.
3. Explain the role of President and Prime Minister.
4. Know the Structure of supreme court and High court.

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions.

Learning Outcomes:

At the end of this unit students will be able to:

1. Understand the structure of state government.
2. Analyze the role Governor and Chief Minister.
3. Explain the role of state Secretariat.
4. Differentiate between structure and functions of state secrateriate.

UNIT-IV

A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

Learning Outcomes:

At the end of this unit students will be able to:

1. Understand the local Administration.
2. Compare and contrast district administration role and importance.
3. Analyze the role of Myer and elected representatives of Municipalities.
4. Evaluate Zilla panchayat block level Organisation.

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women.

Learning Outcomes:

At the end of this unit students will be able to:

1. Know the role of Election Commission apply knowledge.
2. Contrast and compare the role of Chief Election commissioner and Commissiononerate.
3. Analyze role of state election commission.
4. Evaluate various commissions of viz SC/ST/OBC and women.

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi.
2. SubashKashyap, Indian Constitution, National Book Trust.
3. J.A. Siwach, Dynamics of Indian Government & Politics.
4. D.C. Gupta, Indian Government and Politics.
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication.
6. J.C. Johari, Indian Government andPolitics Hans.

Course Outcomes:

1. Understand historical background of the constitution making and its importance for building a democratic India.
2. Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
3. Understand the value of the fundamental rights and duties for becoming good citizen of India.
4. Analyze the decentralization of power between central, state and local self-government.
5. Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

6. Know the sources, features and principles of Indian Constitution.
7. Learn about Union Government, State government and its administration.
8. Get acquainted with Local administration and Pachayati Raj.
9. Be aware of basic concepts and developments of Human Rights.
10. Gain knowledge on roles and functioning of Election Commission.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF CHEMISTRY
II B.TECH – I/II SEMESTER Mandate Course (MC)
(THEORY)

Subject Code	Title of the Subject	L	T	P	C
	Environmental Science	3	0	-	0

COURSE OBJECTIVES	
1	To make the student understand multi disciplinary nature of environment and its components.
2	To investigate the relationship between human life and environment from scientific prospective.
3	To impart knowledge to the students about fundamental concepts of Ecosystem and Biodiversity
4	Necessasity of analyzing regional, national and global environmental problems
5	To understand and apply the fundamentals of Environmental science to important local, regional, national and global environmental problems and potential issues

COURSE OUTCOMES	
CO1	Able to solve the environmental problems based fundamental concepts of Environmental Science.
CO2	Enable the students to understand the structure and function of significant environmental systems
CO3	Knowledge of concepts makes them differentiate Natural and Polluted environment..
CO4	Enable to apply the Pyramid of number, mass and Energy, understand about Renweable energy resources. Illustrate the Forest ecosystem, Discuss about Grass and Net biomass productivity
CO5	Differentiate between Forest and desert Ecosystems, Critically evaluate arguments regarding environmental issues. Illustrate the Food chain and food web, Identify the applications of rain water harvesting, Interpret advantages of In-situ and Ex-situ conservation of biodiversity

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

UNIT-I:

i) Multidisciplinary nature of environmental studies

The **Multidisciplinary** nature of environmental studies Definition; Scope and importance, Need for public awareness.

ii) Natural Resources:

Renewable and non-renewable resources: Natural resources and associated problems.

a) Forest resources: Use and Over-exploitation, deforestation, case studies. Dams, benefits and their effects on forests and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water

c) Earth: Geomorphology, Weathering, Structure of Earth - inner core, outer core, mantle and the crust, magma.

d) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

e) Food resources: World food problems, changes caused by agriculture, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

UNIT-II:

i) 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.

Types of some ecosystems: -

a. Forest ecosystem b. Desert ecosystem

d. Aquatic ecosystems (ponds, rivers, oceans, estuaries).

ii) Biodiversity and its Conservation

Introduction-Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, India as a mega-diversity nation.

Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-III:

Environmental Pollution and Disaster management**:**

Definition - Causes, effects and control measures of:

a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution

e. Noise pollution f. Thermal pollution g. Nuclear hazards

Disaster management: floods, earthquake, cyclone and landslides.

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

UNIT-IV:

Social Issues and the Environment

From Unsustainable to Sustainable development. Water conservation, rain water harvesting, watershed management.

Resettlement and rehabilitation of people; its problems and concerns. Case studies.

Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act.

Issues involved in enforcement of environmental legislation. Public awareness.

UNIT-V:

i) Human Population and the Environment

Population growth, variation among nations. Population explosion-Family welfare Programme.

Environment and human health, Women and Child Welfare, Role of information Technology in Environment and human health, Case Studies.

ii) 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 simple ecosystems-pond, river, hill slopes, etc.

Text Books:

1. Shashi Chawla, A Text Book of Environmental Studies, Mc Graw Hill Education, 4th edition, 2014

2. De A.K., Environmental Chemistry, Wiley Eastern Ltd , 2012

Reference Books

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad -380013, India, Email: mapin@icenet. net (R).

2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.

3. Cunningham, W.P.Cooper, T.H. Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA

B.Tech – II-I SEM

L	T	P	C
3	0	0	3

COMPLEX VARIABLES, TRANSFORMS & APPLICATIONS TO PARTIAL DIFFERENTIAL EQUATIONS

(Common to MECH & CIVIL)

Course Objective:
This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables. The aim is to analyze the solutions of partial differential equations.

Unit-I: Complex Variables – Differentiation:
Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations in Cartesian and Polar coordinates (without proof), analytic functions, harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method.
Properties of elementary functions of exponential, trigonometric, hyperbolic, and logarithm.Conformal mappings-standard and special transformations (z^2, sin z, cos z, e^z, lnz) Mobius transformations (bilinear) and their properties.

Unit Outcomes:
Students will be able to

- Understand functions of Complex variable and its properties.
- Find derivatives of complex functions.
- Understand the analyticity of complex functions.
- Understand the conformal mappings of complex functions.

Unit-II: Complex Variables – Integration:
Line integral-Contour integration, Cauchy's integral theorem (with proof), Cauchy Integral formula, generalized Cauchy Integral formula (All theorems without Proof).
Power series expansions: Taylor's series and Laurent's series (without proof); zeros of analytic functions, singularities.

Residues: Evaluation of residue by formula and by Laurent's series, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi-circle with f(z) not having poles on real axis).

Unit Outcomes:
Students will be able to

- Understand the integration of complex functions.
- Apply Cauchy's integral theorem and Cauchy's integral formula.
- Understand singularities of complex functions.
- Evaluate improper integrals of complex functions using Residue theorem.

Unit-III: Laplace Transforms

Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

Unit Outcomes:
Students will be able to

- Understand the concept of Laplace transforms and finds the Laplace transforms of elementary functions.
- Find the Laplace transforms of general functions using its properties.
- Understand Laplace transforms of special functions (Unit step function, Unit Impulse & Periodic).
- Apply Laplace transforms to solve Differential Equations.

Unit-IV: Fourier series &Fourier transforms
Fourier Series : Fourier coefficients (Euler's formulae) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions.

Fourier Integrals & Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem – Finite Fourier Sine and Cosine transforms.
Unit Outcomes:
Students will be able to

- Understand finding Fourier series expression of the given function.
- Determine Fourier coefficients (Euler's) and identify existence of Fourier series of the given function.
- Expand the given function in Fourier series given in Half range interval.
- Find Fourier Sine and cosine integrals.
- Understand Fourier transforms.
- Apply properties of Fourier transforms.

Unit-V: Partial Differential Equations & Applications
Solution of PDEs by Method of separation of variables –Solutions of one dimensional wave equation, one dimensional heat equation and Laplace equation in two dimensions under initial and boundary conditions.
Unit Outcomes:
Students will be able to

- Understand the method of separation of variables.
- Solve applications of Partial Differential Equations.

Course Outcomes:
After the completion of course, students will be able to

- Understand the analyticity of complex functions and conformal mappings.
- Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
- Understand the usage of Laplace Transforms.
- Evaluate the Fourier series expansion of periodic functions.
- Formulate/solve/classify the solutions of Partial differential equations and also find the solution of one dimensional wave equation and heat equation.

Text Books:

1. B.S.Grewal, "Higher Engineering Mathematics", Khanna publishers.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India

Reference Books:

1. B.V.Ramana, "Higher Engineering Mathematics", McGraw Hill publishers.
2. Alan Jeffrey, "Advanced Engineering Mathematics", Elsevier.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

COLLEGE OF ENGINEERING PULIVENDULA (AUTONOMOUS) -PIN: 516390(A.P.)

HUMANITIES AND SOCIAL SCIENCES DEPARTMENT

Subject Code	Title of the Subject	L	T	P	C
	Universal Human Values	**2**	**0**	**0**	**0**

COURSE OBJECTIVES	
1	To create an awareness on Engineering Ethics and Human Values.
2	To instill Moral and Social Values and Loyalty.
3	To appreciate the rights of Others.

COURSE OUTCOMES	
CO1	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field.
CO2	Identify the multiple ethical interests at stake in a real-world situation or practice.
CO3	Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects.
CO4	Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work.
CO5	Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

Unit I: HUMAN VALUES

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty - Courage- Co Operation – Commitment – Empathy –Self Confidence Character – Spirituality.

Unit II: ENGINEERING ETHICS

Senses of 'Engineering Ethics- Variety of moral issued – Types of inquiry – Moral dilemmas – Moral autonomy –Kohlberg's theory- Gilligan's theory- Consensus and controversy – Models of professional roles- Theories about right action- Self-interest - Customs and religion –Uses of Ethical theories – Valuing time – Cooperation – Commitment.

Unit III: ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering As Social Experimentation – Framing the problem – Determining the facts – Codes of Ethics – Clarifying Concepts – Application issues – Common Ground - General Principles – Utilitarian thinking respect for persons.

UNIT IV: ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK

Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing risk- Safety and the Engineer- Designing for the safety- Intellectual Property rights (IPR).

UINIT V: GLOBAL ISSUES

Globalization – Cross culture issues- Environmental Ethics – Computer Ethics – Computers as the instrument of Unethical behavior – Computers as the object of Unethical acts – Autonomous Computers- Computer codes of Ethics – Weapons Development - Ethics and Research – Analyzing Ethical Problems in research – Intellectual property Rights(IPR).

Text Books

1. "**Engineering Ethics"** by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
2. **Engineering Ethics includes Human Values**" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.
3. **"Ethics in Engineering"** by Mike W. Martin and Roland Schinzinger – Tata McGraw-Hill– 2003.
4. **"Professional Ethics and Morals**" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
5. **"Professional Ethics and Human Values**" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications.
6. **"Indian Culture, Values and Professional Ethics"** by PSR Murthy-BS Publication.
7. **"Professional Ethics and Human Values**" by Prof.D.R.Kiran.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)
Semester-3 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	STRENGTH OF MATERIALS – II	2	1	--	3

Course Objectives

1) To teach the student with basic concepts for determination of principal stresses and strains in various structural elements.
2) To demonstrate analytical methods for determining strength & stiffness and assess stability of structural members.
3) To make the student analyze circular shafts subjected to torsion
4) To make the student determine critical loads for columns with different end conditions.

UNIT-I

SHEAR STRESSES: Derivation of formula for Shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T and angle sections.

Compound Stresses and Strains:

Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, and its applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain.

UNIT -II

Deflection of Beams:

Uniformbending – slope, deflection and radius of curvature – Differential equation for elastic line of a beam – Double integration and Macaulay's methods. Determination of slope and deflection for cantilever and simply supported beams under point loads, U.D.L. uniformly varying load-Mohr's theorems – Moment area method – application to simply supported and overhanging beams-

Propped cantilevers:

Analysis of propped cantilever beams under UDL and point loads.

UNIT -III

Torsion:

Theory of pure torsion – Assumptions and Derivation of Torsion formula for circular shaft – Torsional moment of resistance – Polar section modulus – power transmission through shafts – Combined bending and torsion –. Springs -Types of springs – deflection of close coiled helical springs under axial pull and axial couple – Carriage or leaf springs.

UNIT -IV

Direct and Bending stresses:

Introduction-eccentric loading – Columns with eccentric loading – Symmetrical columns with eccentric loading about one axis –about two axes – Unsymmetrical columns with eccentric loading – limit of eccentricity.

Theories of failure:
Maximum Principal stress theory- Maximum shear stress theory- Maximum strain theory- Maximum strain energy theory-Maximum distortion energy theory

UNIT -V

Columns and Struts:

Introduction – Classification of columns – Axially loaded compression members – Euler's crippling load theory – Derivation of Euler's critical load formulae for various end conditions – Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Eccentric loading and Secant formula – Prof. Perry's formula.

TEXT BOOKS:

1. Mechanics of Materials – Dr.B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications.
2. Strength of Materials by R.K Rajput, S.Chand& Company Ltd.
3. Strength of materials by Dr. Sadhu Singh, Khanna Publishers.

REFERENCES:

1) R. K. Bansal, A Text book of Strength of materials, Laxmi Publications (P) Ltd., New Delhi.
2) Strength of Materials, Fourth edition, S.S. Bhavikatti, Vikas Publishing House, Pvt. Ltd.
3) D. S. Prakasa Rao Strength of Materials by, Universities Press Pvt Ltd, Hyderabad.
4) Schaum's outline series Strength of Materials, McGraw hill International Editions.
5) L.S. Srinath, Strength of Materials, Macmillan India Ltd., New Delhi.
6) S. Basavarajaiah and P. Mahadevappa, Strength of Materials in SI units, Universities Press PvtLtd,Hyderabad. 3rd Edition 2010.

Course Outcomes:

On completion of the course, the student will be able to:

- Understand principal stresses and principal planes.
- Determine deflection at any point on a beam under simple and combined loads
- Analyze members under torsion, deformation in springs,
- Know the effect of eccentricity of load in columns, apply failure criteria to implement in design of structural members.
- Know the crippling load for the columns.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)

Semester-3 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	FLUID MECHANICS	2	1	0	3

Course Objectives:

To explain concepts of fluid mechanics used in Civil Engineering.

1) To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
2) To impart ability to solve engineering problems in fluid mechanics
3) To enable the students measure quantities of fluid flowing in pipes, tanks and channels
4) To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
5) To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

UNIT -I:

Basic concepts and definitions:

Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapor pressure, boiling point, surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Fluid statics:

Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer.pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT -II:

Fluid kinematics:

Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three -dimensional continuity equations in Cartesian coordinates.

UNIT -III:

Fluid Dynamics:

Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : Venturimeter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;

UNIT -IV:

Analysis Of Pipe Flow: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length – Pipes in Parallel and Series.

UNIT-V:

DIMENSIONAL ANALYSIS: Introduction, dimensions, Dimensional Homogeneity, Methods of Dimensional Ananlysis – Rayleigh's Metho, Buckingham Pi theorem, Model analysis. Silmilitude – types of similarities. Model laws partially submerged objects, types of models, Scale effect

BOUNDARY LAYER THEORY & DRAG AND LIFT: Boundary layer - Concepts. Prandlt's contribution. Characteristics of Boundary Layer along a thin flat plate laminar and turbulent Boundary layers. Seperation of BL expression for Drag and Lift. Lift and Drag Coefficients, Pressure drag and friction drag.

TEXT BOOKS:

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House
2. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.

REFERENCES:

1. Fluid Mechanics and Hydraulic Machines, S.C.Gupta, Pearson publication
2. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi.
3. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill
4. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
5. K. Subramanya, Open Channel flow, Tata Mc.Grawhill Publishers.

6.S K SOM and G Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill,New Delhi

Course Outcomes:

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

- Understand the principles of fluid statics, kinematics and dynamics
- Familiarize basic terms used in fluid mechanics
- Understand flow characteristics and classify the flows
- Apply the continuity, momentum and energy principles

- Estimate various losses in flow through channels

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)

Semester-3 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	ENGINEERING GEOLOGY	3	0	0	3

OBJECTIVES: *Theobjectives of this is to give the basic knowledge of Geology that is required for construction of various Civil Engineering Structures. The syllabus includes the basics of Geology. Geological hazard's and gives a suitable picture on the Geological aspects that are to be considered for the planning and construction of major Civil Engineering projects.*

COURSE OUTCOMES	
CO1	The students would have the knowledge of principles of engineering geology.
CO2	The students would have the knowledge of properties of soil, various rocks and minerals
CO3	The students would be able to judge the suitability of sites for various civil engineering structures.
CO4	The students would exhibit the ability to use the knowledge of geological strata in the analysis and design the civil engineering structures.
CO5	The students would have the knowledge for deciding the suitability of water and soil conservation projects.

UNIT – I

INTRODUCTION:

Importance of geology from Civil Engineering point of view.Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs.Importance of Physical geology, Petrology and Structural geology.

WEATHERING OF ROCKS : Its effect over the properties of rocks importance of weathering with REFERENCE to dams, reservoirs and tunnels weathering of common rock like "Granite"

MINERALOGY:

Definition of mineral, Importance of study of minerals, Different methods of study of minerals.Advantages of study of minerals by physical properties.Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar , Quartiz , Flint , Jasper, Olivine , Augite , Hornblende , Muscovite , Biotite , Asbestos, Chlorite , Kyanite , Garnet, Talc , Calcite. Study of other common economics minerals such as Pyrite, Hematite , Magnetite, Chrorite , Galena , Pyrolusite , Graphite, Magnesite, and Bauxite.

UNIT – II

PETROLOGY:

Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of Igneous. Sedimentary and Metamorphic rocks. Their distinguishing features, Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

STRUCTURAL GEOLOGY:

Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints – their important types. Their importance Insitu and drift soils, common types of soils, their origin and occurrence in India

UNIT – III

GROUND WATER,EARTH QUAKE &LAND SLIDES:-

Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration. Earth quakes, their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Land slides, their causes and effect; measures to be taken to prevent their occurrence. Importance of study of ground water, earth quakes and land slides.

UNIT –IV

GEOPHYSICAL STUDIES:-

Importance of Geophysical studies Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and Geothermalmethod. Special importance of Electrical resistivitymethods, and seismic refraction methods.Improvement of competence of sites by grouting etc.

UNIT – V

GEOLOGY OF DAMS,RESERVOIRS AND TUNNELS :

Types of dams and importance of Geology of site in their selection, Geological Considerations in the selection of a dam site.Analysis of dam failures of the past. Factor's Contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs. Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (ie. Tithological, structural and ground water) in tunneling over break and lining in tunnels.

TEXT BOOKS:

1) Engineering Geology by N.Chennkesavulu, Mc-Millan, India Ltd. 2005

2) Engineerring Geology by VasudevKanthi, Universities press, Hyderabad.

REFERENCES:

1. Engineerring geology by Prabinsingh, KatsonPubilcations
2. Engineering geology by Duggal, TMH Publishers.
3. Engineering Geology by SubinoyGangopadhyay, Oxford University press.
4. Principals of Engineering Geology by K.V.G.K. Gokhale – B.S publications
5. K. S. Valdiya, " Environmental Geology",, Tata McGraw Hill.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)

Semester-3 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	STRUCTURAL ANALYSIS – I	2	1	0	3

OBJECTIVE: *To make the students to understand the principles of analysis of structures of static and moving loads by various methods.*

COURSE OUTCOMES	
CO1	Ability to understand the concepts of various classical methods for indeterminate structures.
CO2	Ability to analyse whether a structures is statically determinate or in-determinates.
CO3	Ability to analyse statically determinate trusses, beams and frames and obtain internal reactions.
CO4	Ability to determine shear and moment functions and diagrams for beams for beam structures.
CO5	Ability to evaluate deflection of beams and frames using classical methods.

UNIT – I

ENERGY THEOREMS: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castigliano's first theorem-Deflections of simple beams and pin jointed trusses.

UNIT – II

ANALYSIS OF INDETERMINATE STRUCTURES : Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano's theorem.

UNIT – III

FIXED BEAMS & CONTINUOUS BEAMS : Introduction to statically indeterminate beams with uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

UNIT – IV

SLOPE-DEFLECTION METHOD: Introduction-derivation of slope deflection equations-application to continuous beams with and without settlement of supports- Analysis of singlebayportal frames without sway.

UNIT – V

MOMENT DISTRIBUTION METHOD: Introduction to moment distribution method-Application to continuous beams with and without settlement of supports-Analysis of single bay storey portal frames without sway.

TEXT BOOKS:

(1) Analysis of Structures – Vol-I&II by V.N.Vazirani&M.M.Ratwani, Khanna Publications, New Delhi.
(2) Structural Analysis by S SBhavikatti – Vikas Publishing House.
(3) Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi.

REFERENCES :

(1) Structural analysis – Hibbler – Pearson education
(2) Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi.
(3) Structural Analysis – D.S.Prakasarao -Univeristy press.
(4) Introduction To Structural Analysis-Nautial- New Age Pubilishers
(5) Strength of Materials and Mechanics of Structures by B.C.Punmia, Khanna Publications, NewDelhi.
(6) Structual analysis Vol.I and II by Dr. R.Vaidyanathan and Dr.PPerumal – Laxmi publications.
(7) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

B.Tech (R-19 Civil Engineering)

Semester-3 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	SURVEYING	3	1	--	4

Course Objectives:

- To make the student to get well conversant with the fundamentals of various basic methods and instruments of surveying.
- To introduce to the students in identifying reduced level of the ground and its profile for finding areas and volumes of embankments and cuttings.
- To make the student to use angular measuring instruments for horizontal and vertical control.
- To enable the student to set simple horizontal curves.
- To introduce the knowledge construction surveys and usage of modern instrument such as total station.

UNIT– I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying. Measurement of Distances and Directions Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip.

Plane table surveying: Introduction, accessories, setting up of plane table, techniques, testing, adjustments, errors, advantages and disadvantages.

UNIT - II

Levelling - Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct & Indirect methods of contour surveying, interpolation and sketching of Contours.

Computation of Areas and Volumes: Areas - Determination of areas consisting of irregular boundary and regular boundary, Planimeter. Volumes - Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

UNIT - III

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

UNIT - IV

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry.

Curves: Types of curves and their necessity, elements of simple circular curve, setting out of simple horizontal circular curves.

UNIT - V

Construction surveys: Introduction-staking out buildings-pipelines and sewers-highways-culverts. Bridge surveys-determining the length of a bridge-locating centres of piers- surface surveys and tunnel alignment-underground surveys-connection of surface and underground surveys-levelling in tunnels.

Total station Surveying: Basic principles, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments.

Course Outcomes:

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

- Calculate angles, distances and levels
- Identify data collection methods and prepare field notes
- Understand the working principles of survey instruments
- Estimate the volumes of earth work
- Able to use modern survey instruments.

Text Books:

1. S.S Bhavikatti, "Surveying theory and Practice", 2nd edition, Dreamtech press, Wiley distributors.
2. C.Venkatramaiah, "Text book of surveying", 2nd edition, Universities press, 2018

References:

1. Arthur R Benton and Philip J Taety, "Elements of Plane Surveying", McGraw Hill – 2000.
2. Arora K R "Surveying" Vol 1, 2 & 3, Standard Book House, Delhi, 2004.
3. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain,"Surveying" (Vol – 1, 2 & 3), - Laxmi Publications (P) ltd., New Delhi.
4. Chandra A M, "Plane Surveying", New Age International Pvt. Ltd., New Delhi, 2002.
5. Bhavikatti "Surveying" Vikas publishing house ltd.
6. S K Duggal, "Surveying" (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2004.
7. R. Agor Khanna Publishers 2015 "Surveying and leveling".
8. R. Subramanian, "Surveying and levelling" Oxford university press, New Delhi.
9. Chandra A M, "Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi, 2002.

10. S.S Bhavikatti "Surveying and Levelling", Vol. 1 and 2, Dreamtech press, Wiley distributors.

11. Hoffman. B, H. Lichtenegga and J. Collins, Global Positioning System – "Theory and Practice", Springer -Verlag Publishers, 2001.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)

Semester-3 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	ENGINEERING GEOLOGY LAB	0	0	3	1.5

COURSE OUTCOMES	
CO1	The study and identification of minerals, rocks and structures with their utilization in civil engineering works.
CO2	Ability to solve the problems related to strike and Dip problems
CO3	Ability to study and identify the minerals , rocks by their physical properties
CO4	To know the electrical resistivity surveys and to understand interpretation of resistivity data and assessment of bed rock and ground water table.
CO5	Ability to analyze the geological maps & thickness of beds.

1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic description and identification of rocks referred under theory.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.

4. Simple Structural Geology problems.

LAB EXAMINATION PATTERN:

1. Description and identification of SIX minerals
2. Description and identification of Six (including igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problems.

Text Books:-

1. Elementary Exercises in Geology by CVRK Prasad, Universities press.
2. B.S.SatyanarayanaSwamy, Engineering Geology Laboratory Manual , DhanpatRaiSons,New Delhi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

B.Tech (R-19 Civil Engineering)

Semester-3 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	SURVEYING LAB	-	-	3	1.5

Course objectives:

By performing this laboratory, the student will be able to know the usage of various surveying equipments and their practical applicability.

- Setting up of Right angles using cross staff
- Plane table survey; finding the area of a given boundary
- Two Point Problem by the plane table survey.
- Fly levelling: Height of the instrument method and rise and fall method.
- Fly levelling: Longitudinal Section and Cross sections of a given road profile.
- Theodolite Survey: Determining the Horizontal and Vertical Angles
- Finding the distance between two inaccessible points using Theodolite
- Tachometric survey: Heights and distance problems using tachometric principles.
- One Exercise on Curve setting.
- Total Station Determination of area using total station. Traversing and Contouring
- Total Station: Determination of Remote height.
- Developing a Contour map

Course Outcomes:

By performing the various tests in this laboratory the student will be able to know the principles of surveying in chain surveying, compass surveying, plane table surveying, levelling, thedolite surveying and total station.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA
B.Tech – II-II Sem

L	T	P	C
3	0	0	3

Numerical Methods, Probability and Statistics
(Common to CIVIL, ME, EEE& CSE)

Course Objectives:

1) To familiarize the students with numerical methods of solving the non-linear equations, interpolation, differentiation, integration, and ordinary differential equations.
2) To impart knowledge in basic concepts and few techniques in probability and statistics in various applications in engineering.

Unit I: Solution to algebraic and transcendental equations& Interpolation

Solution of algebraic and transcendental equations: bisection method, Newton-Raphson method and Regula-Falsi method, Finite differences, relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Learning Outcomes:

After completion of this unit student able to

- find approximate roots of the an equation by using different numerical methods
- explain various discrete operators and find the relation among operators
- apply Newton forward and backward formulas for equal and unequal intervals

Unit II: Numerical differentiation, integration &Solution of Initial Value Problems to Ordinary Differential Equations of first order.

Numerical Differentiation and Numerical integration: Numerical differentiation using Newton's forward & backward interpolation formulae; Numerical Integration by trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

Numerical Solutions of Ordinary differential equation: Solution by Taylor's series, Picard's method of successive approximations, Euler's method, modified Euler's method and Runge-Kutta method of fourth order.

Learning Outcomes:

After completion of this unit student able to

- find integration of a function by different numerical methods
- solve ordinary differential equations using different numerical schemes

Unit III: Probability & Random Variables

Probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem.

Random variables (discrete and continuous)**,** probability distribution: Binomial - Poisson approximation to the binomial distribution and normal distribution-their properties. (All concepts without proofs)

Learning Outcomes:

At the end of this unit, the student will be able to

- explain the terms sample space, random variable, expected value
- apply probability theory via Baye's theorem
- identify the notations of discrete and continuous distribution functions
- evaluate Binomial and Poisson distributions
- explain the properties of normal distribution

Unit IV: Testing of hypothesis

Formulation of hypothesis, critical region, level of significance. Large sample tests: test for single proportion, difference of two proportions, test for single mean and difference of two means.

Learning Outcomes:

At the end of this unit, the student will be able to

- explain the concept of testing of hypothesis
- apply the concept of hypothesis testing for large samples

Unit V: Small Sample Tests

Student t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test), $\chi 2$ - test for independence of attributes and goodness of fit.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply the concept of testing hypothesis for small samples
- estimate the goodness of fit

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008
3. S.S.Sastry, "Introductory methods of Numerical Analysis", 5th edition, PHI, 2012.

References:

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons publications, 2012.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.
3. P. Kandasamy, K. Thilagavathy, S. Gunavathy, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.

Course Outcomes:

Students will be able to

- apply different methods to find roots of the equations
- find approximate the solutions of ordinary differential equations
- apply the Laplace transform for solving differential equations
- explain the concepts of probability and their applications
- apply discrete and continuous probability distributions in practical problems
- use the statistical inferential methods based on small and large sampling tests

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)

Semester-4 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	WATER RESOURCES ENGINEERING	3	0	0	3

OBJECTIVE:

To study the concepts of

i. *Engineering Hydrology and its applications like Runoff estimation, estimation of design discharge and flood routing.*
ii. *Irrigation Engineering – Water utilization for Crop growth, canals and their designs.*

UNIT – I

INTRODUCTION TO HYDROLOGY: Engineering hydrology and its applications; Hydrologic cycle; precipitation- types and forms, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, presentation and interpretation of rainfall data.

DESCRIPTIVE HYDROLOGY: Evaporation- factors affecting evaporation, measurement of evaporation; Infiltration- factors affecting infiltration, measurement of infiltration, infiltration indices; Run off- Factors affecting run- off, Computation of run-off; Design Flood; Estimation of maximum rate of run-off; separation of base flow.

UNIT – II

HYDROGRAPH ANALYSIS: Hydrograph; Unit Hydrograph- construction and limitations of Unit hydrograph, Application of the unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration; S-hydrograph.

GROUND WATER: Introduction; Aquifer; Aquiclude; Aquifuge; aquifer parameters- porosity, Specific yield, Specific retention; Divisions of sub–surface water; Water table; Types of aquifers; storage coefficient-coefficient of permeability and transmissibility

UNIT – III

IRRIGATION: Introduction; Necessity and Importance of Irrigation; advantages and ill effects of Irrigation; types of Irrigation; methods of application of Irrigation water; quality for Irrigation water. Duty and delta; duty at various places; relation between duty and delta; factors affecting duty; methods of improving duty.

WATER REQUIREMENT OF CROPS: Types of soils, Indian agricultural soils, preparation of land for Irrigation; soil fertility; Soil-water-plant relationship; vertical distribution of soil moisture; soil moisture tension; soil moisture stress; various soil moisture constants; Limiting soil moisture conditions; Depth and frequency of irrigation; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; Kor depth and Kor period; crop seasons and crop rotation; Irrigation efficiencies; Determination of irrigation requirements of crops; Assessment of

Irrigation water. Consumptive use of water-factors affecting consumptive use, direct measurement and determination by use of equations (theory only)

UNIT – IV

CHANNELS – SILT THEORIES: Classification; Canal alignment; Inundation canals; Cross–section of an irrigation channel; Balancing depth; Borrow pit; Spoil bank; Land width; Silt theories– Kennedy's theory, Kennedy's method of channel design; Drawbacks in Kennedy's theory; Lacey's regime theory- Lacey's theory applied to channel design; Defects in Lacey's theory; Comparison of Kennedy's and Lacey's theory.

WATER LOGGING AND CANAL LINING: Water logging; Effects of water logging; Causes of water logging; Remedial measures; Saline and alkaline soils and their reclamation; Losses in canal; Lining of irrigation channels – necessity, advantages and disadvantages; Types of lining; Design of lined canal.

UNIT – V

WELL HYDRAULICS

Steady and unsteady flow to a well in a confined and unconfined aquifer - Partially penetrating wells - Wells in a leaky confined aquifer - Multiple well systems - Wells near aquifer boundaries - Hydraulics of recharge wells

TEXT BOOKS:

1. Irrigation and water power engineering by Punmia&Lal, Laxmi publications pvt. Ltd., New Delhi
2. Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna Publishers, Delhi.

REFERENCES:

1. Engineering Hydrology by K.Subramanya, The Tata Mcgraw Hill Company, Delhi
2. Engineering Hydrology by Jayarami Reddy, Laxmi publications pvt. Ltd., New Delhi
3. Irrigation and Water Resources & Water Power by P.N.Modi, Standard Book House.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)

Semester-4 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	HYDRAULICS AND HYRAULIC MACHINERY	2	1	0	3

Course Objectives:

1) To Introduce concepts of laminar and turbulent flows
2) To teach principles of uniform and non-uniform flows through open channel.
3) To impart knowledge on design of turbines.
4) To impart knowledge on design of pumps.

UNIT -I:

Laminar & Turbulent flow in pipes:

Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow.Resistance to flow of fluid in smooth and rough pipes-Moody's diagram – Introduction to boundary layer theory.

UNIT -II:

Uniform flow in Open Channels:

Open Channel Flow-Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section.Hydraulically efficient channel sections**:** Rectangular, trapezoidal and triangular channels, Energy and Momentum correction factors.

UNIT III:

Non-Uniform flow in Open Channels:

Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and Velocity –Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow.Hydraulic Jump and classification - Elements and characteristics- Energy dissipation.

UNIT -IV:

Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - velocity triangles at inlet and outlet - Work done and efficiency

Hydraulic Turbines: Classification of turbines; pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation: causes and effects.

UNIT -V:

Pumps:

Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies.

TEXT BOOKS:

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House
2. K. Subramanya, Open channel Flow, Tata McGraw Hill.

REFERENCES:

1. Rajput, Fluid mechanics and fluid machines , S. Chand & Co
2. D. S. Kumar Fluid Mechanics & Fluid Power Engineering, Kataria& Sons.
3. Srinivasan, Open channel flow by, Oxford University Press
4. Banga& Sharma, Hydraulic Machines, Khanna Publishers.
5. Fluid Mechanics and Hydraulic Machines, S.C.Gupta, Pearson publications,
6. R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi

Course Outcomes:

At the end of the course, the student will be able to

- Understand characteristics of laminar and turbulent flows.
- Analyze characteristics for uniform and non-uniform flows in open channels.
- Design different types of turbines
- Design centrifugal and multi stage pumps.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)

Semester-4 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	STRUCTURAL ANALYSIS – II	2	1	0	3

OBJECTIVE: *Indeterminate structures are subjected to different loading with different supported conditions; hence it is necessary to study the behaviour of the structures.*

COURSE OUTCOMES	
CO1	To demonstrate the behaviour of arches and their methods of analysis
CO2	To use various classical methods for analysis of indeterminate structures
CO3	Ability to analyse the beam and frames for vertical and horizontal loads and draw SFD and BMD
CO4	To determine the effect of support settlements for indeterminate structures. Able to calculate forces in members of truss due to load by stiffness method.
CO5	Ability to analyse and perform plastic analysis on various structural elements.

UNIT I
ARCHES : Three hinged and Two hinged arches, Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature-Determination of horizontal thrust bending moment, normal thrust and radial shear – Rib shortening and temperature stresses.

UNIT-II
MOMENT DISTRIBUTION METHOD FOR FRAMES:-Analysis of single bay single storeyportalframe including side sway–Substitute frame analysis by two cycle method.

UNIT – III
KANI`S METHOD:-
Analysis of continuous beams with and without settlement of supports -Single bay single storey portal frames with and without side sway.

UNI T – IV
FLEXIBILITY METHOD :-
Flexibility methods- Introduction- Application to continuous beams including support settlements—Analysis of Single bay single storey portal frames without and with side sway.

UNIT – V
STIFFNESS METHOD:
Stiffness methods- Introduction-application to continuous beams including support settlements-Analysis of Single bay single storey portal frames without and with side sway.

TEXT BOOKS:

1. Analysis of structures by Vazrani&Ratwani – Khanna Publications.
2. Theory of structures by Ramamuratam, jain book depot , New Delhi.

REFERENCES :

1.Structural analysis by R.S.Khurmi, S.Chand Publications, New Delhi.

2. Basic Structural Analysis by K.U.Muthu*et al.,*I.K.International Publishing House Pvt.Ltd

3.Theory of Structures by Gupta S P, G S Pundit and R Gupta, Vol II, Tata McGrawHill Publications company Ltd.

4.D S Prakash Rao, **"Structural Analysis: A Unified Approach"**, Universities Press

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)

Semester-4 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	CONCRETE TECHNOLOGY	3	0	0	3

Course Objectives:

- Lot of advances is taking place in the concrete technology as par with development taking place in the engineering.
- The present day industry needs the knowledge of concrete technology thoroughly.
- The subject is designed to give the basic knowledge as well as latest developments in concrete technology.

UNIT I

CEMENTS ,CONCRETE AND ITS COMPONENTS :

Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Test`s on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures. AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

UNIT – II

FRESH & HARDENED CONCRETE:

Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.Water / Cement ratio – Abram‟s Law – Gel space ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compressive & tensile strength - Curing.Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests –

UNIT – III

ELASTICITY, CREEP &SHRINKAGE:– Modulus of elasticity – Dynamic modulus of elasticity – Poisson‟s ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage. Introduction to Non-destructive testing methods – Rebound Hammer – Ultra Pulse Velocity method – Pullout - Codal provisions for NDT

UNIT – IV.

MIX DESIGN: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – ACI method & IS 10262 method

UNIT – V

SPECIAL CONCRETES: Light weight aggregates – Light weight aggregate concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Different types of fibres – Factors affecting properties of F.R.C – Applications – Polymer concrete – Types of Polymer concrete – Properties of polymer concrete – Applications – High performance concrete – Self consolidating concrete – SIFCON – Bacterial concrete(self healing concrete)

TEXT BOOKS:

1. Properties of Concrete by A.M.Neville – Pearson publication – 4th edition
2. Concrete Technology by M.S.Shetty. – S.Chand& Co. ; 2004

REFERENCES:

1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
2. Concrete: Micro structure, Properties and Materials – P.K.Mehta and J.M.Monteiro, McGraw Hill Publishers
3. Design of Concrete Mix by Krishna Raju, CBS pubilishers.

Outcomes:

After completing the course, the student should be able to do the following:

1. The students should be able to check and recommend different constituent of concrete.
2. The students should be able to test strength and quality of plastic and set concrete.
3. The students should have understanding of application admixture and its effect on properties of concrete.
4. The students should be able to design mix of concrete according to availability of ingredients and design needs.
5. The students should be able to test various strength of concrete by destructive and nondestructive testing method

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)

Semester-4 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	Building Planning and Drawing	1	2	0	3

OBJECTIVE: *This subject provides the knowledge of building by laws, registration, planning of various types of buildings different sign convention of various Civil Engineering Materials, Doors, windows, tiles of roof, drawing of building plans etc.*

COURSE OUTCOMES	
CO1	The scope of this course is to introduce the concepts of building planning and drawing with emphasis on architectural planning.
CO2	This subject is designed as an introduction for subjects who wish to develop their competence and skills in the preparation of architectural and building drawings.
CO3	Able to know the requirements of different rooms and characteristics of various types of residential buildings.
CO4	Able to know about building byelaws and regulations.
CO5	Ability to draw line sketch and planning and bi section of a building.

PART-A

UNIT -I

PLANING OF BUILDINGS: Types of buildings, types of residential buildings, site selection for residential building, orientation of buildings; aspect; prospect; privacy; furniture requirement;grouping;circulation;sanitation;lighting;ventilation;cleanliness;flexibility;elegancy;Economy; practical considerations.

BUILDING BYELAWS AND REGULATIONS: Introduction- Terminology ;Objectives of building byelaws; Minimum plot sizes; Open space requirements ;Plinth area, floor area, carpet area; Floor area ratio (FAR), Floor space Index (FSI) ;areas for different units; Principles underlying building byelaws ; built up area limitations – Height of Buildings ,Wall thickness, lighting and ventilation requirement, safety from fire, drainage and sanitation; applicability of the bye-laws.

UNIT –II

PLANNING OF RESIDENTIAL BUILDINGS: Minimum standards for various parts of buildings – requirements of different rooms and their grouping – characteristics of various types of residential buildings

PLANNING OF PUBLIC BUILDING: Planning of Educational institutions, Hospitals, Office buildings, Banks, Industrial buildings, Hotels and Motels, Hostels, Bus Station.

UNIT -III

BUILDINGS: SAFETY AND COMFORT: aspects of safety-structural, health, fire and constructional safety. Components of building automation system - HVAC, electrical lighting, Security, fire-fighting, communication etc. design for thermal comfort, ventilation comfort, air conditioning comfort, lighting comfort, noise and acoustic comfort.

PART-B

UNIT -IV

SIGN CONVENTIONS AND BONDS: Brick, Stone, Plaster, Sand filling, Concrete, Glass, Steel, Cast iron, Copper alloys, Aluminum alloys etc., Lead, Zinc, tin, and white lead etc., Earth, Rock, Timber and Marble. English bond & Flemish bond; odd & even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.

DOORS WINDOWS, VENTILATORS AND ROOFS: Paneled Door – paneled and glazed door; glazed windows – paneled windows; Swing ventilator – Fixed ventilator; Couple roof – Collar roof; Kind Post truss – Queen post truss.

UNIT –V

Given line diagram with specification to draw plan, section and elevation of the following :

1. Residential Building
2. Hospital
3. Schools
4. Post office
5. Corporate Office Building
6. Hotels
7. Bank buildings
8. Bus stations
9. Industrial buildings

FINAL EXAMINATION PATTERN: The end examination paper should consist of Part- A and Part-B. Part- A consists of three questions with either or choice from three units in planning portion .Each question carries 10 marks. Total marks for Part-A is 30 marks. Part- B consists of two questions with either or choice from drawing portion. Question from unit-IV carries 10 marks and question from unit-V carries 30 marks. Total marks for Part-B is 40 marks.

TEXT BOOKS:

1. Planning and Designing and Scheduling – Gurucharan Singh and Jagadish Singh- Standard publishers.
2. Building Planning and Design – N.KumaraSwamy and A.Kameswara Rao. Charotar publications.

REFERENCE:

1. Building by laws by state and Central Governments and Municipal corporations. National Building Code
2. Building drawing with an integrated approach to building environment-M.G.Saha, G.M.Kale, S.Y.patki-Tata McGraw Hill

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)

Semester-4 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	CONCRETE TECHNOLOGY LABORATORY	0	0	2	1.0

To know the concept and procedure of different type of tests to be conducted on cement, aggregate and finished concrete and designing the concrete mix of given specification of its ingredients along with appropriate water cement ratio and admixtures.

Course outcomes	
CO 1	*To be able to determine the importance of testing of cement and its properties*
CO 2	*To be able to assess the different properties of aggregate*
CO 3	*To be able to summarize the concept of workability and testing of concrete*
CO 4	*To be able to assess the properties of hardened concrete*

SYLLABUS:

1. Normal Consistency of fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity of cement.
4. Soundness of cement.
5. Compressive strength of cement.
6. Workability test on concrete by compaction factor,
7. Workability test on concrete by slump
8. Workability test on concrete by Vee-bee test
9. Young's modulus and compressive strength of concrete.
10. Specific Gravity and Water Absorption of Coarse aggregate.
11. Bulking of Fine aggregate.
12. Non-Destructive testing on concrete (for demonstration)
13. Fineness modulus of sand and importance of zoning
14. Bulk density of Coarse Aggregate.
15. Bulk density of Fine Aggregate.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA

B.Tech (R-19 Civil Engineering)

Semester-4 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	FLUID MECHANICS AND HYDRAULIC MACHINERY LAB	0	0	3	1.5

OBJECTIVE: *The object of the course to make the students understand the fluid flow concepts and get familiarity with flow measuring devices.*

COURSE OUTCOMES	
CO1	To calibrate the flow measuring devices.
CO2	To calculate loss coefficients for use in the pipe-flow analysis.
CO3	To prepare the characterstics for curves of the pumps and turbines.
CO4	To find the performance of francis, pelton wheel turbines.
CO5	To understand the efficiency of centrifugal, reciprocating pumps, and to calibrate venturimeter, orifice meter.

SYLLABUS:

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of contracted Rectangular Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Verification of Bernoulli's equation.
8. Impact of jet on vanes.
9. Study of Hydraulic jump.
10. Performance test on Pelton wheel turbine.
11. Performance test on Francis turbine.
12. Efficiency test on centrifugal pump.

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COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-19 Civil Engineering)

Semester-4 Syllabus

Subject Code	Title of the Subject	L	T	P	C
-	**Computer Aided Drafting Lab**	0	0	3	1.5

(2)

Course outcome / Course Objectives:

1. After completion of the course A student will able to know how to apply engineering drawing using computers
2. A student can understand about the scope of Auto CAD software
3. A student will know what is plan and how it should drawn in auto CAD software.

LIST OF EXERCISES:

1. Introduction to computer aided drafting
2. Software for CAD – Introduction to different software‘s
3. Practice exercises on CAD software
4. Drawing of plans of buildings using software for Single storied buildings
5. Drawing of plans of buildings using software for multi storied buildings
6. Developing sections and elevations for Single storied buildings
7. Developing sections and elevations for multi storied buildings
8. Detailing of building components like Doors, Windows, Roof Trusses etc. using CAD software
9. Exercises on development of working of buildings

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
College of Engineering (Autonomous), Pulivendula -516390, A.P, INDIA.

L	T	P	C
2	0	0	0

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Constitution of India

Course Objectives:

6. To Enable the student to understand the importance of constitution.
7. To understand the structure of executive, legislature and judiciary.
8. To understand philosophy of fundamental rights and duties.
9. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
10. To understand the central and state relation financial and administrative.

UNIT-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning Outcomes:

At the end of this unit students will be able to:

5. Understand the concept of Indian constitution.
6. Apply the knowledge on directive principle of state policy.
7. Analyze the History, features of Indian constitution.
8. Evaluate Preamble Fundamental Rights and Duties.

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

Learning Outcomes:

At the end of this unit students will be able to:

5. Understand the structure of Indian government.
6. Differentiate between the state and central government.
7. Explain the role of President and Prime Minister.
8. Know the Structure of supreme court and High court.

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions.

Learning Outcomes:

At the end of this unit students will be able to:

5. Understand the structure of state government.
6. Analyze the role Governor and Chief Minister.
7. Explain the role of state Secretariat.
8. Differentiate between structure and functions of state secrateriate.

UNIT-IV

B. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

Learning Outcomes:

At the end of this unit students will be able to:

5. Understand the local Administration.
6. Compare and contrast district administration role and importance.
7. Analyze the role of Myer and elected representatives of Municipalities.
8. Evaluate Zilla panchayat block level Organisation.

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women.

Learning Outcomes:

At the end of this unit students will be able to:

5. Know the role of Election Commission apply knowledge.
6. Contrast and compare the role of Chief Election commissioner and Commissiononerate.
7. Analyze role of state election commission.
8. Evaluate various commissions of viz SC/ST/OBC and women.

REFERENCES:

7. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi.
8. SubashKashyap, Indian Constitution, National Book Trust.
9. J.A. Siwach, Dynamics of Indian Government & Politics.
10. D.C. Gupta, Indian Government and Politics.
11. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication.
12. J.C. Johari, Indian Government andPolitics Hans.

Course Outcomes:

11. Understand historical background of the constitution making and its importance for building a democratic India.

12. Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
13. Understand the value of the fundamental rights and duties for becoming good citizen of India.
14. Analyze the decentralization of power between central, state and local self-government.
15. Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

16. Know the sources, features and principles of Indian Constitution.
17. Learn about Union Government, State government and its administration.
18. Get acquainted with Local administration and Pachayati Raj.
19. Be aware of basic concepts and developments of Human Rights.
20. Gain knowledge on roles and functioning of Election Commission.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE51- SOIL MECHANICS

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To enable the student to find out the index properties of the soil and classify it.
- To enable the student to determine permeability of soils using various methods.
- To impart the concept of seepage of water through soils and determine the seepage discharge.
- To enable the students to differentiate between compaction and consolidation of soils and to determine the consolidation settlement.
- To impart knowledge on soil exploration.
- To teach slope stability and safety assessment of earth retaining structures.
- To impart knowledge on bearing capacity and settlement of shallow foundations.
- To throw light on pile and well foundation designs.

UNIT – I:

INTRODUCTION: Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass-volume relationship – Relative density.

INDEX PROPERTIES OF SOILS: Moisture Content, Specific Gravity, In-Situ density, Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the characteristics of soils
- Assess relationships between different parameters
- Determine soil properties
- Determine Liquid, Shrinkage and Plasticity Limits
- Characterize and classify soils based on different limits.

UNIT – II: PERMEABILITY:

Soil water – capillary rise – flow of water through soils – Darcy's law permeability – Factors affecting – laboratory and Field determination of coefficient of permeability –Permeability of layered systems.

SEEPAGE THROUGH SOILS: Total, neutral and effective stresses –quick sand condition – Seepage through soils – Flownets: Characteristics and Uses.

Learning Outcomes:

At the end of this unit, the student will be able to

- Determine the permeability of soils and stratified soils
- Explain factors effecting permeability
- Estimate the rate of seepage using flow net

UNIT – III:STRESS DISTRIBUTION IN SOILS:

Boussinesq's and Westergaard's theories for point loads and areas of different shapes – New- mark's influence Chart.

COMPACTION:

Mechanism of compaction – factors affecting – effects of compaction on soil properties. – Field compaction Equipment – compaction control.

Learning Outcomes:

At the end of this unit, the student will be able to

- Compute stresses in soils under various loading conditions.
- Explain compaction of soils
- Compaction control can be understand.

UNIT – IV: CONSOLIDATION:

Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log p curves – normally consolidated soil, over consolidated soil and under consolidated soil – pre-consolidation pressure and its determination – Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods - computation of total settlement and time rate of settlement.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the consolidations and settlement of soils.
- Differentiate compaction and consolidation
- Assessment of final settlements of soil
- Differentiate primary and secondary consolidation

UNIT – V: SHEAR STRENGTH OF SOILS:

Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelops – Shear strength of sands - dilatancy – critical void ratio – Liquefaction- shear strength of clays.

Learning Outcomes:

At the end of this unit, the student will be able to

- Can able to determine the shear strength of the soil.
- To understand the various shear tests based on drainage conditions.

Text Books:

1. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
2. Soil Mechanics and Foundation by byB.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., NewDelhi
3. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).

Reference Books:

1. Basic and Applied Soil Mechanics by GopalRanjan& ASR Rao, New age International Pvt . Ltd, NewDelhi.
2. Soil Mechanics and Foundation Engineering by Purushtoma Raj, PearsonPubilications
3. Geotechnical Engineering V.N.S.Murthy, CRC Press, Newyork, Special IndianEdition
4. Geotechnical Engineering by Brije.M.Das, Cengage Publications, New Delhi.
5. Geotechnical Engineering by Brije.M.Das, Cengage Publications, NewDelhi.

Course Outcomes:

At the end of this Course the student will be able to

- Carry out soil classification
- Solve any practical problems related to soil stresses estimation, permeability and seepage including flow net diagram
- Estimate the stresses under any system of foundation loads
- Solve practical problems related to consolidation settlement and time rate of settlement

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE52- HIGHWAY ENGINEERING

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To impart knowledge on highway development.
- To teach concepts of Geometric design and alignment.
- To throw light on different traffic surveys.
- To teach design of highway intersections
- To impart knowledge on highway materials and design of pavements

UNIT – I: HIGHWAY DEVELOPMENT AND PLANNING:

Highway development in India – Necessity for Highway Planning-Jayakar Committee and its Recommendations - Different Road Development Plans- First, Second and Third Twenty Year Road Development Plans-Classification of Roads - Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand importance of highway development
- Classify highways based on hierarchy.

UNIT – II: HIGHWAY GEOMETRIC DESIGN

Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Surface Characteristics, Carriageway, Shoulders, Formation, Right of way; Kerbs, foot paths, Medians- design specifications. Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment-Gradients--Verticalcurves.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand different aspects governing highway geometric design.
- Design vertical and horizontal alignment of highways

UNIT – III: TRAFFIC ENGINEERING

Basic Parameters of Traffic-Volume, Speed and Density – Definitions and their interrelationship – Highway Capacity and Level of Service concept – Factors affecting Capacity and Level of Service - Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies and Parking characteristics- Road Accidents- Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams- Road Traffic Signs – Types and Specifications – Road markings-Need for Road Markings-Types of Road Markings- Specifications. Design of Traffic Signals –Webster Method –Saturation flow Rate-Phasing and Timing diagrams – Numerical problems.

Learning Outcomes:
At the end of this unit, the student will be able to

- Identify need and methods of Traffic Surveys.
- Understand importance of parking and related surveys.
- Understand the role of engineering in road safety

UNIT – IV: **INTERSECTION DESIGN:**
Conflicts at Intersections- Channelization: Objectives –Traffic Islands and Design criteria- Types of At-Grade Intersections – Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersection.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the objectives of channelization.
- Understand the types of intersections and their design features.

UNIT – V: PAVEMENT DESIGN:
Types of Pavements – Difference Between Flexible And Rigid Pavements – Pavement Components – Sub Grade, Sub Base, Base And Wearing Course – Functions Of Pavement Components – Design Factors – Flexible Pavement Design Methods – G.I Method, CBR Method, (As Per IRC 37-2002)– Design Of Rigid Pavements – Critical Load Positions - Westergaard's Stress Equations – Computing Radius Of Relative Stiffness And Equivalent Radius Of Resisting Section – Stresses In Rigid Pavements – Design Of Expansion And Contraction Joints In CC Pavements. Design Of Dowel Bars And Tie Bars.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand about the pavement and its components
- Understand the design of Rigid pavement and Flexible pavements.

Text Books:

1. Highway Engineering – S.K.Khanna&C.E.G.Justo, Nemchand& Bros., 7th edition(2000).
2. Transportation Engineering, Volume – I by C.Venkataramaiah, UniversitiesPress, Hyderabad.

3. Principles and Practice of Highway Engineering Design – L.R.Kadiyali and Lal-Khanna Publications.

Reference Books:

1. Traffic Engineering and Transportation Planning by L.R.Kadiyali and Lal- Khanna Publications.
2. Highway Engineering – Dr.S.K.Sharma, S.ChandPublishers

Course Outcomes:

At the end of this Course the student will be able to

- On completion of the course, the students will be able to:
- Understand the importance of highways in economic development of nation.
- Understand the history of road development in India and various road developmentplans.
- Identify the highway materials and tests related to them.
- Design horizontal and vertical alignment aspects.
- Understand the surveys required for highway planning and design.
- Differentiate between types of pavements and their design features.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE53- DESIGN OF REINFORCED CEMENT CONCRETE STRUCTURES

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize Students with different types of design philosophies.
- Equip student with concepts of design of flexural members.
- Understand Concepts of shear, bond and torsion.
- Familiarize students with different types of compressions members and Design.
- Understand different types of footings and their design.

UNIT – I:

Introduction: RCC design philosophy–Different methods of design **Working stress Design:** working stress method, design constants; Design singly reinforced**Limit state design:** Concepts of limit state design – Comparison between two methods- Basic statistical principles – Characteristic loads – Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars.

Learning Outcomes:

At the end of this unit, the student will be able to

- Familiarize with working stress and limit stress method of design.

UNIT – II:

Limit State Design:–Assumptions in limit state design-stress - block parameters – limiting moment of Resistance- Limit state design of singly reinforced doubly reinforced. **Beams:**, T and L sections by limit state method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand stress block parameters in methods of analysis
- Design of beams of varying cross sections adopting IS Code

UNIT – III:

Shear, Torsion, Bond, & Serviceability: Limit state design of section for shear and torsion – concept of bond, anchorage and development length, Limit state design of serviceability for deflection, cracking and codal provision

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand behavior of beams under shear and torsion
- Visualize importance of bond and anchorage
- Design and Detail RC beams under due to shear and torsion adopting IS Code.

UNIT – IV:

Slabs: Design of one way slab - Two-way slab, continuous slab- **Stair cases:** Types of stair cases -Design of Dog-legged stair cases

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify understand performance of slabs based on dimensions
- Design reinforced concrete slabs & Stair cases as per IS codal provisions.

UNIT – V:

Columns & Footings: Short columns – under axial loads, uni-axial bending and **biaxial bending(Not for Examination)**, I S Code provisions. Different types of footings – Design of isolated, square, Rectangular, stepped and sloped footings

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify footings based on shape and utility
- Examine the field conditions and suggest appropriate footings
- Design reinforced concrete footings.

Text Books:

1. Design of Reinforced Concrete Structures (Limit State) – A.K.Jain, 1st Edition, NemchandBrothers,Roorkee.
2. Reinforced concrete structures, Vol.1, by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt.Ltd., NewDelhi.
3. Reinforced concrete structures – I.C. Syal&A.K.Goel, S.ChandPublishers.
4. Limit State Design by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., NewDelhi.

Reference Books:

1. Reinforced concrete structural elements – behaviour, Analysis and design by P.Purushotham, Tata Mc.Graw-Hill, 1994.
2. Reinforced concrete design by S.Unnikrishna Pillai &DevdasMenon, Tata Mc.Graw Hill, New Delhi.
3. Limit state designed of reinforced concrete – P.C.Varghese, Prentice Hall of India, New Delhi.
4. Design of concrete structures – Arthus H.Nilson, David Darwin, and Chorles W. Dolar, Tata Mc.Graw-Hill, 3rd Edition, 2005.
5. Fundamentals of reinforced concrete by N.C. Sinha and S.K Roy, S. Chand publishers.

Course Outcomes:

At the end of this Course the student will be able to

- Will be able to understand the basic concepts of reinforced concrete analysis and design.
- Will be able to understand the behavior and various modes of failure of reinforced concrete members.
- Will be able to analyze and design various reinforced concrete members.
- Will be able to understand and analyze the effect of various support conditions on design of structures.
- Will be able to implement the knowledge in using analysis and design softwares.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE54a- REMOTE SENSING AND GIS

(Professional Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Introduce the basic principles of Remote Sensing and GIS techniques.
- Teach various types of satellite sensors and platforms
- Impart concepts of visual and digital image analyses
- Teach concepts of principles of spatial analysis
- Teach about the application of RS and GIS in Civil engineering

UNIT – I:

Introduction to photogrammetric: Principles & types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducially points, parallax measurement using fiducially line.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand concepts of photogrammetry
- Estimate heights and distances

UNIT – II:

Remote sensing: Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units. Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand advantages of remote sensing
- Demonstrate concepts of remote sensing.

UNIT – III:

Geographic information system: Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS. Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand concepts of GIS.

- Explain data collection and data interpretation
- Develop terrain characteristics using Mapping

UNIT – IV:
GIS spatial analysis: Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

Learning Outcomes:
At the end of this unit, the student will be able to

- Know applications of GIS and data interpretation

UNIT – V:
Water resources applications: Land use/Land cover in water resources, Surface water mapping and inventory -Watershed management for sustainable development and Watershed characteristics - Reservoir sedimentation, Fluvial Geomorphology - Ground Water Targeting, Identification of sites for artificial Recharge structures - Inland water quality survey and management, water depth estimation and bathymetry.

Learning Outcomes:
At the end of this unit, the student will be able to

- Know applications of RS & GIS in water resources applications.
- Study technological problems like reservoir sedimentation ground water identification

Text Books:

1. Remote Sensing and GIS by B.Bhatta, Oxford University Press,NewDelhi.
2. Advanced surveying : Total station GIS and remote sensing – SatheeshGopi – Pearson publication.

Reference Books:

1. Fundamentals of remote sensing by gorge Joseph , Universities press,Hyderabad.
2. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall(India) Publications.
3. Basics of Remote sensing & GIS by S.Kumar, LaxmiPublications.
4. Remote sensing and GIS by M.Anjireddy ,B.S.Pubiliications,NewDelhi.
5. Remote Sensing and its applications by LRA Narayana University Press1999.
6. GIS by Kang – tsungchang, TMH Publications &Co.,
7. Principals of Geo physical Information Systems – Peter A Burragh and Rachael Mc Donnell, Oxford Publishers2004

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

- Comparing with ground, air and satellite based sensor platforms.
- Interpret the aerial photographs and satellite imageries.
- Create and input spatial data for GIS application.
- Apply RS and GIS concepts in water resources engineering.
- Applications of various satellite data.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE54b- REPAIR AND REHABILITATION OF STRUCTURES

(Professional Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To describe causes of distress in concrete structures and plan repair strategies.
- To explain issues on serviceability and durability of concrete.
- To throw light on various repair materials and their characteristics.
- To demonstrate repair techniques and protection measures.
- To illustrate suitable retrofitting schemes.

UNIT – I:

Introduction – Deterioration of Structures – Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage- case studies of failure –Loss Assessment

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand importance and requirement of maintenance
- Gain knowledge on quantification of repairs and documentation

UNIT – II:

Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desiccation.-case studies of failure

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the corrosion and its effects on concrete
- Understand the damage of concrete from fire

UNIT – III:

Inspection and Testing – Symptoms and Diagnosis of Distress – Damage assessment – NDT.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand how to diagnose distress from symptoms
- Understand how to diagnose distress through NDT

UNIT – IV:

Repair of Structure – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting – Shot Create – Underpinning. Strengthening of Structures – Strengthening Methods – Retrofitting – Jacketing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain techniques for repair and rehabilitation.
- Understand methods of corrosion protection and inhibition

UNIT – V:

Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the need for health monitoring of structures

Text Books:

1. Concrete Technology by A.R. Santakumar, Oxford Universitypress
2. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.

Reference Books:

1. Defects and Deterioration in Buildings, EF & N Spon,London
2. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press
3. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W.H. Ranso, (1981)
4. Building Failures : Diagnosis and Avoidance, EF & N Spon, London, B.A. Richardson, (1991).

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

- Understand evaluation procedure and plan for repair.
- Design suitable rehabilitation scheme for serviceability and durability.
- Choose suitable repair material for different magnitudes of distress.
- Apply efficient repair and retrofitting schemes.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE54c- WATER RESOURCES ENGINEERING-II

(Professional Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about
To study various head works canal structures and their design principles the subject also covers the river structures, their classifications, designs, etc.

UNIT – I:

CANAL REGULATION WORKS:Canal falls: Necessity and location of falls; Types of falls; classification of falls; cistern design; roughening devices; design of sarada type fall. Canal regulators: off-take alignment; head regulators and cross-regulators; design of cross- regulator and distributary headregulator.

Learning Outcomes:
At the end of this unit, the student will be able to

-

UNIT – II:

STREAM GAUGING: Necessity; Selection of gauging sites; methods of Discharge Measurement Area-Velocity method; Slope-Area method; Tracer method, Electromagnetic induction method, Ultrasonic method; Measurement of depth –Sounding rod, Echo-sounder; Measurement of velocity: Floats – Surface floats, Sub–surface float or Double float, Velocity rod; Pitottube; Current meter-rating of current meter, measurement of velocity; chemical method; Measurement of stage-Staff gauge, wire gauge, water stage recorder, bubble gauge recorder; stage-discharge curve.

RIVER ENGINEERING: Classification of rivers; Meandering; Causes of meandering; Basic factors controlling process of meandering; Aggrading type of river; Degrading type of River; River training: objectives, Classification of river training works; Types of River training works : Guide banks, Marginal embankments ,Groynes or spur, levees, bank protection, pitched islands.

Learning Outcomes:
At the end of this unit, the student will be able to

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UNIT – III:

RESERVOIR PLANNING: Introduction; Investigations for reservoir planning; Selection ofsitefor a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curveand demand curve; Calculation of reservoir capacity for a specified yield from the mass inflowcurve; Determination of safe yield from a reservoir of a given capacity; Sediment flow instreams:Reservoir sedimentation; Life of reservoir; Reservoir sediment control; Flood routing;Methodsof flood routing-Graphical Method (Inflow – storage discharge curves method).

DAMS :GENERAL: Introduction; Classification according to use; classification according to material- Gravity dams, Arch dams, Buttress dams, Steel dams, Timber dams, Earth dams and rock fill dams-advantages and disadvantages; Physical factors governing selection of type of dam ; selection of site for a dam.

Learning Outcomes:
At the end of this unit, the student will be able to

-

UNIT – IV:

GRAVITY DAMS: Introduction; Forces acting on a gravity dam; Combination of loading for design; Modes of failure: stability requirements; principal and shear stresses; Stability analysis; Elementary profile of a gravity dam; Practical profile of a gravity dam; Limiting height of a gravity dam- High and low gravity dams;.

EARTH DAMS: Introduction; Types of earth dams; Causes of failure of earth dams; suitable and available materials for Seepage control measures; Slope protection. Seepage through earth dam

Learning Outcomes:
At the end of this unit, the student will be able to

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UNIT – V:

SPILLWAYS: Introduction; Types of spillways; Profile of ogee spillway; Energy dissipation below spillways for relative positions of jump height curve and tail water curve; Stilling basins; Indian standards on criteria for design of hydraulic jump type stilling basins with horizontal aprons; Spillway crest gates-Types and description only.

Learning Outcomes:
At the end of this unit, the student will be able to

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Text Books:

1. Irrigation and Water Power Engineering by Dr. B.C.Punmia& Dr. Pande B.B. Lal;Laxmi Publications pvt. Ltd., NewDelhi.
2. Irrigation Engineering and Hydraulic Structure by S. K. Garg; Khanna publishers,Delhi.

Reference Books:

1. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers
2. Irrigation, Waterpower and Water Resources Engineering by K R Arora; Standard Publication, NewDelhi.

3. Water resources engineering by Satyanarayana Murthy. Challa, New Age International Publishers

Course Outcomes:

At the end of this Course the student will be able to

- Design various channel systems
- Design head and cross regulator structures
- Identify various types of reservoir and their design aspects
- By the Establishes the understanding of cross drainage works and its design
- Design different types of dams
- Design gravity dam and earthen dam
- Design the canal systems

B.Tech III Year I semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS10-CAMPUS RECRUITMENT TRAINING & SOFT SKILLS

(Open Elective-I) (Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To prepare to face global competition for employment and excellence in profession.
- To help the students understand and build interpersonal and interpersonal skills that will enable them to lead meaningful professional life.

UNIT – 1: SOFT SKILLS: INTRODUCTIUON

Soft Skills: Definition-Meaning--Importance- Why skill gap -Analysis—Personality Developments. Soft Skills- Learning Methods.

Learning Outcomes:

At the end of this unit, the student will be able to

- Developing self-motivation, raised aspirations and belief in one's own abilities, defining and committing to achieving one's goals. **L1**
- Learning to keep going when things don't go according to plan, coping with the unfamiliar, managing disappointment and dealing with conflict **L2**

UNIT – II: PERSONAL SKILLS

Intra-Personal: Definition-Meaning-Importance-SWOT analysis- Goal Setting- Emotional Intelligence- Right thinking- Problem Solving-Time management.

Inter-Personal: Definition-Meaning-Importance-Communications skills- Team Work-Negotiation Skills-Leadership skills.

Learning Outcomes:

At the end of this unit, the student will be able to

- A commitment to ethics and integrity in academic and professional relationships, within the community and the environment. **L1**
- Describe how good communication with other can influence our working relationships **L2**

UNIT – III:VERBAL AND NON VERBAL SKILLS

Verbal Skills: Definition and Meaning-Importance-Improving Tips for Listening, Speaking, Reading-Writing Skills.

Non Verbal Skills: Definition and Meaning-Importance- Dress Code- Facial Expressions- Eye Contact- Proxemics - Haptics-Posture-Kinetics- Para Language.

Learning Outcomes:

At the end of this unit, the student will be able to

- Compares verbal and nonverbal communication **L1**
- Understand the functions of nonverbal communication **L2**

UNIT – IV: FINISHING SCHOOL

Before Interview: Bridging between Campus and Corporate-Preparation of Resume-Cover Letter-Statement of Purpose-E-mail writing-Corporate Etiquettes.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learner will be able to prepare his/ her own Resume and Cover letter. **L1**
- Learner will understand the importance of etiquettes and learn the nuances of expected behaviour within a group, a social class and society at general **L2**

UNIT – V: DURING INTERVIEW

Interview Skills: Importance-Purpose- Types of interviews –Preparation for interviews - Top Questions- Body Language in Interview Room-Do's and Don't s of interview.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learner will be able to face interview questions and effectively present his /her. skills **L1**
- Learner will manage how to plan and organize personal and professional life. **L2**

Reference Books:

1. Sherfield, M. Robert at al **CornerstoneDeveloping Soft Skills**, 4th ed. Pearson Publication,New Delhi, 2014.
2. Alka Wadkar, **Life Skills for Success,** Sage Publications India Private Limited; First edition (1 May 2016)
3. Sambaiah.M. **Technical English**, Wiley publishers India. New Delhi. 2014.
4. GANGADHAR JOSHI, **From Campus to Corporate**, SAGE TEXT.
5. Alex.K, **Soft Skills,** 3rd ed. S. Chand Publication, New Delhi, 2014.
6. Meenakshi Raman and Sangita Sharma, **Technical Communication: Principle and Practice**, Oxford University Press. 2009.
7. Shalini Varma, **Body Language for Your Success Mantra**, 4th ed, S. Chand Publication, New Delhi, 2014.
8. Stephen Covey, **Seven Habits of Highly Effective People**, JMD Book, 2013.

Course Outcomes:

At the end of this Course the student will be able to

- The students will be able to assimilate and understood the meaning and importance of soft skills and learn how to develop them. **L1**
- The students will understand the significance of soft skills in the working environment for professional excellence. **L2**
- The students will be prepared to undergo the placement process with confidence and clarity. **L3**
- The students will be ready to face any situation in life and equip themselves to handle them effectively. **L4**
- The students will understand and learn the importance of etiquettes in both professional and personal life **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS20-MATHEMATICAL MODELING

(Open Elective -I) (Common To All Branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To provide the basic knowledge to understand a Mathematical model.
- To formulate a Mathematical model related to a real world problems of engineering, biological science etc.

UNIT – 1: Mathematical Modeling & Mathematical modeling Through Ordinary differential equations of First Order : **9 Hrs**

Mathematical Modeling : Need, Techniques, Classifications and Simple illustrations,

Mathematical modeling Through Ordinary differential equations of First Order :

Mathematical modeling Through differential equations; Linear growth and decay models; Non-Linear Growth and Decay models; Mathematical modeling in dynamics through ordinary differential equations of first order.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn various mathematical techniques in modeling a problem. **L2**
- Learn modeling in dynamics through ordinary differential equations of first order. **L3**

UNIT – II: Mathematical modeling Through System of Ordinary differential equations of First Order:

Mathematical modeling in population dynamics; Mathematical modeling of Epidemics through system of ordinary differential equations of first order; Compartment models through Systems of ordinary differential equations; Mathematical modeling in dynamics through systems of ordinary differential equations of first order.

Learning Outcomes:

At the end of this unit, the student will be able to

- Develop a modeling of Epidemics through system of ordinary differential equations of first order. **L4**
- Analyze a modeling in dynamics through systems of ordinary differential equations of first order. **L3**

UNIT – III: Mathematical modeling Through Ordinary differential equations of Second Order:

Mathematical modeling of Planetary motion; Mathematical modeling of Circular motion and motion of satellites; Mathematical modeling through linear differential equations of second order.

Learning Outcomes:

At the end of this unit, the student will be able to

- Evaluate a mathematical modeling of planetary motion. **L5**
- Analyze a mathematical modeling of Circular motion and motion of satellites **L3**

UNIT – IV: Mathematical modeling Through Difference equations :

Need for Mathematical modeling Through Difference equations and simple models; Basic theory of Linear difference equations with constant coefficients; Mathematical modeling Through Difference equations in population dynamics and genetics; Mathematical modeling Through Difference equations in Probability theory.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze mathematical modeling through difference equations in population dynamics and genetics. **L4**
- Analyze mathematical modeling through difference equations in probability theory. **L4**

UNIT – V: Mathematical modeling Through Functional, Integral, Delay- Differential and Differential-Difference Equations :

Mathematical modeling Through Functional equations; Mathematical modeling Through Integral equations; Mathematical modeling Through Delay- Differential and Differential-Difference Equations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze a mathematical modeling through functional equations and integral equations. **L4**
- Analyze a mathematical modeling Through Delay- Differential and Differential-Difference Equations **L4**

Text Books:

1. J. N. Kapoor. Mathematical Modeling , NEW AGE INTERNATIONAL PUBLISHERS.

Reference Books:

1. A. C. Fowler. Mathematical Models in Applied Sciences, Cambridge University Press.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the basic concepts in mathematical modeling. **L1**
- Have better insight of the real word problems through mathematical modeling. **L2**
- Apply various concepts of mathematics in modeling. **L3**
- Analyze the real word problems through the techniques of modeling. **L4**
- Evaluate the real word problems through mathematical modeling. **L5**

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B.Tech III year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS21-FUZZY SET THEORY, ARITHMETIC AND LOGIC

(Open Elective -I) (Common To All Branches)

L	T	P	C
3	0	0	3

Course Objectives: This course aims at providing

- the basic knowledge to understand Fuzzy set theory and Arithmetic. and
- Logic, related to a real word problems of engineering, Science etc.

UNIT – 1: Classical (Crisp) Sets To Fuzzy Sets & Fuzzy Sets Versus Crisp Sets **9 Hrs**

Classical (Crisp) Sets To Fuzzy Sets:

Introduction: Crisp Sets: An Overview, Fuzzy Sets: Basic Types, Fuzzy Sets: Basic Concepts, Characteristics and Significance of the Paradigm Shift.

Fuzzy Sets Versus Crisp Sets:

Alpha -Cuts :Additional Properties of alpha -Cuts, Representations of Fuzzy Sets, Extension Principle for Fuzzy Sets

Learning Outcomes:

At the end of this unit, the student will be able to

- The basic concepts of Sets and Fuzzy sets **L2**
- Analyze the Fuzzy Sets Versus Crisp Sets **L3**

UNIT – II: Operations On Fuzzy Sets:

Types of Operations, Fuzzy Complements, Fuzzy Intersections: t-Norms Fuzzy Unions: t- Conorms, Combinations of Operations, Aggregation Operations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Do some operations on Fuzzy sets **L2**
- Assess t-Norms Fuzzy Unions **L3**

UNIT – III: Fuzzy Arithmetic & Fuzzy Relations:

Fuzzy Arithmetic :

Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals, Arithmetic Operations on Fuzzy Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Fuzzy Relations:

Crisp versus Fuzzy Relations, Projections and Cylindric Extensions, Binary Fuzzy Relations, Binary Relations on a Single Set, Fuzzy Equivalence Relations, Fuzzy Compatibility Relations, Fuzzy Ordering Relations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Perform arithmetic operations on Fuzzy numbers and equations. **L2**
- Analyze Fuzzy Relations, Projections and Cylindric Extensions etc. **L3**

UNIT – IV: Fuzzy Relation Equations & Possibility Theory

Fuzzy Relation Equations:

General Discussion ,Problem Partitioning , Solution Method , Fuzzy Relation Equations Based on Sup-i Compositions , Fuzzy Relation Equations Based on Inf- ω_i Compositions

Possibility Theory:

Fuzzy Measures, Evidence Theory, Possibility Theory, Fuzzy Sets and Possibility Theory, Possibility Theory versus Probability Theory.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve Fuzzy relation equations. **L3**
- Analyze Possibility Theory **L4**

UNIT – V: Fuzzy logic

Classical Logic: An Overview, Multivalued Logics, Fuzzy Propositions, Fuzzy Quantifiers, Linguistic Hedges, Inference from Conditional Fuzzy Propositions, Inference from Conditional and Qualified Propositions, Inference from Quantified Propositions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Fuzzy logic. **L1**
- Analyze the Inferences from Conditional, Qualified, and Quantified Propositions. **L4**

Text Books:

2. Fuzzy Sets and Fuzzy Logic, Geoge J. Klir and Bo Yuan

Reference Books:

2. Fuzzy Mathematical Models in Engineering and Management Science, A. Kaufmann and M.M. Gupta
3. Fuzzy Logic, Timothy J. Ross
4. Fuzzy Set Theory, H.J. Zimmermann
5. Introduction to Fuzzy Logic and Fuzzy Sets, J.J. Buckley and E. Eslami

Course Outcomes:

At the end of this Course the student will be able to

- Understand the basic concepts of Fuzzy sets and logic. **L1**
- Do some operations of Fuzzy sets. **L2**
- Solve Fuzzy relation equations. **L3**
- Analyze the Inferences from Conditional, Qualified, and Quantified Propositions. **L4**
- Analyze the real word problem through the technique of Fuzzy set theory and logic to have better insight of the real word problems. **L5**

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B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS22-NUMBER THEORY

(Open Elective -I) (Common To All Branches)

L	T	P	C
3	0	0	3

Course Objectives: This course aims at providing the basic knowledge

- To understand basic concepts of Number theory and
- To analyze the applications of Riemann Zeta Function and Dirichlet L Function of Number theory related to real word problems of engineering, biological science etc.

UNIT – 1: Divisibility and Primes & Congruences **9 Hrs**

Divisibility and Primes:

Division algorithm, Euclid's algorithm for the greatest common divisor- Linear Diophantine equations - Prime numbers, fundamental theorem of arithmetic, infinitude of primes- Distribution of primes, twin primes, Goldbach conjecture - Fermat and Mersenne primes - Primality testing and factorization.

Congruences:

Modular arithmetic- Linear congruences- Simultaneous linear congruences, Chinese Remainder Theorem- An extension of Chinese Remainder Theorem (with non-coprime moduli).

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn Division algorithm, Euclid's algorithm etc. **L2**
- Analyze linear congruences- Simultaneous linear congruences, and Chinese Remainder Theorem. **L3**

UNIT – II: Congruences with a Prime-Power Modulus, Euler's Function and RSA Cryptosystem, and Units Modulo an Integer

Congruences with a Prime-Power Modulus:

Arithmetic modulo p, Fermat's little theorem, Wilson's theorem - Pseudo-primes and Carmichael numbers- Solving congruences modulo prime powers.

Euler's Function and RSA Cryptosystem:

Definition of Euler function, examples and properties - Multiplicative property of Euler's function - RSA cryptography.

Units Modulo an Integer:

The group of units modulo an integer, primitive roots- Existence of primitive roots.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the Congruences with a Prime-Power Modulus **L3**
- Analyze the Euler's Function, RSA Cryptosystem and Units Modulo an Integer **L4**

UNIT – III: Quadratic Residues and Quadratic Forms

Quadratic residues, Legendre symbol, Euler's criterion- Gauss lemma, law of quadratic reciprocity- Quadratic residues for prime-power moduli and arbitrary moduli- Binary quadratic forms, equivalent forms- Discriminant, principal forms, positive definite forms, indefinite forms- Representation of a number by a form, examples- Reduction of positive definite forms, reduced forms- Number of proper representations, automorph, class number.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the Quadratic residues **L3**
- Analyze the Quadratic Forms **L4**

UNIT – IV: Sum of Powers, Continued Fractions and Pell's Equation

Sum of Powers:

Sum of two squares, sum of three squares, Waring's problem- Sum of four squares-Fermat's Last Theorem.

Continued Fractions and Pell's Equation:

Finite continued fractions, recurrence relation, Euler's rule- Convergents, infinite continued fractions, representation of irrational numbers- Periodic continued fractions and quadratic irrationals- Solution of Pell's equation by continued fractions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Compute sum of powers and learn Fermat's last theorem. **L3**
- Solve Pell's equation by continued fractions **L4**

UNIT – V: Arithmetic Functions, **The Riemann Zeta Function and Dirichlet L Function**

Arithmetic Functions:

Definition and examples, multiplicative functions and their properties- Perfect numbers, Mobius function and its properties- Mobius inversion formula- Convolution of arithmetic functions.

The Riemann Zeta Function and Dirichlet L Function:

Historical background for the Riemann Zeta function, Euler product formula, convergence. - Applications to prime numbers- Dirichlet L-functions, Products of two Dirichlet L functions, Euler product formula.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the arithmetic functions **L3**
- Analyze the Riemann Zeta function and its Applications to prime numbers **L4**

Text Books:

3. G. A. Jones & J.M. Jones, Elementary Number Theory, Springer UTM, 2007.
4. Niven, H. S. Zuckerman & H.L. Montgomery, Introduction to the Theory of Numbers, Wiley, 2000.
3. D. Burton; Elementary Number Theory, McGraw-Hill, 2005

Reference Books:

6. Tom M. Apostol, Introduction to Analytical Number theory, Narosa Publishing house, 1998.
7. Elementary number theory and its applications, BEL laboratories.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the basic concepts such as Learn Division algorithm, Euclid's algorithm etc. **L1**
- Analyze the Congruences with a Prime-Power Modulus and RSA Cryptosystem. **L2**
- Analyze the Quadratic residues and Quadratic forms. **L3**
- Solve Pell's equation by continued fractions **L4**
- Analyze the real word problem through the technique of Number theory. **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS31-SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS

(Open Elective-I)(Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To provide exposure to various kinds of sensors, actuators and their Engineering applications.
- Capable of understanding the principles and physics of various kinds of sensors from macro to micro/nano level.

UNIT – 1: Introduction to sensors **9 Hrs**

Content of the Unit – I

Sensors, Sensor systems, Nanosensors, -Types of sensors(based on Functions, temperature, pressure, strain, ranging and motion, time- active and passive sensors). Materials used and their fabrication process (Deposition, Pattern and Etching), General characteristics of sensors. Actuators, Functional diagram of actuators, Design of Actuators, Types of actuators (Hydraulic, Pneumatic, Mechanical, Electromagnetic, EAP and EM actuators). Applications of Actuators.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify different types of Sensors, Actuators and their characteristics
- Identifies the applications of Actuators in different fields
- Explain about different fabrication process of Sensors
- Illustrate functional diagram of Actuators

UNIT – II: Mechanical sensors **9 Hrs**

Content of the Unit – II

Principles of mechanical sensors (piezoresistivity, piezoelectricity, capacitive, inductive and resonant techniques), Displacement sensors, velocity sensors, Torque sensors, flow sensors, Micro and nanosensors, Multimodal nanosensors.

Learning Outcomes:

At the end of this unit, the student will be able to

- Summarize various types of Mechanical sensors
- Explain the working principle of different types mechanical sensors
- Identifies the applications of Mechanical sensors in different environmental conditions
- Understand the basic concepts of micro and nano sensors

UNIT – III: Thermal sensors and Magnetic sensors **9 Hrs**

Content of the Unit – III

Introduction – Principles of Thermal sensors, Thermocouples, Types of thermocouples, Bi-metallic thermometer, Resistance Temperature Detectors (RTD), Advantages and Applications of these temperature sensors.

Introduction, Difference between conventional and magnetic sensors, Types of magnetic sensors (Low field, Earth field and BIAS magnetic field sensors), Working of variable reluctance sensors, Inductive sensors (LVDT), Eddy current sensors, Hall effect sensors, Applications of magnetic sensors.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyse the difference between conventional sensors and magnetic sensors
- Explain the working principle of different magnetic sensors
- Identifies the applications of Thermal and Magnetic sensors

- Summarize various types of thermal and magnetic sensors

UNIT – IV: Electronic and Optical Sensors-I **9 Hrs**

Content of the Unit – IV

Introduction, Block diagram of electronic sensor system, Microelectronic sensors, semiconductor strain gauge, Gas sensors – Basic principle and working, Applications of electronic sensors – Electronic nose. Optical system components, Solid state optical systems, Optical radiation sources.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the working and principle of various electronic and optical sensors
- Explain the block diagram of electronic sensor system
- Identifies the applications Electronic sensors in various fields
- Identify the various optical, solid state system components

UNIT – V: Electronic and Optical Sensors –II **9 Hrs**

Content of the Unit – V

Optical system components, Solid state optical systems, Optical transmitter and filters type (Geometrical optics, Fiber optics, optical Filters), Solid state photoelectric sensors, Photoconductive cells, Photo junction sensors, photon couplers, Example: MEMS transducers, Sensors calibration and compensation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the optical system components and solid state optical systems
- Classify different types of Optical filters
- Explain the solid state photoelectric sensors, photo junction sensors and photoconductive cells
- Understand basics of MEMS transducers, sensors calibration and compensation

Text Books:

1. Sensors and Signal Conditioning Wiley-Blackwell, 2008 Jacob Fraden,
2. Piezoelectric Sensors and Actuators: Fundamentals and Applications, Springer,2018Senturia S. D.

Reference Books:

1. Doebelin, “Measurement Systems: Application and Design”, McGraw Hill Kogakusha Ltd.
2. Julian W. Gardner, Vijay K. Varadan, Osama O. Awadelkarim “Microsensors, MEMS and Smart Devices”, New York: Wiley, 2001.
3. Henry Bolte, “Sensors – A Comprehensive Sensors”, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.
5. Microsystem Design, Kluwer Academic Publisher, 2001 J.D. Plummer, M.D. Deal, P.G. Griffin

Course Outcomes:

At the end of this Course the student will be able to

- Recognize the need of sensors
- Types of sensors which they will able to utilize for the concerned engineering application

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS32-PHYSICS OF ELECTRONIC MATERIALS

(Open Elective-I)(Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- Be able to explain the fundamentals of materials.
- Be able to explain the kinds of semiconductor materials, their physical properties, and their applications.
- Be able to explain the kinds of magnetic materials, their physical properties, advances and their applications.
- Be able to explain the kinds of dielectric materials, their physical properties, advances and their applications.

UNIT – 1: Fundamentals of Materials **9 Hrs**

Content of the Unit – I

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. Elementary idea of point, line and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RT and glow discharge).

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic concepts of Phase and Phase diagram
- Understand the straight forward information of Nucleation and Growth
- Explain the preparation and deposition of Thin film using various methods
- Illustrate the methods of Crystal growth
- Summarize the different defects in crystal growth

UNIT – II: Semiconductors **9 Hrs**

Content of the Unit – II

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, diffusion length, diffusion and recombination. The Fermi level & Fermi dirac distribution, Temperature dependence of carrier concentration, Invariance of the Fermi level at equilibrium. Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Transistors, MOSFETs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basics concepts regarding drift, diffusion, diffusion length and recombination.
- Classifies the energy bands of a Semiconductors
- Analyse how the position of the fermi level changes with carrier concentration and temperature.
- Explain the concepts regarding PN junctions, Transistors and MOSFETs.

UNIT – III: Optoelectronics **9 Hrs**

Content of the Unit – III

Introduction, Optoelectronic concepts, Hetrostructure p-n junction, Schottky junction and Ohmic contacts, Light emission and absorption, amplification and modulation in semiconductors, Semiconductor Light sources [Light emitting diodes (LEDs) , LASER, vertical cavity surface emitting laser (VCSEL), Quantum well laser {device structure – characteristics – Materials and applications}] and semiconductor Photo detectors [General Characteristics, Responsivity and Impulse response, photoconductors, semiconductor photodiodes].

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic concepts of PN junction and Schottky junction
- Explain about absorption, emission, amplification and modulation
- Illustrate various semiconductor light sources and their structure
- Identifies the characteristics and applications of optoelectronic devices
- Elucidate semiconductor photodetectors

UNIT – IV: Dielectric Materials and their applications **9 Hrs**

Content of the Unit – IV

Introduction, Dielectric properties, Electronic polarisability and susceptibility, dielectric constant and frequency dependence of polarization, Dielectric strength and dielectric loss, Piezoelectric properties.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of dielectric constant, polarisability, susceptibility
- Describe how the polarisation of the dielectric constant depends on the frequecy
- Explain about dielectric strength and dielectric loss
- Comprehend dielectric and piezoelectric properties

UNIT – V: Magnetic Materials and their applications **9 Hrs**

Content of the Unit – V

Introduction, Magnetism & various contributions to para and dia magnetism, Fero and Ferri magnetism and ferrites, concepts of Spin waves and Magnons, antiferromagnetism, domains and domain walls, coercive force, hysteresis, Nanomagnetism, Superparamagnetism – Properties and applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Differentiate different types of magnetic materials depending upon their properties
- Understand the concepts of Spin waves and Magnons
- Interpret the concepts of domains and domain walls
- Explain about the properties of Nanomagnetism, Super paramagnetism
- Identify the applications of magnetic materials

Text Books:

1. S.O. Kasap Principles of Electronic Materials and Devices, 3rd edition, McGraw-Hill Education (India) Pvt. Ltd., 2007.
2. Electrical Engineering Materials",by A.J. Dekker, PHI Pub.
3. "Electronic Components and Materials" Grover and Jamwal, DhanpatRai and Co.

Reference Books:

1. B.G. Streetman and S. Banerjee, Solid State Electronic Devices, 6th edition, PHI Learning,
2. Eugene A. Irene, Electronic Materials Science, Wiley, 2005
3. Wei Gao, Zhengwei Li, Nigel Sammes, An Introduction to Electronic Materials for Engineers, 2nd Edition, World Scientific Publishing Co. Pvt. Ltd., 2011
4. W D Callister, Materials Science and Engineering – An Introduction, Jr., John Willey and Sons, Inc, New York, 7th edition, 2007.
5. "A First Course In Material Science" by Raghvan, McGraw Hill Pub.
6. "Solid State Physics" by S.O.Pillai,New Age Publication.
7. 'The Science and Engineering of materials' by Donald R.Askeland,Chapman& Hall Pub.

Course Outcomes:

At the end of this Course the student will be able to

- Recognize the need of semiconductors
- Dielectric and magnetic materials which they will able to utilize for the concerned engineering application

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS41-Chemistry of Energy Materials

(Open Elective-I) (Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To make the student understand basic electrochemical principles such as standard electrode potentials, EMF and applications of electrochemical principles in the design of batteries.
- To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
- To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquefaction method
- Necessasity of harnessing alternate energy resources such as solar energy and its basic concepts.
- To understand and apply the basics of calculations related to material and energy flow in the processes.

UNIT – 1: Electrochemical Systems **9 Hrs**

Galvanic cell, standard electrode potential, application of EMF, Electrode mechanism, polarization, Batteries-Lead-acid and Lithium ion batteries.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve the problems based on electrode potential **L3**
- Describe the Galvanic Cell **L2**
- Differentiate between Lead acid and Lithium ion batteries **L2**
- Illustrate the electrical double layer **L2**

UNIT – II: : Fuel Cells

Basic design of fuel cell, Fuel cell working principle, Fuel cell efficiency Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), and their applications

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe the working Principle of Fuel cell **L2**
- Explain the efficiency of the fuel cell **L2**
- Discuss about the Basic design of fuel cells **L3**
- Classify the fuel cell **L2**

UNIT – III: Hydrogen Storage

Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF), Carbon structures (Carbon nano tubes, fullerenes), metal oxide porous structures, hydrogen storage by high pressure methods. Liquefaction method

Learning Outcomes:

At the end of this unit, the student will be able to

- Differentiate Chemical and Physical methods of hydrogen storage **L2**
- Discuss the metal organic frame work **L3**
- Illustrate the carbon and metal oxide porous structures **L2**
- Describe the liquification methods L2

UNIT – IV: Solar Energy

Solar energy introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar Fuels – Hydrogen: Ammonia& Hydrazine, Solar cells (Si-Te& Cd-Te), advantages and disadvantages.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply the photo voltaic technology **L3**
- Demonstrate about solar energy and prospects **L2**
- Illustrate the Solar cells **L2**
- Discuss about concentrated solar power **L3**

UNIT – V: Photo and Photoelectrochemical Conversions

Photochemical cells and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Differentiate between Photo and Photo electrochemical Conversions **L2**
- Illustrate the photochemical cells **L2**
- Identify the applications of photochemical reactions **L3**
- Interpret advantages of photoelectron catalytic conversion **L2**

Text Books:

5. Bahl and Bahl and Tuli, Essentials of Physical Chemistry, S. Chand Publications, New Delhi, 28th Edition, 2020.
6. US Department of Energy (EG&G technical services and corporation), Fuel Cell Hand Book 7th Edition, 2004.

Reference Books:

1. Ira N. Levine, Physical chemistry 6th Edition, McGraw Hills Education, New Delhi, 2009.
2. Silver and Atkins, Inorganic Chemistry, , 7th Edition, Oxford University Press, 2018.
3. Michael Hirscher, Hand book of Hydrogen Storage: New materials for future energy, storage, Wiley-VCH Verlag GmbH & Co. KGaA, 2010
4. Klaus Jagar et.al., Solar energy fundamental, technology and systems, UIT-Cambridge publishers, 2016

Course Outcomes:

At the end of this Course the student will be able to

- Understand to perform simultaneous material and energy balances **L1**
- Lists about various electrochemical and energy systems **L1**
- Classify solid, liquid and gaseous fuels **L3**
- Analyze the energy demand of world, nation and available resources to fulfill the demand **L3**
- Evaluate the conventional energy resources and their effective utilization **L3**
- To be able to understand and perform the various characterization techniques of fuels **L1**
- Explain knowledge of modern energy conversion technologies **L2**
- To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively **L1**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS42-Advanced Polymers and their applications

(Open Elective-I) (Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To understand the basic principles of polymers
- To synthesize the different polymeric materials and their characterization by various instrumental methods.
- To impart knowledge to the students about fundamental concepts of Hydro gels of polymer networks, surface phenomenon by micelles
- To enumerate the applications of polymers in engineering

UNIT – 1: Polymers-Basics and Characterization **9 Hrs**

Basic concepts: monomers, repeat units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization mechanisms: condensation, addition, radical chain, ionic and coordination copolymerization, Zeigler-Natta and Ring opening metathesis polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: end group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers, Characterization of polymers by XRD, DSC.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify the polymers **L3**
- Explain polymerization mechanism **L2**
- Differentiate addition, condensation polymerizations **L2**
- Describe measurement of molecular weight of polymer **L2**

UNIT – II: : Synthetic Polymers

Polymerization processes – Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties, Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications.

Preparation of Polymers based on different types of monomers, Olefin polymers, Diene polymers, nylons, Urea - formaldehyde, phenol - formaldehyde and melamine Epoxy and Ion exchange resins

Learning Outcomes:

At the end of this unit, the student will be able to

- Differentiate Bulk, solution, Suspension and emulsion polymerization **L2**
- Describe fibers and elastomers **L2**
- Identify the thermosetting and thermo polymers **L3**

UNIT – III: Natural Polymers & Modified cellulosics

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins. Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe the properties and applications of polymers **L2**
- Interpret the properties of cellulose, lignin, starch, rosin, latex etc., **L2**

- Discuss the special plastics of PES, PAES, PEEK etc., **L3**
- Explain modified cellulosics **L2**

UNIT – IV: Hydrogels of Polymer networks and Drug delivery

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels**, Applications** of hydrogels in drug delivery. Introduction to drug systems including, drug development, regulation, absorption and disposition, routes of administration and dosage forms. Advanced drug delivery systems and controlled release.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify types of polymer networks **L3**
- Describe methods involve in hydrogel preparation **L2**
- Explain applications of hydrogels in drug delivery **L2**
- Demonstrate the advanced drug delivery systems and controlled release **L2**

UNIT – V: Surface phenomena

Surface tension, adsorption on solids, electrical phenomena at interfaces including electro-kinetics, micelles, reverse micelles, solubilization. XPS principle-application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces.

Learning Outcomes:

At the end of this unit, the student will be able to

- Demonstrate electrical phenomena at interfaces including electrokinetics, miselles, reverse micelles etc., **L3**
- Explain photoelectron spectroscopy **L2**
- Discuss ESCA and Auger spectroscopy to the study of surfaces **L3**
- Differentiate micelles and reverse micelles **L2**

Text Books:

1. Fred W.Billmayer, A Text book of Polymer science, 3rd Edition, Wiley India, 2007.
2. K.J.Saunders, Organic polymer Chemistry, Chapman and Hall, 1973.

Reference Books:

1. B.Miller, Advanced Organic Chemistry, Prentice Hall, 2nd Edn, 2003.
2. Ambikanandan Misra, Aliasgar Shahiwala, Applications of polymers in Drug delivery system, Elsevier Pub., 2020.
3. Gowarikar, Polymer Chemistry –New Age International Publications, 2019.
4. Physical Chemistry , Samel Galsstone, Lan Caster Press, 1970.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the state of art synthesis of Polymeric materials **L1**
- Understand the hydro gels preparation, properties and applications in drug delivery system. **L2**
- Characterize polymers materials using XPS. **L2**
- Analyze surface phenomenon of micelles and characterize using photoelectron spectroscopy, ESCA and Auger spectroscopy. **L3**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS43-Marine Chemistry

(Open Elective-I) (Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To classify the different dissolved gases in sea water.
- To predict the role of biological processes in affecting oceanic carbonate system.
- To describe chemical and pharmacological properties of bioactive substances in marine organisms.
- To determine micro-nutrient elements (N, P, Si) in seawater.
- To identify dissolved elements in the estuary.

UNIT – 1: Dissolved gases in seawater **9 Hrs**

Dissolution of gases in seawater and their solubility; classification of dissolved gases and factors affecting their concentration in seawater; distribution of dissolved oxygen in seawater and affecting factors, Apparent Oxygen Utilization (AOU) and oxygen minimum zone formation in the ocean, origin and consequences of ocean hypoxia, Methane hydrate, clathrates

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the factors affecting on the dissolution of gases **L1**
- Understand apparent oxygen utilization and ozygen minimum zone formation in ocean. **L1**
- Compare the distribution of dissolved gaseous in sea water **L4**
- Analyze origin and consequences of ocean hypoxia, methane hydrate and clathrates **L3**

UNIT – II: : Carbonate systems in the ocean

Acid base equilibria in seawater, carbon dioxide system – absorption of carbon dioxide, carbon cycle; parameters of carbonate systems and their distribution in the ocean; role of biological processes in affecting oceanic carbonate system; precipitation and dissolution of calcium carbonate in seawater, lysocline and carbonate compensation depth; Ocean acidification

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic principle of acid-base equibria in sea water **L1**
- Explain the concept of carbon cycle **L1**
- Lists the various biological process in affecting oceanic carbonate, pptn and dissolution **L1**
- Analyze the parameters of carbonate system in oceanic water **L3**

UNIT – III: Chemistry of marine natural products

Biomedical aspects; chemical and pharmacological properties of bioactive substances in marine organisms, carbohydrates and their derivatives in red and brown algae, aliphatic acids and their derivatives in marine organisms, steroids and their use as biomarkers, nitrogenous compounds in invertebrates, nucleosides from sponges, biopolymer

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the chemical and pharmacological properties of bioactive substances in marine organism **L1**
- Explain the steroids and their use as biomarkers **L2**
- List the chemical properties in nitrogenous compounds in invertebrates **L1**

UNIT – IV: Micronutrients in seawater

Micro-nutrient elements (N, P, Si) in seawater, their forms, distribution and seasonal variation in the ocean. Stoichiometry of uptake and regeneration of nutrients elements and Apparent Oxygen Utilization (AOU)

Learning Outcomes:

At the end of this unit, the student will be able to

- List the micro-nutrients in sea water **L1**
- Understand the stoichiometry of uptake and regeneration of nutrients **L1**
- Differentiate the distribution of micronutrients with seasonal variation in the ocean **L2**

UNIT – V: Estuarine chemistry

Behavior of dissolved and particulate material during estuarine mixing, interaction among them and speciation of dissolved elements in the estuary; physico-chemical characteristics of estuarine sediment, anoxic sediments and pore water; heavy metals in estuaries and the processes affecting their distribution

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the behavior of dissolved and particulate matter in estuarine system **L1**
- Analyze the physicochemical characteristics of estuarine system **L3**
- Differentiate the effect of heavy metals in estuaries and affecting in distribution **L2**

Text Books:

1. Riley, J.P. and Chester, R., Introduction to Marine Chemistry, Academic Press, 1971.
2. Chester, R., Marine Geochemistry, Blackwell Science, 1990, 2000

Reference Books:

1. Riley, J.P., Skirrow, G, Chemical Oceanography (Vol.1,2, 3), Academic Press, 1975.
2. Horne, R.A, Marine Chemistry - The Structure of Water and the Chemistry of the Hydrosphere, 1969 Wiley- Interscience.
3. Seawater: Its composition, properties & behaviour, 2nd Edn, The Open University Team, 1989
4. Martin, D.F., Marcel Dekker, Marine Chemistry (Vol.2), 2nd Edition, Academic Press, NY, 1970.
5. Broecker and Peng, Tracers in the Sea, Lamont-Doherty Geological Observatory, 1982, NY.
6. Chemical Oceanography, 1992 – Millero, F. J. and Sohn, M.L., CRC Press
7. Burton et al., Dynamic processes in the chemistry of the upper ocean, Plenum Press, 1986.
8. Heinrich D Holland, The Chemistry of the Atmosphere and Oceans, John Wiley & sons Inc, 1978.

Course Outcomes:

At the end of this Course the student will be able to

- List the various dissolved gases in sea water and factors affecting their. **L1**
- Demonstrate knowledge of concepts and principles of ocean acidification. Analyse and evaluate biomedical aspects of marine natural products. **L2**
- Integrate and apply the knowledge of stoichiometry of uptake and regeneration of nutrients elements. **L3**
- Reflect on the influence heavy metals in estuaries. **L4**
- Evaluate total findings in marine chemistry to solve engineering problems **L3**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE55a- BASICS OF NON-CONVENTIONAL ENERGY SOURCES

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Identify various sources of Energy and the need of Renewable Energy Systems
- Understand the concepts of Solar Radiation, Wind energy and its applications
- Distinguish between solar thermal and solar PV systems
- Interpret the concept of geo thermal energy and its applications
- Understand the use of biomass energy and the concept of Ocean energy and fuel cells.

UNIT – I: Solar Energy **10 Hrs**

Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy thermal storage.

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand about solar thermal parameters
- To distinguish between flat plate and concentrated solar collectors
- To know about thermal storage requirements
- To know about measurement of solar radiation

UNIT – II: PV Energy Systems **10 Hrs**

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Electrical characteristics of silicon PV cells and modules, PV systems for remote power, Grid connected PV systems..

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of PV effect in crystalline silicon and their characteristics
- Understand other PV technologies
- To know about electrical characteristics of PV cells & modules
- To know about grid connected PV systems

UNIT – III: Wind Energy **10 Hrs**

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand basics of wind energy conversion and system
- To distinguish between VAWT and HAWT systems
- To understand about design considerations
- To know about site selection considerations of WECS

UNIT – IV: Geothermal Energy **10 Hrs**

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India..

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Geothermal energy and its mechanism of production and its Applications
- Analyze the concept of producing Geothermal energies
- To learn about disadvantages and advantages of Geo Thermal Energy Systems
- To know about various applications of GTES

UNIT – V: Miscellaneous Energy Technologies **10 Hrs**

Ocean Energy: Tidal Energy-Principle of working, performance and limitations. Wave Energy-Principle of working, performance and limitations.

Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration

Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the operation of tidal energy
- Analyze the operation of wave energy
- Analyze the operation of bio mass energy
- Understand the principle, working and performance of fuel cell technology
- Apply these technologies to generate power for usage at remote centres

Text Books:

1. Stephen Peake, "Renewable Energy Power for a Sustainable Future", Oxford International Edition, 2018.
2. G. D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers, 2000.

Reference Books:

1. S. P. Sukhatme, "Solar Energy",3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd,2008.
2. B H Khan , " Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
3. S. Hasan Saeed and D.K.Sharma,"Non-Conventional Energy Resources",3rd Edition, S.K.Kataria& Sons, 2012.
4. G. N. Tiwari and M.K.Ghosal, "Renewable Energy Resource: Basic Principles and Applications", Narosa Publishing House, 2004.

Course Outcomes:

At the end of this Course the student will be able to

- To distinguish between various alternate sources of energy for different suitable application requirements
- To differentiate between solar thermal and PV system energy generation strategies
- To understand about wind energy system
- To get exposed to the basics of Geo Thermal Energy Systems
- To know about various diversified energy scenarios of ocean, biomass and fuel cells

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE55b- ELECTRICAL MEASUREMENTS & SENSORS

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- The basic principles of different types of electrical instruments for the measurement of voltage, current, power factor, power and energy.
- The measurements of RLC parameters using bridge principles.
- The principles of magnetic measurements.
- The principle of working of CRO and its applications.
- Extending the range of an Instrument.

UNIT – I: Measuring Instruments **10 Hrs**

Classification – Ammeters and Voltmeters – PMMC, Dynamometer, Moving Iron Types – Expression for the Deflecting Torque and Control Torque – Errors and their Compensation, Extension of range–Numerical examples

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the operation of different in struments.
- Know the different types of errors and their compensation

UNIT – II: Measurement of Power, Power Factor and Energy **10 Hrs**

Single Phase Dynamometer Wattmeter, LPF and UPF, Double Element and Three Elements, Expression for Deflecting and Control Torques; P.F. Meters: Dynamometer and Moving Iron Type– 1-phand3-ph Power factor Meters. Single Phase Induction Type Energy Meter-Driving and Braking Torques–Errors and their Compensation, Three Phase Energy Meter-Numerical examples

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the working principles and construction of different types of Energy meters
- Distinguish between low and high power factor ranges in wattmeters

UNIT – III: Instrument transformers, Potentiometers, and magnetic measurements **10 Hrs**

Current Transformers and Potential Transformers – Ratio and Phase Angle Errors – MethodsforReductionofErrors-DesignConsiderations.DCPotentiometers: Principle and Operation of D.C. Crompton's Potentiometer –Standardization – Measurement of unknown Resistance, Currents and Voltages. A.C. Potentiometers: Polar and Coordinate types-Standardization – Applications. Determination of B-H Loop Methods of Reversals – Six Point magnetic measurement Method– A.C.Testing–Iron Loss of Bar Samples –Numerical Examples

Learning Outcomes:

At the end of this unit, the student will be able to

- Distinguish between CTs and PTs
- Understand the principles and working of various measuring instruments used to detect electrical circuit parameters R,L,C

UNIT – IV: D.C & A.C Bridges **10 Hrs**

Method of Measuring Low, Medium and High Resistances – Sensitivity of Wheat stone's Bridge – Kelvin's Double Bridge for Measuring Low Resistance, Measurement of High Resistance –Loss of Charge Method. Measurement of Inductance-Maxwell's Bridge, Anderson's Bridge. Measurement of Capacitance and Loss Angle – DeSauty Bridge. Wien's Bridge –Schering Bridge– Numerical Examples

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the bridge configurations and their applications for various ranges of resistance measurement
- Compute the unknown parameters of Inductance and Capacitance using the bridges

UNIT – V: CRO and Digital Meters **10 Hrs**

Cathode Ray Oscilloscope-Cathode Ray Tube-Time Base Generator-Horizontal and Vertical Amplifiers–Applications of CRO–Measurement of Phase, Frequency, Current and Voltage-Lissajous Patterns. Digital Voltmeters – Successive Approximation, Ramp, and Integrating Type-Digital Frequency Meter-Digital Multimeter- Digital Tachometer.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the operation of CRO and its parts
- Know about Digital voltmeters and Distinguish between an along and digital meters

Text Books:

3. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications, 2007.
4. Electrical Measurements and measuring Instruments–by E.W.Golding and F.C.Widdis, 5th Edition, Reem Publications,2011.

Reference Books:

5. Electronic Instrumentation by H.S. Kalsi, Tata McGraw-Hill, 3rd Edition, 2011.
6. Electrical Measurements: Fundamentals, Concepts, Applications –by Reissland, M.U, New Age International (P) Limited,2010.
7. Electrical & Electronic Measurement & Instrumentation by R.K.Rajput,2nd Edition, S.Chand & Co., 2nd Edition,2013.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the working of various instruments and equipments used for the measurement of various electrical engineering parameters like voltage, current, power, phase etc in industry as well as in power generation, transmission and distribution sectors **L1**
- Analyze and solve the varieties of problems and issues coming up in the vast field of electrical measurements. **L2**
- Analyze the different operation of extension range ammeters and voltmeters, **L3**
- Design and development of various voltage and current measuring meters. **L4**
- Analyze DC and AC bridges for measurement of parameters and different characteristics of periodic and a periodic signals using CRO. **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE55c- ELECTRIC VEHICLE ENGINEERING

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To get exposed to new technologies of battery electric vehicles, fuel cell electric vehicles
- To get exposed to EV system configuration and parameters
- To know about electro mobility and environmental issues of EVs
- To understand about basic EV propulsion and dynamics
- To understand about fuel cell technologies for EV and HVEs
- To know about basic battery charging and control strategies used in electric vehicles

UNIT – I: Introduction to EV Systems and Parameters **10 Hrs**

Past, Present and Future EV, EV Concept, EV Technology, State-of-the Art EVs, EV configuration, EV system, Fixed and Variable gearing, single and multiple motor drive, in-wheel drives, EV parameters: Weight, size, force and energy, performance parameters.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about past, present and latest technologies of EV **L1**
- To understand about configurations of EV systems **L1**
- To distinguish between EV parameters and performance parameters of EV systems **L2**
- To distinguish between single and multiple motor drive EVs **L4**
- To understand about in-wheel EV **L5**

UNIT – II: EV and Energy Sources **10 Hrs**

Electro mobility and the environment, history of Electric power trains, carbon emissions from fuels, green houses and pollutants, comparison of conventional, battery, hybrid and fuel cell electric systems

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about various types of EV sources **L1**
- To understand about e-mobility **L2**
- To know about environmental aspects of EV **L3**
- To distinguish between conventional and recent technology developments in EV systems **L4**

UNIT – III: EV Propulsion and Dynamics **10 Hrs**

Choice of electric propulsion system, block diagram, concept of EV Motors, single and multi motor configurations, fixed and variable geared transmission, In-wheel motor configuration, classification, Electric motors used in current vehicle applications, Recent EV Motors, Vehicle load factors, vehicle acceleration.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about what is meant by propulsion system **L1**
- To understand about single and multi motor EV configurations **L2**
- To get exposed to current and recent applications of EV **L3**
- To understand about load factors in vehicle dynamics **L4**
- To know what is meant acceleration in EV **L5**

UNIT – IV: Fuel Cells **10 Hrs**

Introduction of fuel cells, basic operation, model, voltage, power and efficiency, power plant system – characteristics, sizing, Example of fuel cell electric vehicle. Introduction to HEV, brake specific fuel consumption, comparison of series, series parallel hybrid systems, examples

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about fuel cell technology of EV **L1**
- To know about basic operation of FCEV **L2**
- To know about characteristics and sizing of EV with suitable example **L3**
- To get exposed to concept of Hybrid Electric Vehicle using fuel cells **L4**
- To know about the comparison of various hybrid EV systems **L5**

UNIT – V: Battery Charging and Control **10 Hrs**

Battery charging: Basic requirements, charger architecture, charger functions, wireless charging, power factor correction. Control: Introduction, modeling of electro mechanical system, feedback controller design approach, PI controllers designing, torque-loop, speed control loop compensation, acceleration of battery electric vehicle

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand about basic requirements of battery charging and its architecture **L1**
- To know about charger functions **L2**
- To get exposed to wireless charging principle **L3**
- To understand about block diagram, modeling of electro mechanical systems of EV **L4**
- To be able to design various compensation requirements **L5**

Text Books:

5. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University PressInc., New York 2001.

6. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

Reference Books:

8. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2005.

9. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2015.

Course Outcomes:

At the end of this Course the student will be able to

- To understand and differentiate between conventional and latest trends in Electric Vehicles **L1**
- To know about various configurations in parameters of EV system **L2**
- To know about propulsion and dynamic aspects of EV **L3**
- To understand about fuel cell technologies in EV and HEV systems **L4**
- To understand about battery charging and controls required of EVs **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55a – INTRODUCTION TO HYBRID AND ELECTRICAL VEHICLES

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Provide good foundation on hybrid and electrical vehicles.
- To address the underlying concepts and methods behind power transmission in hybrid and electrical vehicles.
- Familiarize energy storage systems for electrical and hybrid transportation.
- To design and develop basic schemes of electric vehicles and hybrid electric vehicles.

UNIT I: Electric Vehicle Propulsion And Energy Sources **12 hours**

Introduction to electric vehicles, vehicle mechanics - kinetics and dynamics, roadway fundamentals propulsion system design - force velocity characteristics, calculation of tractive power and energy required, electric vehicle power source - battery capacity, state of charge and discharge, specific energy, specific power, Ragone plot. Battery modeling - run time battery model, first principle model, battery management system- soc measurement, battery cell balancing. Traction batteries - nickel metal hydride battery, Li-Ion, Lipolymer battery.

Learning Outcomes:

At the end of this unit, the student will be able to

- Summaries the concepts of electrical vehicle propulsion and energy sources. **L2**
- Identify the types of power sources for electrical vehicles **L3**
- Demonstrate the design considerations for propulsion system. **L2**
- Solve the problems on tractive power and energy required. **L3**

UNIT II: Electric Vehicle Power Plant And Drives **10 hours**

Introduction electric vehicle power plants. Induction machines, permanent magnet machines, switch reluctance machines. Power electronic converters-DC/DC converters - buck boost converter, isolated DC/DC converter. Two quadrant chopper and switching modes. AC drives- PWM, current control method. Switch reluctance machine drives - voltage control, current control.

Learning Outcomes:

At the end of this unit, the student will be able to

- Choose a suitable drive scheme for developing electric vehicles depending on resources. **L1**
- List the various power electronic converters. **L1**
- Describe the working principle DC/DC converters and buck boost convertor. **L2**
- Explain about AC Drives. **L2**

UNIT III: Hybrid And Electric Drive Trains **10 hours**

Introduction hybrid electric vehicles, history and social importance, impact of modern drive trains in energy supplies. Hybrid traction and electric traction. Hybrid and electric drive train topologies. Power flow control and energy efficiency analysis, configuration and control of DC motor drives and induction motor drives, permanent magnet motor drives, switch reluctance motor drives, drive system efficiency.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the social importance of hybrid vehicles. **L3**
- Discus impact of modern drive trains in energy supplies. **L6**
- Compare hybrid and electric drive trains. **L2**
- Analyze the power flow control and energy efficiency. **L6**

UNIT IV: Electric And Hybrid Vehicles - Case Studies **8 hours**

Parallel hybrid, series hybrid -charge sustaining, charge depleting. Hybrid vehicle case study –Toyota Prius, Honda Insight, Chevrolet Volt. 42 V system for traction applications. Lightly hybridized vehicles and low voltage systems. Electric vehicle case study - GM EV1, Nissan Leaf, Mitsubishi Miev. Hybrid electric heavy duty vehicles, fuel cell heavy duty vehicles

Learning Outcomes:

At the end of this unit, the student will be able to

- List the various electric and hybrid vehicles in the present market. **L1**
- Discuss lightly hybridized vehicle and low voltage systems. **L6**
- Explain about hybrid electric heavy duty vehicles and fuel cell heavy duty vehicles. **L2**

UNIT V: Electric And Hybrid Vehicle Design **8 hours**

Introduction to hybrid vehicle design. Matching the electric machine and the internal combustion engine. Sizing of propulsion motor, power electronics, drive system. Selection of energy storage technology, communications, supporting subsystem. Energy management strategies in hybrid and electric vehicles - energy management strategies- classification, comparison, implementation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Illustrate matching the electric machine and the internal combustion engine. **L2**
- Select the energy storage technology. **L3**
- Select the size of propulsion motor. **L3**
- Design and develop basic schemes of electric and hybrid electric vehicles. **L3**

Text Books:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, 2/e, CRC Press, 2003.
2. Amir Khajepour, M. Saber Fallah, Avesta Goodarzi, Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach, illustrated edition, John Wiley & Sons, 2014
3. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

Reference Books:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2. John G. Hayes, G.Abas Goodarzi, Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles, 1/e, Wiley-Blackwell, 2018.

Course Outcomes:

At the end of this Course the student will be able to

- Explain the working of hybrid and electric vehicles. **L2**
- Choose a suitable drive scheme for developing hybrid and electric vehicles depending on resources. **L3**
- Develop the electric propulsion unit and its control for application of electric vehicles. **L3**
- Choose proper energy storage systems for vehicle applications. **L3**
- Design and develop basic schemes of electric vehicles and hybrid electric vehicles. **L3**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55b – RAPID PROTOTYPING

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize techniques for processing of CAD models for rapid prototyping.
- Explain fundamentals of rapid prototyping techniques.
- Demonstrate appropriate tooling for rapid prototyping process.
- Focus Rapid prototyping techniques for reverse engineering.
- Train Various Pre – Processing, Processing and Post Processing errors in RP Processes

UNIT I **12 Hours**

Introduction: Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

RP Software: Need for RP software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, SolidView, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain prototyping process. **L2**
- Classify different Rapid Prototyping Processes. **L2**
- Summarize RP software's and Represent a 3D model in STL format, other RP data formats. **L2**

UNIT II **10 Hours**

Solid and Liquid Based RP Systems**:** Stereolithography (SLA): Principle, Process, Materials, Advantages, Limitations and Applications. Solid Ground Curing (SGC): Principle, Process, Materials, Advantages, Limitations, Applications. Fusion Deposition Modeling (FDM): Principle, Process, Materials, Advantages, Limitations, Applications. Laminated Object Manufacturing (LOM): Principle, Process, Materials, Advantages, Limitations, Applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the principles, advantages, limitations and applications of Solid and Liquid based AM systems. **L2**
- Identify the materials for Solid and Liquid based AM systems. **L2**

UNIT III **8 Hours**

Powder Based RP Systems**:** Principle and Process of Selective Laser Sintering (SLS), Advantages, Limitations and Applications of SLS, Principle and Process of Laser Engineered Net Shaping (LENS), Advantages, Limitations and Applications of LENS, Principle and Process of Electron Beam Melting (EBM), Advantages, Limitations and Applications of EBM.

Other RP Systems: Three Dimensional Printing (3DP): Principle, Process, Advantages, Limitations and Applications. Ballastic Particle Manufacturing (BPM): Principle, Process, Advantages, Limitations, Applications. Shape Deposition Manufacturing (SDM): Principle, Process, Advantages, Limitations, Applications.

Learning Outcomes:
At the end of this unit, the student will be able to
- Explain the principles, advantages, limitations and applications of powder based AM systems. **L2**
- Understand the principles, advantages, limitations and applications of other Additive Manufacturing Systems such as 3D Printing, Ballistic Particle Manufacturing and Shape Deposition Modeling. **L2**

UNIT IV **8 hours**

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

Learning Outcomes:
At the end of this unit, the student will be able to
- Classify Rapid Tooling methods. **L2**
- Explain the concepts of reverse engineering and scanning tools. **L2**

UNIT V **8 Hours**

Errors in RP Processes: Pre-processing, processing, post-processing errors, Part building errors in SLA, SLS, etc.

RP Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Learning Outcomes:
At the end of this unit, the student will be able to
- Identify various Pre – Processing, Processing and Post – Processing errors in RP processes. **L2**
- Apply of RP in engineering design analysis and medical applications. **L3**

Text Books:

1. Chua C.K., Leong K.F. and Lim C.S., Rapid Prototyping: Principles and Applications, 2/e Edition, World Scientific Publishers, 2003.
2. Ian Gibson, David W. Rosen, Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 1st Edition, Springer, 2010.
3. Rafiq Noorani, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons, 2006.

Reference Books:

1. Liou W. Liou, Frank W., Liou, Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development, CRC Press, 2007.
2. Pham D.T. and Dimov S.S., Rapid Manufacturing; The Technologies and Application of RPT and Rapid tooling, Springer, London 2001.
3. Gebhardt A., Rapid prototyping, Hanser Gardener Publications, 2003.
4. Hilton P.D. and Jacobs P.F., Rapid Tooling: Technologies and Industrial Applications, CRC Press, 2005.

Course Outcomes:
At the end of this Course the student will be able to
- Use techniques for processing of CAD models for rapid prototyping. **L3**
- Understand and apply fundamentals of rapid prototyping techniques. **L3**
- Use appropriate tooling for rapid prototyping process. **L3**
- Use rapid prototyping techniques for reverse engineering. **L3**
- Identify Various Pre – Processing, Processing and Post Processing errors in RP processes. **L3**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55c – DESIGN FOR MANUFACTURING AND ASSEMBLY

(Open Elective – I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Discuss various factors influencing the manufacturability of components and use of tolerances in manufacturing
- Explain various considerations in casting, welding, forging and machining processes.
- Demonstrate on the design factors dependent on the assembly methods.
- Teach the principles and rules of design for assembly.
-

UNIT I: INTRODUCTION TO DFM **12 Hours**

Significance of design, qualities of a designer and Design factors, Systematic working plan, The engineering problem to be solved, The basic design, Factors influencing choice of materials and the factors influencing manufacturing Process Capability Mean, Median, Variance, Mode, Standard Deviation, Normal Distribution and Process capability metrics, Process Capability, Tolerances-symbols and definition, Tolerances relevant to manufacturing, assembly and material condition, Tolerance stack-effects on assembly with examples, Methods of eliminating tolerance stack with examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the desirable qualities of a designer. **L2**
- List various factors influencing the choice of materials. **L1**
- Recall the concepts of Mean, Median, Variance and Mode. **L1**
- Discuss the methods of eliminating tolerance stack with examples. **L2**

UNIT II: FORM DESIGN-CASTING AND WELDING **10 Hours**

Influence of loading, Materials, Production methods on form design, Casting considerations, Grey iron castings, Steel castings, Aluminum Casting Requirements and rules for casting, Form design of pressure die castings, Welding considerations welding Processes, Requirements and rules for welding, Redesign of components for casting-pattern-mould- Parting Line, Redesign of components for welding, Case studies in form design-simple problems in form design.

Learning Outcomes:

At the end of this unit, the student will be able to

- Recall the function of various components (pattern, mould, parting line, etc) in casting **L1**
- Explain the various production methods on form design. **L2**
- Understand the requirements and rules for casting and welding. **L2**
- Make use of case studies to understand redesign of the components. **L3**

UNIT III: FORM DESIGN-FORGING AND MACHINING **8 Hours**

Forging considerations hammer forging drop forging, Requirements and rules for forging, Choice between casting, forging and welding, Machining considerations Drills, Milling-Keyways, Dwells and Dwelling Procedure Countersunk Head screws Requirements and rules for Machining considerations and Reduction of machined areas Redesign of components for Forging, Redesign of components for Machining, Simplification by separation and Simplification by amalgamation, Case studies.

Learning Outcomes:

At the end of this unit, the student will be able to

- Choose the manufacturing process depending upon the shape and size of the product. **L3**
- Classify various machining processes **L2**
- Discuss the rules and design considerations of forging **L2**

- Recall the redesign concepts of forging and machining. **L1**

UNIT IV: INTRODUCTION TO DFA **8 hours**

DFA, Introduction, Distinction between assembly methods and processes, Factors Determining assembly methods and processes, Success and failure-Causes of failure, Product Design factors independent of methods and processes , Introduction-Number of operations in the product, Assembly Precedence, Standardization, Design factors dependent on Assembly methods , Introduction-Single Station Assembly Line Assembly, Hybrid Systems, Manual Assembly lines, Flexible Assembly lines, Design factors dependent on Assembly processes, Factors Influencing Production rate to Facility Ratio- Parts Presentation, Manual Assembly, Dedicated Assembly, Transportation, Separation and Orientation-Flexible Assembly, Gripping, Transferring, Part Insertion, Failures and Error Recovery

Learning Outcomes:

At the end of this unit, the student will be able to

- Illustrate manual assembly lines and flexible assembly lines. **L2**
- Explain the product design factors independent of methods and processes **L2**
- Discuss the importance of standardization in design for assembly. **L2**
- List the design factors that are dependent and independent on the Assembly processes. **L1**

UNIT V: DESIGN FOR ASSEMBLY METHODS **8 Hours**

Approaches to design for assembly and Introduction, Approaches based on design principles and rules, Example DFA method using Design Principles, DFA Systems employing Quantitative evaluation procedures, IPA Stuttgart Method, DFA Methods employing a Knowledge based approach, Knowledge representation Computer Aided DFA methods, Part model, Feature, Processing. Assembly measures like Qualitative and Quantitative measures, Boothroyd and Dewhurst DFA method. Redesign of a simple product , Small consumer product and Fastener solution redesign using symmetry, Case Studies Designing of a disposal valve, Design of a lever-arch file mechanism

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain various approaches to design for assembly. **L2**
- Demonstrate on DFA systems employing quantitative evaluation procedures. **L2**
- Discuss DFA methods employing a knowledge based approach. **L2**
- Understand the qualitative and quantitative measures in assembly. **L2**

Text Books:

1. Harry Peck., “Design for Manufacture”, Pittman Publications, 1983.
2. Alan Redford and chal, “Design for Assembly-Principles and Procedures”, McGraw Hill International Europe, London, 1994.

Reference Books:

1. Robert Matousek, “Engineering Design A Systematic Approach”, Blackie &sons Ltd., 1963
2. James G.Bralla, “Hand Book of Product design for Manufacturing”, McGraw Hill Co., 1986
3. Swift, K.G., “Knowledge Based Design for Manufacture”, Kogan Page Ltd., 1987

Course Outcomes:

At the end of this Course the student will be able to

- Recall the importance of Design for Manufacturing and Assembly. **L1**
- Explain the form design factors with the help of Case study. **L2**
- Evaluate how the factor of redesign affects the product life cycle. **L5**
- Make use of DFA methods proposed by Boothroyd and Dewhurst. **L3**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55d – POWER PLANT OPERATION AND CONTROL

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize with various methods of power generation.
- Outline the working components of power plants.
- Expose the students measuring of various controllable and uncontrollable factors in power plants.
- Explain the concepts of boiler and turbine control.

UNIT I : OVERVIEW OF POWER GENERATION **12 Hours**

Survey of methods of power generation: Hydro, thermal, nuclear, solar and wind power - Importance of instrumentation in power generation - Thermal power plant - Building blocks - Combined cycle systems - Combined heat and power system - sub critical and supercritical boilers.

Learning Outcomes:

At the end of this unit, the student will be able to

- List the various types of power plants. **L1**
- Illustrate the importance of instrumentation in power generation. **L4**
- Compare subcritical and supercritical boilers. **L2**

UNIT II: MEASUREMENTS IN POWER PLANTS **10 Hours**

Measurement of feed water flow, air flow, steam flow and coal flow – Drum level measurement – Steam pressure and temperature measurement – Turbine speed and vibration measurement – Flue gas analyzer – Fuel composition analyzer

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe turbine speed and vibration measurements. **L2**
- Determine the steam flow and coal flow in power plants. **L3**
- Appraise the importance of flue gas and fuel composition analyzer in power plants. **L5**
- Illustrate the various controllable and uncontrollable factors that can be measure in power plants. **L2**

UNIT III : BOILER CONTROL – I **8 Hours**

Combustion of fuel and excess air – Firing rate demand – Steam temperature control – Control of deaerator– Drum level control – Single, two and three element control – Furnace draft control – implosion – flue gas dew point control – Trimming of combustion air – Soot blowing.

Learning Outcomes:

At the end of this unit, the student will be able to

- List the various boiler control methods. **L1**
- Describe the steam temperature control and drum level control. **L2**
- Demonstrate furnace draft control and drum level control. **L2**

UNIT IV : BOILER CONTROL – II **8 hours**

Burners for liquid and solid fuels – Burner management – Furnace safety interlocks – Coal pulverizer control – Combustion control for liquid and solid fuel fired boilers – air/fuel ratio control – fluidized bed boiler – Cyclone furnace.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the burners for liquid and solid fuels. **L3**
- Describe the working principle of coal pulverizer control. **L2**
- Explain combustion control for liquid and solid fuel fired boiler. **L2**

UNIT V :CONTROL OF TURBINE **8 Hours**

Types of steam turbines – impulse and reaction turbines – compounding – Turbine governing system – Speed and Load control – Transient speed rise – Free governor mode operation – Automatic Load Frequency Control – Turbine oil system – Oil pressure drop relay – Oil cooling system – Turbine run up system.

Learning Outcomes:

At the end of this unit, the student will be able to

- List the various types of steam turbines. **L1**
- Compare impulse and reaction turbines. **L2**
- Describe turbine governing system for speed and load control. **L2**
- Explain about oil cooling system in turbine. **L2**

Text Books:

1. Sam Dukelow, Control of Boilers, Instrument Society of America, 1991.
2. Everett Woodruff , Herbert Lammers, Thomas Lammers, Steam Plant Operation,9th Edition McGraw Hill, 2012.
3. Rajput R.K. A Text book of Power plant Engineering. 5th Edition, Lakshmi Publications, 2013.

Reference Books:

1. Liptak B.G., Instrumentation in Process Industries, Chilton Book Company, 2005.
2. Jain R.K., Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.
3. P.K.Nag, Powerplant Engineering, Tata McGraw-Hill Education, 3rd edition, 2007.
4. Tamilmani, Power plant instrumentation, Sams Publishers, 2011.
5. Krishnaswamy.K and Ponnibala.M., Power Plant Instrumentation, PHI Learning Pvt.Ltd., New Delhi, 2011.

Course Outcomes:

At the end of this Course the student will be able to

- Outline sources of energy for various power plants. **L2**
- Explain boiler and turbine control. **L2**
- Describe working components of a steam power plant. **L2**
- Illustrate the working mechanism of Diesel and Gas turbine power plants. **L2**
- Summarize types of measuring parameters for controlling the power plant. **L2**
- Demonstrate the working principle of nuclear power plants. **L4**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55e – SMART MATERIALS

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize the smart materials and its role in developing intelligent systems.
- Introduce the students with HBLS and LBHS smart materials.
- Expose the students in smart systems development and uses.
- Understand the working principle of smart actuators and smart sensors.

UNIT I **12 Hours**

Introduction to Smart Materials: What is Intelligence? Artificial intelligence Vs. embedded Intelligence, Definition of smart material, need for smart materials, classifications of smart systems, components of a smart systems, smart system applications, the role of Smart Materials in developing Intelligent Systems and Adaptive Structures.

Learning Outcomes:

At the end of this unit, the student will be able to

- Recall what is intelligence. **L1**
- Define smart materials. **L1**
- Describe the role of smart materials in development of intelligent systems and adaptive structures. **L2**
- Illustrate the applications of smart systems. **L2**

UNIT II: High bandwidth - Low strain generating (HBLS) Smart Materials **10 Hours**

Piezoelectric Materials – constitutive relationship, electromechanical coupling coefficients, piezoelectric constants, piezoceramic materials, variation of coupling coefficients in hard and soft piezoceramics, polycrystalline vs single crystal piezoelectric materials, polyvinyldene fluoride, piezoelectric composites.

Magnetostrictive Materials – constitutive relationship, magneto-mechanical coupling coefficients, Joule Effect, Villari Effect, Matteuci Effect, Wiedemann effect, Giant magnetostriction in Terfenol-D, Terfenol-D particulate composites, Galfenol and Metglas materials.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe the constitutive relationship of piezoelectric materials. **L2**
- Compare polycrystalline and single crystal piezeoelectric materials. **L2**
- Explain concepts of Joule effect, Villari effect, Matteuci effect, Wiedemann effect. **L2**
- Discuss Galfenol and Metglas materials. **L6**

UNIT III **8 Hours**

Low bandwidth - High strain generating (LBHS) materials: Shape Memory Alloys (SMA) – Introduction, Phenomenology, Influence of stress on characteristic temperatures, Modelling of shape memory effect. Vibration control through shape memory alloys. Design considerations, multiplexing embedded NiTiNOL actuators. Electro-active Polymers (EAP)- Introduction, Phenomenology, Influence of stress on characteristic temperatures

Learning Outcomes:

At the end of this unit, the student will be able to

- List various types of LBHS smart materials. **L1**
- Identify the influence of stress on characteristic temperatures in SMA and EAP. **L3**
- Explain the concept of vibration control through shape memory alloys. **L2**

- Discuss design considerations of shape memory alloy. **L6**

UNIT IV: Smart actuators **8 hours**

Based on HBLS smart materials: Piezoelectric Actuators – Induced Strain actuation model, Unimorph and Bimorph Actuators, Actuators embedded in composite laminate, Impedance matching in actuator design, Feedback Control, Pulse Drive, Resonance Drive. Magnetostrictive Actuators – Magnetostrictive Mini Actuators, Thermal instabilities, Discretely distributed actuation, Manetostrictive Composites.
Based on LBHS Smart Materials - Shape Memory Alloy based actuators for Shape Control, Electro-active Polymers for Work-Volume Generation

Learning Outcomes:
At the end of this unit, the student will be able to

- Recall working principle of actuators. **L1**
- Explain impedance matching in actuator design, feedback control, pulse drive and resonance. **L2**
- Describe the working principle of Piezoelectric Actuators & Magnetostrictive Actuators. **L2**
- Discuss the concepts of actuators based on HBLS and LBHS. **L6**

UNIT V: Smart sensors **8 Hours**

Sensors based on HBLS Smart Materials - Piezoelectric Sensors Magnetostrictive Sensors Techniques of Self Sensing MEMS Sensors.

Sensors based on LBHS Smart Materials - EAP based sensors, SMA based encoders, Optical Fibre based Sensing.

Learning Outcomes:
At the end of this unit, the student will be able to

- Select the type of sensor required for smart systems. **L1**
- Explain techniques of self sensing MEMS sensors. **L2**
- Discuss EPA based and SMA based sensors. **L6**
- Explain optical based sensing system. **L2**

Text Books:

- M.V. Gandhi, B.D. Thompson" Smart Materials and Structures" Springer Science & Business Media, 31-May-1992.

Reference Books:

1. Brian Culshaw, Smart Structures and Materials, Artech House, 2000.
2. Gauenzi, P., Smart Structures, Wiley, 2009.
3. Cady, W. G., Piezoelectricity, Dover Publication

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

- Describe the role of smart materials in development of intelligent systems and adaptive structures. **L2**
- Compare polycrystalline and single crystal piezoelectric materials. **L2**
- Identify the influence of stress on characteristic temperatures in SMA and EAP. **L3**
- Explain techniques of self sensing MEMS sensors. **L2**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME55f – SUPPLY CHAIN MANAGEMENT

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Explain the basics of supply chain management.
- Familiarize inventory management techniques and models to ensure EOQ batch size under risk management.
- Demonstrate various distribution strategies for shipment of products.
- Focus on evaluating of strategic alliance partners and understanding of RDBMS.

UNIT I **12 Hours**

Understanding the supply chain: What is SCM? Why SCM? The Complexity, Key issues in SCM Logistics network - Introduction, Data Collection, Transportation, Ware house Management, Strategic location of ware houses, Demand forecasting, Role of aggregate planning, MRP, ERP, Managing variability, Key features of Network configuration.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the strategic importance of SCM and how operations relate to other business functions. **L2**
- Summarize working knowledge of the concepts and methods of SCM **L2**
- Apply concepts for continuous improvement for practical problems **L3**

UNIT II **8 Hours**

Inventory management: Concepts of Materials Management, Economic lot size model, Effect of Demand uncertainly, Fixed order costs, Variable lead frames, Inventory under certainly & uncertainty, Risk Management

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain why companies keep inventory and costs of inventory for inventory decisions. **L2**
- Outline the key elements and relationship with customer service. **L2**
- Determine the appropriate reorder point in a continuous inventory system based on a target service level. **L3**
- Apply the order quantity estimate for a periodic inventory system. **L3**

UNIT III **8 Hours**

Distribution strategies: Introduction, Centralized vs Decentralized control, Direct shipment, Cross Docking, Push based vs Pull based supply chain.

Learning Outcomes:

At the end of this unit, the student will be able to

- Discuss outsourcing as a strategic decision. **L3**
- Classify the distribution strategies, systems and processes **L2**
- Analyze issues and trends in the supply chain **L4**

UNIT IV **8 hours**

Strategic alliances: Third party Logistics (3PL), Retailer – supplier relationship issues, requirements, success & failures, Distributor integration Types & issues.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the third party logistics **L2**
- Develop retailer supplier relationship issues **L2**
- Compare distribution integration types and issues **L2**

UNIT V **10 hours**

MIS & SCM: Relational Data Base Management (RDBMS), System Architecture, Communications, and Implementation of ERP, Decision support systems for SCM: Analytical tools, Presentation tools, Smooth production flow Current issues & directing challenges for future, e-Commerce strategies and world class supply chain management.

Learning Outcomes:

At the end of this unit, the student will be able to

- Interpret the basic modes of RDBMS for communication and ERP implementation. **L5**
- Identify support systems for supply chain management **L3**
- Explain the analytical and presentation tools **L2**
- Outline E-commerce strategies for world class SCM **L2**

Text Books:

1. Sunil Chopra, Peter Meindl, Supply Chain Management: Strategy, Planning, and Operation, 4/e, Pearson, 2010.
2. David N. Burt, Donald W. Dobler , World Class Supply Management: The Key to Supply Chain Management, 2/e, McGraw-Hill/Irwin, 2003

Reference Books:

1. John Joseph Coyle, Edward J. Bardi, C. John Langley, The Management of Business Logistics: A Supply Chain Perspective, South-Western/Thomson Learning, 2003.
2. Upendra Kachru, Logistics and Supply Chain Management, Excel Books, 2009.

Course Outcomes:

At the end of this Course the student will be able to

- Apply the concepts of supply chain management for demand forecasting. **L3**
- Make use of SCM and inventory management for procurement. **L3**
- Analyze the shipment activities and related issues. **L4**
- Build third party alliances. **L5**
- Adapt the RDBMS data for communications and analyzing future challenges and understand e-commerce strategies. **L6**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC55a- FUNDAMENTALS OF ELECTRONICS AND COMMUNICATION ENGINEERING

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To study the basic principle, construction and operation of semiconductor devices.
- To learn the real time applications of semiconductor devices.
- To introduce binary number systems, logic gates and digital logic circuits.
- To get an idea about the basic principles of communication systems and their applications.
- To learn the measurement of physical parameters using Sensors and Transducers.

UNIT – I:

Introduction to Electronics Engineering: Overview, scope and objective of studying Electronics Engineering. Introduction to semiconductor devices: Bond structure of semiconductors, intrinsic and extrinsic semiconductors; Basic principle and operation of semiconductor devices – diode, bipolar junction transistor, field effect transistors; Introduction to VLSI.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic principle, construction and operation of semiconductor devices. **L2**
- Learn about the diode, bipolar junction transistor and field effect transistors. **L1**

UNIT – II:

Applications of semiconductor devices: Basic concepts of rectifiers, voltage regulators, amplifiers and oscillators; Basic concepts of operational amplifier and their applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn the real time applications of semiconductor devices.(L1) **L1**
- To understand the basic concepts of operational amplifier and their applications.(L2) **L2**

UNIT – III:

Introduction to digital systems: Binary number system, Boolean algebra, Logic gates, adders, one-bit memory, flip-flops (SR, JK), shift registers, Asynchronous counter.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the binary number systems, Boolean algebra and working of logic gates. **L2**
- Know the working and applications of digital logic circuits. **L1**

UNIT – IV:

Introduction to Communication Systems: Elements of a communication system – transmitter and receiver; Signal types in communication; FDM and TDM; Processing of signals for transmission – basic concepts of amplitude and frequency modulation; Examples of telecommunication systems – telephone, radio, television, mobile communication and satellite communication.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the basic elements of a communication system. **L2**
- Understand various examples of telecommunication systems. **L2**

UNIT – V:

Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic working principle and applications of different sensors and transducers. **L2**
- Measure physical parameters using different types of sensors and transducers. **L3**

Text Books:

1. Millman J, Halkias C.C andJit S, "Electronic Devices and Circuits", Tata McGraw-Hill, 2nd 2007 Edition.
2. Mano M.M., "Digital Design", Prentice-Hall, 3rd Edition. 2002
3. A.K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai& Co. 3rd edition Delhi, 2010.
4. Kennedy G. and Davis B., "Electronic Communication Systems", Tata McGraw-Hill, 4th 2008 Edition.

Reference Books:

1. Tomasi W., "Advanced Electronic Communication Systems", Pearson/Prentice-Hall, 6th 2004 Edition.
2. Boylstead R.L. andNashelsky L., "Electronic Devices and Circuit Theory", Pearson, 10th 2009 Edition.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the basic principle, construction and operation of semiconductor devices. **L2**
- Learn the real time applications of semiconductor devices. **L1**
- Comprehend the binary number systems, logic gates and digital logic circuits. **L1**
- Understand the basic principles of communication systems and their applications. **L2**
- Measure the physical parameters using Sensors and Transducers. **L3**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC55b- TRANSDUCERS AND SENSORS

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To study about the characteristics of instrumentation system and transducers.
- To know the operation of different types of Temperature Transducers.
- To learn the operation of different types of Flow Transducers.
- To understand the working and operation of different types of Pressure Transducers.
- To gain the knowledge on working of Force and Sound Transducers.

UNIT – I:

Introduction: General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification.

Motion Transducers: Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the characteristics of instrumentation system and transducers. **L1**
- Measure motion using different motion transducers. **L3**

UNIT – II:

Temperature Transducers: Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics.

Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezo-electric sensors.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the working principle of temperature transducers. **L2**
- Study about different types of bio sensors and smart sensors. **L1**

UNIT – III:

Flow Transducers: Bernoulli's principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow meter.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Bernoulli's principle and continuity. **L2**
- Learn how to measure flow using different types of flow meters. **L1**

UNIT – IV:

Pressure Transducers: Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high and low pressure measurement.

Learning Outcomes:

At the end of this unit, the student will be able to

- Work with different types of manometers. **L3**
- Use different types of pressure transducersto measure pressure. **L3**

UNIT – V:

Force and Sound Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone**.**

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn how to measure force using force transducers. **L1**
- Understand the working and operation of sound transducers. **L2**

Text Books:

1. A.K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai& Co. 3rd edition Delhi, 2010.
2. Rangan C.S, Sarma G.R and Mani V S V,"Instrumentation Devices and Systems", TATA McGraw Hill publications, 2007.

Reference Books:

1. Doebelin. E.O, "Measurement Systems Application and Design",McGraw Hill International, New York, 2004.
2. Nakra B.CandChaudharyK.K , "Instrumentation Measurement and Analysis", Second Edition, Tata McGraw-Hill Publication Ltd.2006.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the characteristics of instrumentation system and transducers **L2**
- Know the operation of different types of Temperature Transducers. **L1**
- Compare the operation of different types of Flow Transducers. **L2**
- Correlate the working and operation of different types of Pressure Transducers. **L4**
- Gain the knowledge on working of Force and Sound Transducers. **L1**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC55c- PRINCIPLES OF COMMUNICATIONS

(Open Elective-I)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives: The objectives of the course are to make the students learn about

- To understand the importance of modulation and Amplitude modulation.
- To know about the frequency modulation and phase modulation.
- To study different types of pulse analog modulation techniquesand multiple access techniques.
- To gain knowledge on pulse code modulation and different waveform coding techniques.
- To comprehend the wireless communication systems, their evolution and standards.

UNIT – I:

Analog communication-I: Elements of communication systems need for Modulation, Modulation Methods, Baseband and carrier communication Amplitude Modulation(AM),Generation of AM signals, Rectifier detector, Envelope detector, sideband and carrier power of AM, Double side band suppressed carrier(DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Single sideband(SSB) transmission, VSB Modulation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic elements of communication systems. **L2**
- Compare the performance of analog modulation schemes. **L2**

UNIT – II:

Analog communication-II : Angle Modulation & Demodulation: Concept of instantaneous frequency Generalized concept of angle modulation, Bandwidth of angle modulated waves-Narrow band frequency modulation (NBFM); and Wide band FM (WBFM),Phase modulation, Pre-emphasis & De-emphasis, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Compare the performance of different frequency modulated schemes. **L2**
- Learn about the Pre-emphasis & De-emphasis circuits in frequency modulation. **L1**

UNIT – III:

Digital communications-I (Qualitative Approach only) :Pulse Analog Modulation Techniques : Pulse analog modulation techniques, Generation and detection of Pulse amplitude modulation, Pulse width modulation, Pulse position modulation

Multiple Access Techniques: Introduction to multiple access techniques, FDMA,TDMA, CDMA, SDMA: Advantages and applications

Learning Outcomes: At the end of this unit, the student will be able to

- Analyze the performance of different pulse modulation techniques. **L4**
- Understand the basic principles of Multiple Access Techniques. **L2**

UNIT – IV:

Digital communications-II (Qualitative Approach only) : Pulse Code Modulation, DPCM, Delta modulation, Adaptive delta modulation, Overview of ASK, PSK, QPSK, BPSK and M-PSK techniques.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the performance of different types of digital modulation schemes. **L2**
- Explain different types of waveform coding techniques and their applications. **L1**

UNIT – V:

Wireless communications (Qualitative Approach only) : Introduction to wireless communication systems, Examples of wireless communication systems, comparison of 2G and 3G cellular networks, Introduction to wireless networks, Differences between wireless and fixed telephone networks, Introduction to Global system for mobile(GSM),GSM services and features.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand various types of wireless communication systems. **L1**
- Explain GSM services and features. **L2**

Text Books:

1. H Taub, D. Schilling and Gautam Sahe, "Principles of Communication Systems", TMH, 2007, 3rd Edition
2. George Kennedy and Bernard Davis, "Electronics & Communication System", 4th Edition, TMH 2009
3. Wayne Tomasi, "Electronic Communication System: Fundamentals Through Advanced",2nd editions,PHI,2001.

Reference Books:

1. Simon Haykin, "Principles of Communication Systems", John Wiley, 2nd Edition.
2. Sham Shanmugam," Digital and Analog communication Systems",Wiley-India edition,2006.
3. Theodore. S.Rapport, "Wireless Communications",Pearson Education,2nd Edition,2002.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the importance of modulation and Amplitude modulation. **L2**
- Summarize the frequency modulation and phase modulation methods. **L2**
- Explain about different types of pulse analog modulation techniquesand multiple access techniques. **L3**
- Acquire knowledge on pulse code modulation and different waveform coding techniques. **L1**
- Comprehend the wireless communication systems, their evolution and standards. **L1**

III B.Tech I SEMESTER
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ACS55a- OOPS CONCEPTS THROUGH JAVA
(Common to CSE)

L	T	P	C
3	0	0	3

Course Objectives:

- Study the syntax, semantics and features of Java Programming Language
- Study the Object Oriented Programming Concepts of Java Programming language
- Learn the method of creating Multi-threaded programs and handle exceptions
- Learn Java features to create GUI applications & perform event handling

UNIT – 1: INTRODUCTION

Introduction to Java: The key attributes of object oriented programming, simple program, The Java keywords, Identifiers, Data types and operators, Program control statements, Arrays, Strings, String Handling

.**Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand the basics of computer graphics, different graphics systems and applications of computer graphics. **L2**
- Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis. **L3**

UNIT – II: CLASSES

Classes: Classes, Objects, Methods, Parameters, Constructors, Garbage Collection, Access modifiers, Pass Objects and arguments, Method and Constructor Overloading, Understanding static, Nested and inner classes.

. **Learning Outcomes:**

At the end of this unit, the student will be able to

- Use of geometric transformations on graphics objects and their application in composite form. **L2**
- Extract scene with different clipping methods and its transformation to graphics display device. **L3**

UNIT – III: INHERITANCE

Inheritance – Basics, Member Access, Usage of Super, Multi level hierarchy, Method overriding, Abstract class, Final keyword.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explore projections and visible surface detection techniques for display of 3D scene on 2D screen. **L3**
- Render projected objects to naturalize the scene in 2D view and use of illumination models for this **L4**

UNIT – IV: INTERFACES

Interfaces – Creating, Implementing, Using, Extending, and Nesting of interfaces.
Packages – Defining, Finding, Member Access, Importing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basics of Multimedia basics, different graphics systems and applications of computer graphics. **L5**
- Discuss various multimedia data structures. **L5**

UNIT – V: EXCEPTION HANDLING

Exception handling: Hierarchy, Fundamentals, Multiple catch clauses, subclass exceptions, Nesting try blocks, Throwing an exception, Using Finally and Throws, Built-in exceptions, User-defined exceptions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basics of Multimedia Authoring systems **L4**
- Understand the how videos are placed **L5**

Text Books:

1. "Java Fundamentals - A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special Indian Edition, McGrawHill, 2013.
2. "Java The Complete Reference" Herbert Schildt, 8th Edition, 2011, Oracle press, TataMcGraw-Hill
3. "Java – How to Program", Paul Deitel, Harvey Deitel, PHI.

Reference Books:

1. 1. "Programming with Java" T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan Pearson Edition.
2. "Core Java", Nageswar Rao, Wiley Publishers.
4. "Thinking in Java", Bruce Eckel, Pearson Education.
5. "A Programmers Guide to Java SCJP", Third Edition, Mughal, Rasmussen, Pearson.
6. "Head First Java", Kathy Sierra, Bert Bates, O'Reilly
7. "SCJP – Sun Certified Programmer for Java Study guide" – Kathy Sierra, Bert Bates, McGrawHill
8. "Java in Nutshell", David Flanagan, O'Reilly
9. "Core Java : Volume I – Fundamentals, Cay S. Horstmann, Gary Cornell, The Sun Micro Systems Press

Course Outcomes:

At the end of this Course the student will be able to

Introduction to computer graphics

1. Gain knowledge of client-side scripting, validation of forms and AJAX programming **L3**
2. Understand server-side scripting with PHP language **L4**
3. Understand what XML is and how to parse and use XML Data with Java **L5**
4. To introduce Server-side programming with Java Servlets and JSP **L6**

III B.Tech I SEMESTER
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ACS55B- INTRODUCTION TO INTERNET OF THINGS
(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives:

- Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IOT Devices.

UNIT – 1: INTRODUCTION

Introduction – Characteristics-Physical Design - Protocols – Logical Design – Enabling technologies – IoT Levels – Six Levels of IoT - Domain Specific IoTs.**Learning Outcomes:**

At the end of this unit, the student will be able to

- Able to understand the application areas of IOT · **L2**
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

UNIT – II: M2M, IoT vs M2M

M2M, IoT vs M2M, SDN and NFV for IoT, IOT system Management with NETCONF-YANG.

. **Learning Outcomes:**

At the end of this unit, the student will be able to

- Able to understand the application areas of IOT · **L2**
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

UNIT – III: IOT SYSTEM MANAGEMNT

IoT Systems Management – IoT Design Methodology – Specifications Integration and Application Development.

Learning Outcomes:

At the end of this unit, the student will be able to

- Able to understand the application areas of IOT · **L2**
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

UNIT – IV: SENSORS

Sensors- Types of sensor nodes, Internet communications, IP addresses, MAC Address, TCP and UDP Ports, Application layer protocols

Learning Outcomes:

At the end of this unit, the student will be able to

- Able to understand the application areas of IOT · **L2**
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

UNIT – V: IOT APPLICATIONS

IOT application for industry-Future factory concepts, Brownfield IoT, Smart objects, Smart applications, Study of existing IoT platforms/middleware, IoT- A, Hydra etc.

Learning Outcomes:

At the end of this unit, the student will be able to

- Able to understand the application areas of IOT · **L2**

- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A Hands-on Approach", Universities Press, 2015.

Reference Books:

1. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014.
2. Marco Schwartz, "Internet of Things with the Arduino Yun", Pack Publishing, 2014.
3. *Simon Monk, "Programming the Raspberry Pi*: *Getting Started with Python",* McGraw-Hill, *2013.*
4. Charalampos Doukas, "Building Internet of Things With the Arduino", Second Edition, 2012.
5. Dr. John Bates, "Thingalytics: Smart Big Data Analytics for the Internet of Things", Software AG Publisher, 2015.

Course Outcomes:

At the end of this Course the student will be able to

Introduction to computer graphics

Able to understand the application areas of IOT · **L2**

Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks · **L3**

Able to understand building blocks of Internet of Things and characteristics **L4**

III B.Tech I SEMESTER
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ACS55c- INTRODUCTION TO OPERATING SYSTEMS
(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- To make the students understand the basic operating system concepts such as processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection.
- To get acquaintance with the class of abstractions afford by general purpose operating systems that aid the development of user applications

UNIT – 1: OPERATING SYSTEMS OVERVIEW

Operating Systems Overview: Operating system functions, Operating system structure, operating systems Operations, protection and security.

Operating System Structure: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand what makes a computer system function and the primary PC components. **L2**
- Understand past and current trends in computer technology. **L3**

UNIT – II: THREADS

Threads: overview, Multicore Programming, Multithreading Models, Thread Libraries, Implicit threading, Threading Issues.

CPU Scheduling: Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling.

. **Learning Outcomes:**

At the end of this unit, the student will be able to

- Understand past and current trends in computer technology. **L3**
- Use basic software applications. **L4**

UNIT – III: MEMORY MANAGEMENT

Memory Management: Swapping, contiguous memory allocation, segmentation, paging, structure of the page table.

Deadlocks: System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

Learning Outcomes:

At the end of this unit, the student will be able to

- Use basic software applications. **L4**
- Add functionality to the exiting operating systems **L5**

UNIT – IV: MASS-STORAGE STRUCTURE

Mass-storage structure: Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Add functionality to the exiting operating systems **L5**
- Design new operating systems **L6**

UNIT – V: I/O systems

I/O systems: I/O Hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O requests to Hardware operations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Add functionality to the exiting operating systems **L5**
- Design new operating systems **L6**

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Ninth Edition, 2012, Wiley.
2. Operating Systems: Internals and Design Principles, Stallings, Sixth Edition, 2009, Pearson Education.

Reference Books:

1. Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI.
2. Operating Systems, S.Haldar, A.A.Aravind, Pearson Education.
3. Principles of Operating Systems, B.L.Stuart, Cengage learning, India Edition.
4. Operating Systems, A.S.Godbole, Second Edition, TMH.
5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.
6. Operating Systems, G.Nutt, N.Chaki and S.Neogy, Third Edition, Pearson Education.
7. Operating Systems, R.Elmasri, A,G.Carrick and D.Levine, Mc Graw Hill.

Course Outcomes:

At the end of this Course the student will be able to

- Understand what makes a computer system function and the primary PC components. **L2**
- Understand past and current trends in computer technology. **L3**
- Use basic software applications. **L4**
- Add functionality to the exiting operating systems **L5**
- Design new operating systems **L6**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS14a-MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Humanities Elective-I)(Common to CE & ME)

L	T	P	C
3	0	0	3

Course Objectives:

- To inculcate the basic knowledge of micro economics and financial accounting.
- To make the students learn how demand is estimated for different products, input- output relationship for optimizing production and cost.

UNIT – 1

Introduction to Managerial Economics:

Definition of Managerial Economics, Nature and Scope – Managerial Economics and its relation with other subjects- Basic economic tools in Managerial Economics.

Demand Analysis & Elasticity of Demand: Meaning- Demand distinctions- Demand determinants- Law of Demand and its exceptions, Types of Elasticity of demand - Measurement of price elasticity of demand, Significance of Elasticity of Demand.

Demand Forecasting: Meaning - Factors governing demand forecasting - Methods of demand forecasting - Forecasting demand for new products.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the nature and scope of Managerial Economics and its importance. **L1**
- Understand the concept of demand and its determinants. **L2**

UNIT – II

Theory of Production: Production Function- Isoquants and Isocosts, MRTS, Cobb-Douglas Production function.

Cost Analysis: Cost concepts, Opportunity cost, Fixed Vs Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break even analysis -Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEP.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the production function, Input-Output relationship and different cost concepts. **L1**
- Apply the least-cost combination of inputs. **L2**

UNIT – III

Introduction to Markets: Market structures**:** Types of competition, Features of Perfect Competition, Monopoly and Monopolistic Competition. Price-Output Determination under Perfect Competition, Monopoly, Monopolistic Competition.

Pricing Policies: Methods of Pricing-Marginal Cost Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Bundling Pricing, and Peak Load Pricing. Internet Pricing Models: Flat rate pricing, Usage sensitive pricing, Transaction based pricing, Priority pricing, charging on the basis of social cost, Precedence model, Smart market mechanism model.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply the price output relationship in different markets. **L1**

- Evaluate price-output relationship to optimize cost, revenue and profit. **L2**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS14b-ENTERPRENUARSHIP AND INNOVATION MANAGEMENT

(Humanities Elective-I)(Common to CE & ME)

L	T	P	C
3	0	0	3

Course Objectives:

- To enable students understand the opportunities available to start a business.
- To impart knowledge about various sources of support (Financial and Non-financial) available to start an enterprise.

UNIT – 1: FUNDAMENTALS OF ENTREPRENEURSHIP

Fundamentals of Entrepreneurship – Evolution and Theories of Entrepreneurship – Characteristics of Entrepreneurs –Myths of Entrepreneurship – Kakinada Experiment -Elements of leadership –Role of Entrepreneurs in Indian economy – Social and Ethical Perspectives of Entrepreneurship - Corporate entrepreneurship – Social Entrepreneur, women Entrepreneurship

- Opportunities & challenges.

Learning Outcomes:

At the end of this unit, the student will be able to

- Define entrepreneurship and the characteristics of an entrepreneur. **L1**
- Explain the significance of entrepreneurship in the economic development of a nation. **L2**

UNIT – II: IDEATION AND EVALUATION OF BUSINESS IDEAS

Opportunity identification – Ideations process - Sources of business ideas – Role of creativity – Sources of Innovation - Business Idea Evaluation - Product/ Service design – Design Thinking - Customer Value Proposition (CVP) – Business models.

Case study: Business cases of OYO, Paytm and Flipkart/ Smartmart.

Activity: Idea generation in groups and CVP.

Learning Outcomes:

At the end of this unit, the student will be able to

- Select the right business ideas. **L1**
- Explain the business idea evaluation process **L2**

UNIT – III: Business Organizations and Venture Establishment

Forms of business organisations/ownership – Techno-economic feasibility assessment – Financial feasibility – Market feasibility – Preparation of Business plan – Business canvas & Lean canvas – Challenges & Pitfalls in selecting new venture.

Activity: Preparation of business plan (draft).

Learning Outcomes:

At the end of this unit, the student will be able to

- Recall different forms of business organizations. **L1**
- Develop business canvas. **L2**

UNIT – IV: Introduction to Innovation

Creativity, Invention and innovation, Types of Innovation, Relevance of Technology for Innovation, The Indian innovations and opportunities.

Learning Outcomes:

At the end of this unit, the student will be able to

- Able to develop new ideas to discover new ways of looking problems and opportunities. **L1**
- Apply technology to innovation. **L2**

UNIT – V: Promoting and managing innovation

Innovators and Imitators, Patents, Trademarks, Intellectual Property, Exploring, Executing, Leveraging and renewing innovation, Enhancing Innovation Potential & Formulating strategies for Innovation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Intellectual Property Licensing. **L1**
- Summarize the importance of IPR. **L2**

Text Books:

7. Robin Lowe and Sue Marriott, Enterprise: Entrepreneurship and Innovation Concepts, Contexts and Commercialization.
8. John Bessant and Joe Tidd, Innovation and Entrepreneurship.

Reference Books:

8. Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, New Delhi, 1998.
9. Peter F. Drucker, Innovation and Entrepreneurship.
10. EDII "Faculty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development" Institute of India, Ahmadabad, 1986.
11. Philips, Bonefiel and Sharma (2011), Social Entrepreneurship, Global vision publishing house, New Delhi.

Course Outcomes:

At the end of this Course the student will be able to

- Choose entrepreneurship as an alternative career. **L1**
- Distinguish between corporate and social entrepreneurs. **L2**
- Examine and build customer value proposition. **L3**
- Analyze feasibility of business ideas. **L4**
- Compare various supports schemes provided by GOI. **L5**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE56- SOIL MECHANICS LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

To obtain the properties of soils by conducting experiments, it is necessary for students to understand the behavior of soil under various loads and conditions.

LIST OF EXPERIMENTS

1. Atterberg's Limits.
2. Field density-core cutter and sand replacement method
3. Grain size analysis
4. Specific gravity of soils by Density Bottle method &Pycnometer method
5. Permeability of soil, constant and variable head test
6. Compaction test
7. CBR Test
8. Consolidation test
9. Unconfined compression test
10. Tri-axial Compression test(Demo)
11. Direct shear test.
12. Vane shear test

NOTE: At least EIGHT of the above experiments are to be conducted

Text Books:

1. Soil Testing Lab Manual by K.V.S. Appa Rao &V.C.C.Rao,University Science Press ,Laxmi Publication.
2. Soil Testing for Engineers by S.Mittal and J.P.Shukla, Kahna Publishers, NewDelhi.
3. Relevant ISCodes.

Course Outcomes:

At the end of this Course the student will be able to

- Identify various soils based on their characteristics.
- Evaluate permeability and seepage of soils.
- Determine plasticity characteristics of various soils.
- Design consolidation process by predicting settlement of soils.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE57- HIGHWAY ENGINEERING LAB

L	T	P	C
0	0	2	1

Course Objectives: The objectives of the course are to make the students learn about

To have knowledge on various highway materials like aggregate, bitumen, mechanical properties of the materials and their usage in the field.

Note: Minimum of eight experiments is to be executed

I. Tests on Aggregates

1. Aggregate Crushing Value Test
2. Los Angeles Abrasion Test
3. Aggregate Impact Value Test
4. Aggregate shape Test (Flakiness &Elongation)
5. Specific Gravity of Aggregate Test
6. Water Absorption of Aggregate Test
7. Soundness Test

II. Tests onBitumen

1. Penetration Test
2. Ductility Test
3. Softening Point Test
4. Specific Gravity Test
5. Viscosity Test
6. Flash and Fire Point Test

III. Demo on Bituminous Mixes

1. Marshall Stability Test

Course Outcomes:

By performing the various tests in this laboratory the student will be able to know the physical characteristics of aggregates and bitumen

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS16-ORGANIZATIONAL BEHAVIOR

(Common to CE & ME)

L	T	P	C
3	0	0	0

Course Objectives:

- To make the student understand about the organizational behavior
- To enable them to develop self motivation, leadership and management.

UNIT – 1:

Organizational Behavior - Introduction to OB - Meaning and definition, scope - Organizing Process – Making organizing effective - Understanding Individual, Behavior – Attitude - Perception - Learning - Personality Types.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of Organizational Behavior. **L1**
- Evaluate personality types. **L2**

UNIT – II:

Individual Behavior – Diversity – Biographical Characteristics Ability – Implementing Diversity Management – Strategies – Attitudes & Job Satisfaction - Personality – Theories of Personality – Perception – Process of Perception – Perception & Individual Decision Making – Motivation from concepts to Applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of Organizational Behavior. **L1**
- Contrast and compare Individual Behavior and attitude. **L2**

UNIT – III:

Group Behavior – Foundations of Group Behaviour – Defining and Classifying Groups – Stages of Group Development – Group Properties – Roles – Norms – Status, Size and Cohesiveness – Group Decision Making – Understanding Work Teams – Types of Teams – Creating Effective Teams.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the concept of Group Dynamics. **L1**
- Contrast and compare Group behavior and group development. **L2**

UNIT – IV:

Leadership and Motivational Theories: Leadership Theories – Characteristic of effective leader – Finding and Creating Effective Leaders – Power & Polities. Introduction to motivation, Maslow's Hierarchy of Needs, Two- factor theory of Motivation, Mcdregers theory of motivational Model.

Learning Outcomes:

At the end of this unit, the student will be able to

- Contrast and compare Traits theory and Managerial Grid. **L1**
- Know the difference between Transactional and Transformational Leadership. **L2**

UNIT – V:

Foundation of Organizational Structure: Conflicts & Negotiations – Organization Structure – Organization Change & Stress Management – Self Management – Managing Careers.

Learning Outcomes:
At the end of this unit, the student will be able to

- Know the importance of organizational change and development. **L1**
- Apply change management in the organization. **L2**

Text Books:

9. Stephen P. Robbins, Timothy: Organizational Behaviour, Pearson 14th Edition, 2012.
10. Dr. Anjali Ghanekar, Organizational Behaviour Concepts & Cases, Everest, 19th Edition, 2013.

Reference Books:

12. Mirza S Saiyadain, Cases in Organizational Behavior , TMH,2011.
13. Gerard H.Seijts, Cases in Organizational Behavior, Sage,2008.
14. Nelson, Quick and Khandelwala, ORGB, 2/e, Cengage, 2012.
15. P.G. Aquinas: Organizational Behaviour Concepts, Realities, Application & Challenges, 2nd Edition, Excel Books 2012.

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

- To bring about the through understanding of entrepreneurship and constraints for the growth of entrepreneurial culture. **L1**
- To demondtrate knowledge in entrepreneurship development. **L2**
- To understand the concept of entrepreneushiptaining and various entrepreneurship training institutes in India. **L3**
- To be able to demontrate progressive learning in the project report and ownership structures. **L4**
- To be able to demontrate progressive learning in the project report and ownership structures. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS12-ENGLISH LANGUAGESKILLS

(Common to CE & ME)

L	T	P	C
3	0	0	3

Course Objectives:

- Facilitate active listening to enable inferential learning through expert lectures and talks
- Provide training and opportunities to develop fluency in English through participation in formal group discussions and presentations using audio-visual aids

UNIT – I: **12 Hrs**

Listening: Listening to famous speeches for structure and style

Speaking: Oral presentations on general topics of interest.

Reading: Reading for meaning and pleasure – reading between the lines.

Writing: Appreciating and analyzing a poem –Paraphrasing, note-taking.

Grammar and Vocabulary: Tenses (Advanced Level) Correcting errors in punctuation -Word roots and affixes.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the purpose of rhythm and rhyme and the use of figures of speech in making the presentation lively and attractive. **L1**
- Apply the knowledge of structure and style in a presentation, identify the audience and make note of key points. **L2**

UNIT – II: **12 Hrs**

Listening: Following the development of theme; answering questions on key concepts after listening to stories online.

Speaking: Narrating personal experiences and opinions.

Reading: Reading for summarizing and paraphrasing; recognizing the difference between facts and opinions.

Writing: Summarizing, precis writing, letter and note-making

Grammar and Vocabulary: Subject-verb agreement, noun-pronoun agreement, collocations.

Learning Outcomes:

- At the end of this unit, the student will be able to
- Make formal structured presentations on academic topics. **L1**
- Use correct English avoiding common errors in formal speech and writing. **L2**

UNIT – III: **12 Hrs**

Listening: Identifying views and opinions expressed by different speakers while listening to speeches.

Speaking: Small talks on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position.

Reading: Identifying claims, evidences, views, opinions and stance/position.

Writing: Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidences.

Grammar and Vocabulary: The use of Active and passive Voice, vocabulary for academic texts.

Learning Outcomes:

At the end of this unit, the student will be able to

- Participate in group discussions using appropriate conventions and language. Strategies. **L1**
- Use appropriate vocabulary to express ideas and opinions. **L2**

UNIT – IV **12 Hrs**

Listening: Listening to identify important moments - Understanding inferences; processing of information using specific context clues from the audio.

Speaking: Group discussion; reaching consensus in group work (academic context).

Reading: Reading for inferential comprehension.

Writing: Applying for internship/ job **-** Writing one's CV/Resume and cover letter.

Grammar and Vocabulary: Phrasal verbs, phrasal prepositions and technical vocabulary.

Learning Outcomes:

At the end of this unit, the student will be able to

- Express thoughts and ideas with acceptable accuracy and fluency **L1**
- Draw inferences and conclusions using prior knowledge and verbal cues **L2**

UNIT – V **12 Hrs**

Listening: Understanding inferences - processing of explicit information presented in the text and implicit information inferable from the text or from previous/background knowledge.

Speaking: Formal team presentations on academic/ general topics.

Reading: Intensive and extensive reading.

Writing: Structure and contents of a Report – Abstract – Project report features.

Grammar and Vocabulary: Correcting common errors, improving vocabulary and avoiding cliches and jargons.

Learning Outcomes:

At the end of this unit, the student will be able to

- Develop advanced listening skills for in-depth understanding of academic texts. **L1**
- Collaborate with a partner to make effective presentations. **L2**

Text Books:

1. "Forging Ahead": A Course Book for B.Tech Students. Orient BlackSwan,2020.

2. Meenakshi Raman &Sangeeta Sharma, "Technical Communication**"** O U Press2009.

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. (Student Book, Teacher Resource Book, CD & DVD).

Course Outcomes:

- At the end of this Course the student will be able to
- Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English. **L1**
- Apply grammatical structures to formulate sentences and correct word forms **L2**
- Analyze discourse markers to speak clearly on a specific topic in informal discussions. **L3**
- Evaluate reading/listening texts and to write summaries based on global comprehension of the setexts. **L4**
- Create a coherent paragraph interpreting a figure/graph/chart/table. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE61- FOUNDATION ENGINEERING

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- To know the necessity of soil exploration.
- To design the shallow foundations.
- To know and necessity of deep foundations
- To perform the stability analysis of slopes.
- To know the principles and design of earth retaining walls
- To use the principles of Soil mechanics to design the foundations, Earth retaining structures and slope stability safely and economically knowledge of the subject is essential..

UNIT – I: SOIL EXPLORATION:

Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Plate load test – Pressure meter – planning of Programme and preparation of soil investigation report.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn about soil sampling (undisturbed and disturbed)
- To determine the bearing capacity of shallow foundations

UNIT – II: EARTH SLOPE STABILITY

Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method – Taylor's Stability Number- Stability of slopes of earth dams under different conditions.

Learning Outcomes:

At the end of this unit, the student will be able to

- To learn about the failure of slopes.
- To design of infinite and finite slopes using various methods.

UNIT – III: EARTH PRESSURE THEORIES:

Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Rebhann's and Culmann's graphical method

RETAINING WALLS: Types of retaining walls – stability of retaining walls.

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand the role earth pressure on the stability of retaining systems.

UNIT – IV: SHALLOW FOUNDATIONS:

Types – choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi`s, Meyerhoff's and Skempton`s Methods

ALLOWABLE BEARING PRESSURE:
Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – allowable settlements of structures – Settlement Analysis

Learning Outcomes:
At the end of this unit, the student will be able to

- To learn about various types of foundations
- To calculate the bearing capacity and settlement of foundations

UNIT – V:
PILE FOUNDATION: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests – Load carrying capacity of pile groups in sands and clays – Settlement of pile groups. **WELL FOUNDATIONS:** Types – Different shapes of wells – Components of wells – functions and Design Criteria – Sinking of wells – Tilts and shifts

Learning Outcomes:
At the end of this unit, the student will be able to

- To understand the behavior of the piles under different loading conditions.
- To design the load carrying capacity of piles.
- To understand the behavior of well foundations.

Text Books:

1. Geotechnical Engineering by C.Venkataramaiah, New AgePubilications.
2. Soil Mechanics and Foundation Engineering by Arora, Standard Publishers and Distributors, Delhi
3. Soil Mechanics and Foundations by – by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi

Reference Books:

1. Das, B.M.,-(1999) Principles of Foundation Engineering–6th edition(Indian edition) Thomson Engineering
2. Foundation Engineering by Varghese,P.C., Prentice Hall of India., New Delhi.
3. Foundation Engineering by V.N.S.Murthy, CRC Press, New Delhi.
4. Bowles, J.E., (1988) Foundation Analysis and Design – 4 th Edition, McGraw-Hill Publishing company, Newyork.
5. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers New Delhi.

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

- To enable the student to analyze shallow and deep foundations when subjected to various types of loadings
- To enable the student to analyze slopes, retaining walls and well foundations

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE62- DESIGN OF STEEL STRUCTURES

L	T	P	C
2	1	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To teach different types of Connections and relevant IS code provision.
- To impart with design procedures of beams and columns.
- To enable Design of truss elements
- To enable design of column bases
- To teach design and Plate and Gantry Girders with curtailment of flanges

UNIT – I:

Materials – Making of iron and steel – types of structural steel – mechanical properties of steel – Concepts of plasticity – yield strength. Loads – load combinations - wind loads on roof trusses, behavior of steel, local buckling. Concept of limit State Design – Different Limit States as per IS 800 -2007 – Design Strengths- deflection limits – serviceability – Section Classification - Bolted connections – Welded connections – Design Strength – Efficiency of joint – Prying action Types of Welded joints - Design of Tension members – Design Strength of members

Learning Outcomes:

At the end of this unit, the student will be able to

- Estimate strength of welds
- Design Welded and Bolted connections as per IS Codal provisions

UNIT – II:

Design of compression members – Buckling class – slenderness ratio / strength design – laced – battened columns –column splice – column base – slab base.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand behavior of compression members
- Design and detail of compression members under different conditions adopting IS Code.

UNIT – III:

Design of Beams – Plastic section modulus - Shape factor – Bending and shear strength laterally / supported beams design –Introduction to lateral torsion buckling -Built up sections – large plates Web buckling Crippling and Deflection of beams, Design of Purlin.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand behavior of simple and compound beams
- Visualize importance of curtailment of flange plates
- Design and detail of steel beams under different conditions adopting IS Code.

UNIT – IV:

Design of eccentric connections with brackets, Beam end connections – Web angle – Unstiffened and stiffened seated connections (bolted and Welded types) Design of truss joints

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand behavior of simple and compound beams
- Visualize importance of curtailment of flange plates
- Design and detail of steel beams under different conditions adopting IS Code.

UNIT – V:
Plate Girder: Design consideration – I S Code recommendations Design of plate girder Welded – Curtailment of flange plate's stiffeners – splicings and connections.

Learning Outcomes:
At the end of this unit, the student will be able to

- Identify different components of plate girder
- Design and detail of components of plate girder confirming to IS Code
- Understand the functioning of gantry girder for different types of loads

FINAL EXAMINATION PATTERN: The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions on design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

Note: The students should prepare the following plates.

Plate 1 Detailing of simple beams

Plate 2 Detailing of Compound beams including curtailment of flange plates.

Plate 3 Detailing of Column including lacing and battens.

Plate 4 Detailing of Column bases – slab base and gusseted base

Plate 5 Detailing of steel roof trusses including particulars at joints.

Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.

Codes/Tables: IS-800 code books and Structural Steel Tables are to be permitted into the examination Hall.

I S Codes:

1) Indian Standard Code for General Construction in Steel, 3rd revision, Indian Standards Institution, New Delhi, 2008.

2) IS – 875, Code of practice for design loads (other than earth quake) for buildings and structures (Part-1-Part 5), Bureau of Indian standards.

3) Steel Tables.

Text Books:

1. Design of Steel Structures by K.S.SaiRam
2. Limit State Design of Steel Structures by S.K. Duggal
3. Design of Steel Structures by Bhavikatti. IK INT Publication House

Reference Books:

1. Structural Design and Drawing by N.KrishnaRaju, University Press,Hyderabad.

2. Structural Design in Steel by SarwarAlamRaz, New Age International Publishers, NewDelhi
3. Steel Structures by Subramanyam.N, Oxford University press, NewDelhi
4. Design of Steel Structures by Edwin Gaylord, Charles Gaylord,JamesStallmeyer,Tata Mc.Graw-Hill, NewDelhi.

Codes/Tables: IS Codes:

- IS -800 – 2007
- IS – 875 – PartIII
- Steel Tables.
- Railway Design Standards Code. and steel tables to be permitted into the examination hall.

Course Outcomes:

At the end of this Course the student will be able to

- Explain relevant IS codes
- Analysis and design of flexural members and detailing
- Design compression members of different types with connection detailing
- Design Plate Girder and Gantry Girder with connection detailing
- Develop drawings pertaining to different components of steel structures

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE66- ENVIRONMENTAL ENGINEERING – LAB

L	T	P	C
0	0	2	1

Course Objectives: The objectives of the course are to make the students learn about

The laboratory provides knowledge of estimating various parameters like pH, Chlorides, Sulphates, Nitratesin water. For effective water treatment, determination of optimum dosage and chloride demand are also included. The estimation status of Industrial effluents will also be taught in the laboratory by estimating BOD and COD ofeffluent.

LIST OF EXPERIMENTS:

1. Determination of pH and Turbidity.
2. Determination of Conductivity.
3. Determination and Estimation of total solids, total volatile solids and total fixed solids.
4. Determination and Estimation of Total dissolved solids and Total suspended solids.
5. Determination of Alkalinity/Acidity.
6. Determination of Chlorides.
7. Determination of iron.
8. Determination of Nitrogen.
9. Determination of total Phosphorous.
10. Determination of Optimum coagulant dose – Jartest.
11. Determination of Chlorine demand.
12. Determination of Dissolved Oxygen.
13. Determination of B.O.D
14. Determination of C.O.D
15. Presumptive coliformtest.

NOTE: At least 8 of the above experiments are to be conducted.

LIST OF EQUIPMENT:

1. PH meter,
2. Turbidity meter,
3. Conductivity meter,
4. Hot air oven,
5. Mufflefurnace,
6. Dissolved Oxygen meter,
7. U – V visible spectrophotometer,
8. Reflux Apparatus,
9. Jar Test Apparatus,
10. BOD incubator.
11. COD Extraction apparatus

Text Books:

1. Chemistry for Environmental Engineering by Sawyer and Mc.Carty
2. Standard Methods for Analysis of water and Waste Water –APHA
3. Environmental Engineering Lab Manual by Dr.G.Kotaiah and Dr.N.KumaraSwamy, Charotar Publishers, Anand.

Course Outcomes:

At the end of this Course the student will be able to

- Estimate various parameters of water
- Assess quality of waste water parameters

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE64a- ADVANCED REINFORCED CONCRETE CONSTRUCTION

(Professional Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Course is designed to shape the concrete and use the steel bars for external loads on different building elements.
- To understand the codal recommendations for methods of design
- To analyze and design of various reinforced concrete structures like water tanks.
- Analysis and design of intz tank and its staging
- Raft foundation, corbels, underground and on ground circular water tanks, intz tank, bunkers and silos
- To analyze and design of Raft Foundations.
- To analyze and design of Pile Foundations

UNIT – I:

Elevated circular water tank (Working stress method) Introduction ; Design of elevated circular water tank

Learning Outcomes:

At the end of this unit, the student will be able to

- Have a good understanding of design of circular water tanks

UNIT – II:

Design of Intze tank (Working stress method) Calculation of dimensions; Design of top dome; Design of top ring beam ; Design of cylindrical all ; Design of bottom ring beam.

Learning Outcomes:

At the end of this unit, the student will be able to

- have a good understanding of design of intze water tanks and staging .

UNIT – III:

Design of R.C.C combined (Rectangular and Trapezoidal) and strap footings.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design RCC combined and strap footings

UNIT – IV:

Raft Foundations (Limit state method) Soil design; Design of slab; Design of beams

Learning Outcomes:

At the end of this unit, the student will be able to

- After completion of this unit student will
- analyse and design of Raft Foundations

UNIT – V:

Pile Foundations (Limit state method) Introduction; Loads on pile groups ; Soil design of a pile; Structural design of a pile

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyse and design of pile Foundations

Text Books:

- Reinforced concrete , Vol.1 & 2 by H. J. Shah, Charotar publishing house Pvt. Ltd, 2011.

Reference Books:

- RCC Designs by BC Punmia et.al. , 10th Edition, Laxmi Publications (P) Ltd. 2006.

Course Outcomes:

At the end of this Course the student will be able to

- Students can handle the isolated design of individual elements independently.
- Indian Standards of approach can be practiced by the student.
- Students can handle the analysis and design of rectangular and circular tanks.
- Students can handle the Raft foundation
- Students can handle the Pile Foundations

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE64b- GROUND IMPROVEMENT TECHNIQUES

(Professional Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- The knowledge on the problems posed by the problematic soils and the remedies to build the various structures in problematic soils.

UNIT – I:

DEWATERING: Methods of de-watering- sumps and interceptor ditches- single, multi stage well points - vacuum well points- Horizontal wells-foundation drains-blanket drains- criteria for selection of fill material around drains –Electro-osmosis.

GROUTING: Objectives of grouting- grouts and their properties- grouting methods- ascending, descending and stage grouting- hydraulic fracturing in soils and rocks- post grout test.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand methods of dewatering
- Study different types of dewatering and working criteria
- Understand methods of grouting
- Assess efficiency of grouting adopting different tests

UNIT – II: DENSIFICATION METHODS IN GRANULAR SOILS

In – situ densification methods in granular Soils – Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact atdepth.

DENSIFICATION METHODS IN COHESIVE SOILS:–

In – situ densification methods in Cohesive soils – preloading or dewatering, Vertical drains – Sand Drains, Sand wick geodrains – Stone and lime columns – thermal methods.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand methods of in-situ densification
- Study different types of drains for soil densification

UNIT – III:

STABILISATION: Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride, sodium silicate and gypsum.

Learning Outcomes:

At the end of this unit, the student will be able to

- Study different methods of stabilization of soils
- Study utilization of industrial wastes to stabilize soils

UNIT – IV:

REINFORCED EARTH: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.

GEOSYNTHETICS : Geotextiles- Types, Functions and applications – geogrids and geomembranes – functions and applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand principles of reinforced earth in ground improvement
- Study procedures for verification of stability of slopes.
- Utilization of advanced materials for ground improvement
- Compare different types of synthetic based soil stabilization material and understand performance

UNIT – V:

EXPANSIVE SOILS: Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand nature of expansive soils
- Study foundation techniques in expansive soils

Text Books:

- Perceive the knowledge of various methods of ground improvement and their suitability to different field situations.
- Design a reinforced earth embankment and check its stability.
- Understand the functions of Geo-synthetics and their applications in Civil Engineering practice.
- Understand the concepts and applications of grouting

Reference Books:

1. Haussmann M.R. (1990), Engineering Principles of Ground Modification, McGraw- Hill InternationalEdition.
2. Dr.P.Purushotham Raj. Ground Improvement Techniques, Laxmi Publications, New Delhi / University science press, NewDelhi
3. NiharRanajanPatra. Ground Improvement Techniques, Vikas Publications, NewDelhi

Course Outcomes:

At the end of this Course the student will be able to

1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional,Boca Taton, Florida,USA.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley andSons,
   New York, USA.
3. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy,USA

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE64c- TRANSPORTATION ENGINEERING

(Professional Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Introduce different transportation systems and their importance and their role in development
- Understand standards and norms of National and International organizations which are framed for efficient functioning of existing transport systems
- Impart Knowledge regarding the functioning of various components like rails, sleepers, Tracks, Geometric curves, Runways, Taxiways Aprons Wear houses, Jetties etc
- Design elements like horizontal curves, vertical curves, super elevation etc
- Analyze how signal systems ,visual aids and Markings etc help in safe working of transportation systems.

UNIT – I: Railway Engineering:

Introduction – Permanent Way Components – Cross Section Of Permanent Way – Functions And Requirements Of Rails, Sleepers And Ballast – Types Of Gauges – Creep Of Rails – Theories Related To Creep – Coning Of Wheels – Adzing Of Sleepers – RailFastenings.

Learning Outcomes:

At the end of this unit, the student will be able to

- Obtain Knowledge regarding different components of an railway track and its materials
- Can differentiate various types of gauge networks

UNIT – II: Geometric Design of Railway Track

Gradients – Grade Compensation – Cant And Negative Super Elevation – Cant Deficiency – Degree Of Curves – Safe Speed On Railway Track – Points And Crossings – Layout And Functioning Of Left Hand Turn Out And Right Hand Turn Outs – Station Yards – Signaling And Interlocking.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design railway network with proper alignment
- Will be able to overcome problems like super elevation, CANT, speeds on curves
- Can be possible to design points and crossings

UNIT – III: Airport Engineering

Airport Site Selection – Factors Affecting Site Selection And Surveys- Runway Orientation – Wind Rose Diagram – Basic Runway Length – Correction For Runway Length – Terminal Area – Layout And Functions – Concepts Of Terminal Building – Simple Building , Linear Concept, Pier Concept And Satellite Concept – Typical Layouts .

Learning Outcomes:

At the end of this unit, the student will be able to

- How a runway orientation affected by wind rose diagram
- Understand different terms present in an Airport
- Understand wind intensities and directions for designing runway

UNIT – IV: Geometric Design of Runways and Taxiways

Aircraft Characteristics – Influence of Characteristics on Airport Planning and Design – Geometric Design Elements of Runway – Standards and Specifications. As Per – Functions of Taxiways – Taxiway Geometric Design – Geometric Elements and Standard Specifications – Runway and Taxiway Lighting.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design runway in a aerodrome
- Understand functions of taxiway and design taxi way

UNIT – V: Ports, Docks and Harbours

Requirements of Ports And Harbors – Types of Ports – Classification of Harbors – Docks And Types of Docks – Dry Docks, Wharves And Jetties – Breakwaters: Layouts of Different Types of Harbors and Docks – Dredging Operations – Navigation Aids.

Learning Outcomes:

At the end of this unit, the student will be able to

- Differentiate between ports and harbours
- Differentiate types of break water structures to control water current
- Learn Different types of dredging operations

Text Books:

1. A Text Book Of Railway Engineering-S.C.Saxena And S.Arora, Dhanpatrai AndSons, New Delhi.
2. Transportation Engineering, Volume – II (Railways,Airports,Docks and Harbours,Bridges and Tunnels) by C.Venkataramaiah, Universities Press,Hyderabad.
3. Airport Planning And Design- S.K. Khanna And M.G Arora, NemchandBros.

Reference Books:

1. Satish Chandra AndAgarwal, M.M. (2007) "Railway Engineering" Oxford Higher Education, University Press NewDelhi.
2. Highway, Railway, Airport AndHarbour Engineering – K.P. Subramanian, Scitech Pubilishers.

Course Outcomes:

At the end of this Course the student will be able to

1. Gain knowledge regarding various specifications and standards set by organisations and official bodies.
2. Differentiate the working of various transport systems and their working in different scenarios
3. Understanding the functions of various components in Rail, Air, Water transport systems and their importance.
4. Capable of carrying out surveys needed to be done while constructing Railways Airports and seaports
5. Have a in depth knowledge on curve sections super elevations and many other design elements
6. Explain the working of various design elements used in different Transport systems
7. Calculate entities like maximum permissible loads on rails ,degree of curves, permissible speeds on various gauges etc

8. Prepare master plans for Airports, harbour site considering natural phenomenon and different harbour railway airport elements

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS11-COMPETITIVE & SPOKEN ENGLISH

(Open Elective-II) (Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To train students to use language effectively in everyday conversations and to participate in group discussions.
- To enable them to learn and practice competitive English and ready for competitive examinations.

UNIT – 1: Grammar

Sentences-Construction-Types-Affirmative-Interrogative-Nouns-Pronouns-Verbs-Models-Tenses-Adverb-Adjective-Speech-Voice-Articles-Prepositions-Conjunctions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Students will improve their speaking ability in English both in terms of fluency and comprehensibility by enlarging their vocabulary. **L1**
- Students will attain and enhance competence in the four modes of literacy: listening, speaking, reading and writing **L2**

UNIT – II: Vocabulary

Content of the Unit – II

Competitive Vocabulary List-Word Building Tips- Antonyms-Synonyms-One word Substitutes-Idioms and Phrases-Phrasal Verbs-Reading Comprehension-importance- tips- Cracking unknown passage.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the factors that influence use of grammar and vocabulary in speech and writing **L1**
- Comprehend the meaning of paragraphs and unknown passages **L2**

UNIT – III: Speaking Skills

Dynamics of Speaking-Communication Skills -Public Speaking- Significance to Professionals- establishing credibility & Confidence- Preparation of Speech-Audience-Analysis -Topic generation Techniques.

Learning Outcomes:

At the end of this unit, the student will be able to

- Display competence in oral, written and visual communication **L1**
- Showan understanding of opportunities in the field of communication **L2**

UNIT – IV: Stage Dynamics

Organization of Speech- Platform Manners- Body language- Psychology of Persuasion- Speeches for Special Occasions-exercises-Recording and feedback sessions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze your audience and design speeches to reflect your analysis. **L1**
- Evaluate speeches based on a variety of verbal and non-verbal criteria. **L2**

UNIT – V:Accent Neutralization

Realization of past tense and plural forms- Stress Rules– Intonation- Connected speech- weak forms-assimilation-elision- Linking and Intrusion-juncture-contractions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Able to identify which are stressed and unstressed words. **L1**
- Reproduce in speech, appropriate pattern of intonation and rhythm. **L2**

Reference Books:

1. Hari Mohan Prasad, ***Objective English for Competitive Examination,*** Tata McGraw Hill, New Delhi, 2014.
2. V SASIKUMAR and PV DHAMIJA ***: SPOKEN ENGLISH A Self- Learning Guide to Conversation Practice***, 2nd Edition, TATA McGRAW-HILL'S SERIES.
3. M.Sambaiah, ***Technical English***, Wiley publishers India. New Delhi. 2014.
4. JK GANGAL, A PRCACTICAL COURSE IN EFFECTIVE ENGLISHSPEAKING SKILLS, PHI LEARNING Private Ltd. New Delhi. 2012
5. KRISHNA MOHAN and N.P. SINGH,***SPEAKING ENGLISH EFFECTIVELY,*** 2nd Edition, Trinity Press, 2015.
6. Wren and Martin,***High School English Grammar and Composition,*** S. Chand Publication, New Delhi, 2014.
7. Neetu Singh, ***English for General Competitions from Plinth To Paramount*** *(Volume-I&II),*Paramount Reader Publications, 2014.
8. Dale Carnegie,***The Quick And Easy Way To Effective Speaking***, Vermilion Publications, 1990.
9. E Suresh Kumar. ***Effective Publish Speaking***, Orient Longman, 2016.

Course Outcomes:

At the end of this Course the student will be able to

- Becoming active participants in the learning process and acquiring proficiency in spoken English of the students. **L1**
- Speaking with clarity and confidence thereby enhancing employability skills of the students. **L2**
- Participate in critical conversations and prepare, organize and deliver in public contexts **L3**
- Improving their speaking ability in English both in terms of fluency and comprehensibility **L4**
- Equipped with competitive proficiency in English for various competitive examinations at state, national and international level. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS23-INTEGRAL TRANSFORMS AND ITS APPLICATIONS

(Open Elective -II) (Common To All Branches)

L	T	P	C
3	0	0	3

Course Objectives: This course aims at providing the student

- With the concepts and several methods of integral transforms and its applications.
- The concepts of fractional calculus and its applications.

UNIT – 1: Basic concepts of integral transforms:: Fourier transforms: 9 Hrs

Introduction, basic properties, applications to solutions of Ordinary Differential Equations (ODE), Partial Differential Equations (PDE) and Integral Equations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve ordinary differential equations and partial differential equations. **L3**
- Solve Integral equations. **L3**

UNIT – II: Laplace transforms:

Introduction, existence criteria, Convolution, differentiation, integration, inverse transform, Tauberian Theorems, Watson's Lemma, solutions to ODE, PDE including Initial Value Problems (IVP) and Boundary Value Problems (BVP).

Applications of joint Fourier-Laplace transform, definite integrals, summation of infinite series, transfer functions, impulse response function of linear systems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve initial and boundary value problems using Laplace transform technique. **L3**
- Apply the techniques of joint Fourier-Laplace transform techniques. **L4**

UNIT – III: Hankel Transforms & Hilbert Transforms

Hankel Transforms: Introduction, properties and applications to PDE Mellin transforms: Introduction, properties, applications; Generalized Mellin transforms.

Hilbert Transforms: Introduction, definition, basic properties, Hilbert transforms in complex plane, applications; asymptotic expansions of 1-sided Hilbert transforms.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve PDE by using the concepts of Hankel transforms. **L4**
- Learn the concepts of Hilbert transforms. **L3**

UNIT – IV: Stieltjes Transform, Legendre transforms and Radon transforms

Stieltjes Transform:

Definition, properties, applications, inversion theorems, properties of generalized Stieltjestrans form.

Legendre transforms:

Introduction, definition, properties, applications.

Radon transforms:

Introduction, properties, derivatives, convolution theorem, applications, inverse radon transform.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyzes the Stieltje's and Legender's transforms. **L4**
- Analyzes random transforms and focuses on thier applications. **L3**

UNIT – V: Fractional Calculus and its applications & Integral transforms in fractional equations

Fractional Calculus and its applications: Introduction, fractional derivatives, integrals, Laplace transform of fractional integrals and derivatives.

Integral transforms in fractional equations: fractional ODE, integral equations, IVP for fractional Differential Equations (DE), fractional PDE, green's function for fractional DE.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the basic concepts of fractional calculus. **L2**
- Applies the concepts of integral transforms in fractional calculus. **L4**

Text Books:

11. Advanced Topics in Applied Mathematics for Engg. & physical Science: Sudhakar Nair
12. Introduction to Applied Mathematics, Gilbert Strang

Reference Books:

16. Fractional Calculus Theory and Applications of Differentiation and Integration to Arbitrary Order: J. Spanier and K. B. Oldham
17. Handbook of Mathematical Functions: M. Abramowitz & I. Stegun

Course Outcomes:

At the end of this Course the student will be able to

- Use the basic concepts of integral transforms, Stieltjes Transform, Legendre transforms and Radon transforms etc., in real life problems. **L1**
- Use the concepts of Laplace transforms in solving the initial value and boundary value problems. **L2**
- Applies the concepts of Hankel Transforms & Hilbert Transforms while addressing the various problems related to engineering sciences. **L3**
- Analyze the problems in engineering and technology using various techniques of integral transforms and applications. **L4**
- Uses the ideas of fractional calculus and its applications in solve the real world problems. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS24-NUMERICAL ANALYSIS

(Open Elective -II)(Common To All Branches)

L	T	P	C
3	0	0	3

Course Objectives: This course aims at providing the student

- With the concepts and several methods of Numerical methods.
- To explore the solutions of ordinary differential equations, partial differential equations and integral equations.

UNIT – 1: Solution of Algebraic and Transcendental equations & Solution to System of Nonlinear Equations and Spline Functions
9 Hrs

Solution of Algebraic and Transcendental equations:

Ramanujan's method – Secant method – Muller's method – Graeffe's root-squaring method – Lin-Bairstow's method – Quotient-Difference method

Solution to System of Nonlinear Equations and Spline Functions:

Method of Iteration- Newton-Raphson method. Linear splines - Quadratic splines – Cubic splines : Minimizing property of Cubic splines – Error in the Cubic Spline ad its derivatives – Surface fitting by cubic splines. – Cubic B-Splines: Representation of B- Splines – Least squares solution – Applications of B-Splines.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve the algebraic and transcendental equations **L2**
- Solve the system of nonlinear equations and spline functions. **L4**

UNIT – II: Numerical Linear Algebra:

Triangular matrices – LU decomposition of a matrix – vector and matrix norms. – Solutions of linear systems –Direct methods: Gauss elimination – necessary for pivoting – Gauss-Jordan method – modification of the Gauss method to compute the inverse – number of arithmetic operations – LU decomposition method – computational procedure for LU decomposition method – Lu decomposition from Gauss elimination – solution of tridiagonal systems – III conditioned linear systems – Method for III- conditioned systems. – Solution of linear systems –Iterative methods. – Matrix Eigen value problems – Eigen values of a symmetric tridiagonal matrix – Householder's method – QR method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of numerical linear algebra. **L1**
- Apply the concepts of numerical linear algebra. **L3**

UNIT – III: Numerical solution of ordinary differential equations:

Solution by Taylor's series, Picard's method,Euluer's method , Runge-Kutta methods, Predictor-Corrector methods: Adams-Moulton method – Milne's method. – Cubic Spline method – Simultaneous and higher order equations. – Boundary value problems: Finite difference method – Cubic Spline method – Galerkin's method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve first order initial value problems. **L3**
- Solve ssimultaneous and higher order equations and boundary value problems. **L4**

UNIT – IV: Numerical solution of Partial differential equations:

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve Laplace's equation using finite difference technique. **L3**
- Solve Heat equation and wave equation. **L4**

UNIT – V: Numerical solution of Integral equations:

Numerical methods for Fredholm equations: Method of degenerate Kernels – method of successive approximations – Quadrature methods – use of Chebyshev series – cubic Spline method – singular Kernels – method of invariant imbedding.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply numerical methods for solving Fredholm equations. **L3**
- Analyzes cubic Spline method, singular Kernels – method of invariant imbedding etc. **L4**

Text Books:

13. S. S. Sastry, Introductory Methods of Numerical Analysis(Fifth Edition 2012), PHI Learning Private Limited, New Delhi.

Reference Books:

1. M.K.Jain,S.R.K.Iyengar, R.K.Jain, Numerical Methods for Scientific and Engineering Computation (sixth edition),Nee Age International(P) Limited, Publishers, New Delhi.
2. K.E. Atkinson, An Introduction to Numerical Analysis, Wiley, 1989.S.D. Conte and C. De Boor, Elementary Numerical Analysis 302226 An Algorithmic Approach, McGraw-Hill, 1981.
3. K. Eriksson, D. Estep, P. Hansbo and C. Johnson, Computational Differential Equations, Cambridge Univ. Press, Cambridge, 1996.
4. G.H. Golub and J.M. Ortega, Scientific Computing and Differential Equations: An Introduction to Numerical Methods, Academic Press, 1992.
5. J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, 2nd ed., Texts in Applied Mathematics, Vol. 12, Springer Verlag, New York, 1993.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the need of numerical methods in solving engineering problems of various fields. **L1**
- Learn various numerical techniques to solve initial and boundary value problems. **L2**
- Apply various methods in solving initial and boundary value problems **L3**
- Emphasizes the numerical solutions of Integral equations. **L4**
- Analyze the problems in engineering and technology using various techniques of Numerical methods. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS25-OPTIMIZATION TECHNIQUES

(Open Elective -II) (Common To All Branches)

L	T	P	C
3	0	0	3

Course Objectives: This course aims at providing the student

- With the basic concepts and several methods of optimization.
- With the concepts of geometric programming & constrained minimization problems.

UNIT – 1: Linear programming I : Simplex Method

9 Hrs

Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve the problems related to linear programming. **L3**
- Lear the simplex method and two phase simplex method. **L3**

UNIT – II: Linear programming II : Duality in Linear Programming

Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the dual relations and duality theorem **L2**
- Solve transportation problem and assignment problem. **L4**

UNIT – III: Non-linear programming: Unconstrained optimization techniques & Direct Search Methods

Non-linear programming: Unconstrained optimization techniques: Introduction: Classification of Unconstrained minimization methods

Direct Search Methods: Random Search Methods: Random jumping Method, Random Walk method. Grid Search Method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify Unconstrained minimization methods and direct search methods. **L2**
- Apply the unconstrained minimization methods and direct search methods **L3**

UNIT – IV: Non-linear programming: Constrained optimization techniques

Introduction , Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Constrained optimization techniques.

L2

- Solve nonlinear programming problems.

L3

UNIT – V: Geometric Programming & Constrained minimization Problems

Geometric Programming:

Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.

Constrained minimization Problems :

Solution of a constrained geometric programming problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.**L3**
- Solve Solution of a constrained geometric programming problem, primal-dual programming.

L4

Text Books:

14. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.

Reference Books:

1. Chong, E.K.P.and Zak, S. H.. An Introduction to Optimization, John Wiley & Sons, N.Y.
2. Peressimi A.L., Sullivan F.E., Vhl, J.J..Mathematics of Non-linear Programming, Springer – Verlag.

Course Outcomes:

At the end of this Course the student will be able to

- Remembers the concepts of linear programming problems.**L1**
- Understand various techniques of linear programming problems.**L2**
- Solve constrained and unconstrained linear programming problems.**L3**
- Analyzes geometric programming using differential calculus and arithmetic-geometric inequality.**L4**
- Analyze optimization problems that occur in real world in engineering and technology using various elegant optimization techniques.**L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

19ABS33-FUNCTIONAL NANOMATERIALS FOR ENGINEERS

(Open Elective-II) (Common to All Branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To learn and understand the fundamental concepts of functional/smart nanomaterials.
- To understand the classification and important applications of functional materials
- To learn and understand the materials utilized for energy applications
- To learn and understand the principle and applications of nanosensors
- To understand the concept of self-assembling molecular layers and its applications

UNIT – I: INTRODUCTION TO FUNCTIONAL /SMART NANOMATERIALS 9 Hrs

Introduction: Nanomaterials and their importance (in brief), Functional/ Smart Nanomaterials, – (Hydrogels, polymer brushes, Carbon nanotubes, Cellulose),Functionalization techniques, Properties of Smart materials (Sensing materials, Actuation materials, Control devices, Self-detection, self-diagnostics, Self-corrective, self-controlled, self-healing, Shock Absorbers, Damage arrest)-components of smart systems (Sensor :- Data Acquisition, Data Transmission; Command and control unit, Actuator:- Data Instructions, Action Devices)

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic properties and fictionalization of smart nanomaterials **L1**
- Explain the need of functional/smart nanomaterials for advanced technology **L2**
- Identify engineering applications of sensors **L3**
- Analyze the sensing, control and detection mechanism in smart nanomaterials **L4**
- Illustrate the components of smart systems **L2**

UNIT – II: CLASSIFICATION AND APPLICATIONS 9 Hrs

Classification of smart materials (piezoelectric, electrostrictive, Magnetostrictive, Thermoresponsive, Electrochromic and Smart gels), Shape Memory Alloys and their working principle, Quantum Tunneling Composites and their working principle, Applications of smart materials in Aircrafts, Medicine, Robotics, Smart fabrics, Sporting goods and smart glass, Merits and demerits of smart materials.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify smart materials based on electrical, magnetic and thermal characteristics **L1**
- Understand the basic concepts and working principle of memory alloys **L2**
- Identifies the Engineering applications of smart materials **L2**
- Apply the concepts to Aircrafts, Medicine and Robotic fields **L3**
- Explain the working principle of Quantum Tunneling Composites **L2**
- Identify the Merits and demerits of smart materials in engineering field **L2**

UNIT – III: NANOSENSORS

Introduction, Sensor definition, Working principle of nanosensors, Types of nanosensors (Physical nanosensors – Pressure, Force, Mass, Displacement, Optical nanosensors – Proximity, Ambient light, Chemical nanosensors- Chemical composition, Molecular concentration). Applications of nanosensors (Medicine, Aerospace, Communication, Structural Engineering).

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the working principle and concept of nanosensors **L1**
- Classify the nanosensors based on their working principle and application **L2**

- Summarize various types of nanosensors **L2**
- Explain the applications of nanosensors in various fields **L2**
- Apply the concept of nanosensors in Medicine, Aerospace, Communication, Structural Engineering fields **L3**

UNIT – IV: SELF-ASSEMBLING MOLECULAR LAYERS **9Hrs**

Introduction, principles of self-assembly, monolayers, Characteristics of Self assembled monolayers (SAMs), Molecular SAMs, Types of SAMs, Factors influencing Monolayer order, methods of preparation (Langmuir- Boldgett film : Mechanism, Experimental arrangement, Assembly, Advantages and disadvantages of LB films) patterning of SAMs (Locally attract, Locally remove, Modify tail group). Applications (Self-cleaning and moisture repellent).

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concept of self-assembling **L1**
- Understand the significance of molecular layers **L2**
- Explain the concept of Langmuir- Boldgett film preparation **L2**
- Explain the important factors influencing Monolayer order **L2**
- Classify the materials based on patterning of SAMs **L2**
- Apply the concept of Self-cleaning and moisture repellent **L3**

UNIT – V: NANOMATERIALS FOR ENERGY APPLICATIONS

Introduction, **Solar Cells** (Silicon Solar Cells, Thin film Solar Cells, Organic Solar Cells - Dye Sensitized Solar Cells, Polymer solar cells) Working Principle, Efficiency estimation and advantages, **Hydrogen Fuel Cells** – Working Principle, Structure, Assembly of fuel cell, **Water splitting** – H_2 Production, Photocatalytic process.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concept of solar cell **L1**
- Classify the solar cells based on manufacturing material **L2**
- Explain the construction and working principle of solar cell **L2**
- Interpret the efficiency and advantages in various solar cells **L2**
- Explain the construction and working principle of hydrogen cells **L2**
- Identify applications of water splitting for H_2 production **L2**
- Explain the photocatalytic process **L2**

Text Books:

15. YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2012

16. E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

Reference Books:

18. Gauenzi,P.,Smart Structures, Wiley, 2009.

19. MahmoodAliofkhazraei, Handbook of functional nanomaterials, Vol (1&2), Nova Publishers, 2014.

Course Outcomes:

At the end of this Course the student will be able to

- Identify the various functional/smart nanomaterials materials **L1**
- Classify the smart nanomaterials based their applications and properties **L2**
- Apply the various functional nanomaterials in various applications **L3**

UNIT – IV:SPECTROSCOPY TECHNIQUES **9Hrs**

Principle, Experimental arrangement, Analysis and Advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the principle and experimental arrangement of spectrometers **L1**
- Understand the analysis and advantages of the spectroscopic techniques **L2**
- Explain the concept of UV-Visible spectroscopy **L2**
- Explain the principle and experimental arrangement of Raman Spectroscopy **L2**
- Explain the principle and experimental arrangement of Fourier Transform infrared (FTIR) spectroscopy **L2**
- Explain the principle and experimental arrangement of X-ray photoelectron spectroscopy (XPS) **L2**

UNIT – V: ELECTRICAL & MAGNETIC CHARACTERIZATION TECHNIQUES

Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID (Superconducting Quantum Interference Device)

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the various types of electrical properties analysis techniques **L1**
- Classify the solar cells based on manufacturing material **L2**
- Explain the effect of magnetic field on the electrical properties **L2**
- Analyze the magnetization by using induction method **L2**
- Explain the construction and working principle of VSM **L2**
- Explain the construction and working principle of SQUID **L2**

Text Books:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2008
2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008.

Reference Books:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine M. McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity & Stuart R Stocks, Prentice Hall ,2001 – Science.

Course Outcomes:

At the end of this Course the student will be able to

- Identify the various characterization techniques **L1**
- Classify the characterization techniques based on their applications and properties **L2**
- Apply the various characterization techniques for materials characterization. **L3**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS44-Green Chemistry and Catalysis for sustainable Environment

(Open Elective-II) (Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry and the redesign of chemicals, industrial processes and products

Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

UNIT – 1: Principles and concepts of green chemistry **9 Hrs**

Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic reactions: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply the Green chemistry Principles for day to day life as well as synthesis L3
- Describe the sustainable development and green chemistry L2
- Explain economic and un-economic reactions L2
- Demonstrate Polymer recycling L2

UNIT – II: : Catalysis and green chemistry **10Hrs**

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal ion Catalysis, Organo-catalysis, Greener Lewis Acids, Asymmetric Catalysis, Phase transfer catalysis: Hazard Reduction, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries L2
- Differentiate Homogeneous and Heterogeneous catalysis L2
- Identify the importance of Bio and Photo Catalysis L3
- Discuss Transition metal and Phase transfer Catalysis L3

UNIT – III: Organic solvents: environmentally benign solutions **7 Hrs**

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbon dioxide, super critical water and water as a reaction solvent: water based coatings, Ionic liquids as catalysts and solvents

Learning Outcomes:

At the end of this unit, the student will be able to

- Demonstrate Organic solvents and importance of solvent free systems L3

- Discuss Super critical carbondioxide L2
- Explain Super critical water and water as a reaction solvent L2
- Interpret Ionic Liquids as Catalyst and Solvent L2

UNIT – IV: Emerging greener technologies and alternative energy sources **8 Hrs**

Biomass as renewable resource, solar power, other forms of renewable energy, introduction and applications of Fuel Cells, Chemicals from Renewable feedstocks: Chemicals from Fatty Acids, Polymers from Renewable Resources. The Syngas Economy, The Bio-refinery, Design for energy efficiency: Photochemical Reactions and Examples, advantages and Challenges.
Microwave-assisted Reactions-examples and applications, sono-chemical reactions- examples and applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe importance of Biomass and Solar Power L2
- Illustrate Sonochemistry and Green Chemistry L2
- Apply Green Chemistry for Sustainable Development L3
- Discuss the importance of Renewable resources L3

UNIT – V: Green processes for green nanoscience **8 Hrs**

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing nanoscience. Green Synthesis of nanophase inorganic materials and metal oxide nanoparticles: microwave-assisted synthesis, green synthesis of metal and metal oxide nanoparticles, green chemistry applications of inorganic nanomaterials

Learning Outcomes:

At the end of this unit, the student will be able to

- Discuss green Chemistry Principles for practicing Green nano synthesis L3
- Illustrate Microwave Assisted Synthesis L2
- Differentiate Hydrothermal and Reflux synthesis L2
- Demonstrate Green Chemistry applications of Inorganic nanomaterials L2

Text Books:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA, 1997.

Reference Books:

1. Sanjay K. Sharma and AckmezMudhoo, Green Chemistry for Environmental Sustainability, First Edition, , CRC Press, 2010.
2. AlvisePerosa and Maurizio Selva, Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH, 2013

Course Outcomes:

At the end of this Course the student will be able to

- Apply the Green chemistry Principles for day to day life as well as synthesis for sustainable development. L3
- Differentiate Homogeneous and Heterogeneous catalysis L2
- Demonstrate Organic solvents and importance of solvent free systems L2
- Describe importance of Biomass and Solar Power for green environment. L2
- Discuss green Chemistry Principles for practicing Green nano synthesis using Microwave Assisted technique. L3

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS45-Chemistry of Nanomaterials and applications

(Open Elective-II) (Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To understand synthetic principles of Nanomaterials by various methods
- And also characterize the synthetic nanomaterials by various instrumental methods
- To enumerate the applications of nanomaterials in engineering

UNIT – 1: Introduction to nanoscience **8 Hrs**

Introduction**,** importance of nanomaterials, nanoscience in nature, classification of nanostructured materials, properties, scope of nanoscience and nanotechnology& applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify the nanostructure materials **L2**
- Describe scope of nanoscience and technology **L2**
- Explain different synthetic methods of nanomaterials **L2**
- Identify the synthetic methods of nanomaterial which is suitable for preparation of particular material **L3**

UNIT – II: : Synthesis of nanomaterials **10 Hrs**

Bottom-Up approach**:-** Sol-gel synthesis, micro emulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis.

Top-Down approach:- Arc discharge Plasma arc method, aerosol synthesis, ion sputtering, laser pyrolysis, laser ablation, chemical vapour deposition method, electro deposition method, and high energy ball milling.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe the top down approach **L2**
- Explain aerosol synthesis and plasma arc technique **L2**
- Differentiate chemical vapour deposition method and electrodeposition method **L2**
- Discuss about high energy ball milling **L3**

UNIT – III: Characterization nanomaterials **7 Hrs**

Techniques for characterization: Dynamic light scattering for particle size determination, Diffraction technique, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis

Learning Outcomes:

At the end of this unit, the student will be able to

- Discuss different technique for characterization of nanomaterial **L3**
- Explain electron microscopy techniques for characterization of nanomaterial **L3**
- Describe BET method for surface area analysis **L2**
- Apply different spectroscopic techniques for characterization **L3**

UNIT – IV: Structural studies of nanomaterials **8 Hrs**

Properties of nanomaterials: fullerenes, carbon nanotubes, core-shell nanoparticles. Nano-crystalline materials, magnetic nanoparticles and important properties in relation to nano-magnetic materials, thermoelectric materials, non-linear optical materials, liquid crystals

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain synthesis and properties and applications of nanaomaterials **L2**
- Discuss about fullerenes and carbon nanotubes **L3**
- Differentiate nanomagnetic materials and thermoelectric materials **L2**
- Describe liquid crystals **L2**

UNIT – V: Applications of Nanomaterials **7 Hrs**

Engineering, medicine, aerospace applications of nanomaterials

Learning Outcomes:

At the end of this unit, the student will be able to

- Illustrate applications of nanaomaterials **L2**
- Discuss the magnetic applications of nanomaterials **L3**
- List the applications of non-linear optical materials **L1**
- Describe the applications fullerenes, carbon nanotubes **L2**

Text Books:

1. **NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007**
2. **Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, BaldevRai, BB Rath and James Murday, Univ. Press, 2012**

Reference Books:

1. Ludovico Cademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Concepts of Nanochemistry; Wiley-VCH, 2011.
2. Guozhong Cao, Nanostructures & Nanomaterials; Synthesis, Properties & Applications: Imperial College Press, 2007
3. C. N. R. Rao, Achim Muller, K.Cheetham, Nanomaterials Chemistry, , Wiley-VCH, 2007

Course Outcomes:

At the end of this Course the student will be able to

- Understand the state of art synthesis of nano materials **L1**
- Characterize nano materials using ion beam, scanning probe methodologies, position sensitive atom probe and spectroscopic ellipsometry. **L2**
- Analyze nanoscale structure in metals, polymers and ceramics **L3**
- Analyze structure-property relationship in coarser scale structures **L3**

- Understand structures of carbon nano tubes **L1**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ABS46-Environmental Management and Audit

(Open Elective-II) (Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- To make the student understand evolution of LCA, stages in product LCA, procedure and applications for LCA.
- To understand the EMS core elements, benefits, certification, ISO 14000 series, evolution, principles, structure.
- To impart knowledge on environmental monitoring, modelling, technology assessment, risk assessment.
- Understand necessity of environmental design, principles, benefits, strategies.
- To understand types of audit, general audit methodology, audit process and apply the various domestic, industrial activities.

UNIT – 1: Life Cycle Assessment (LCA): 8 Hrs

Evolution, stages, a code of good conduct for LCA, procedure for LCA-goal and scope, analyzing the inventory, assessing the environmental impact, evaluating environmental profiles, applications in government & private Sector

Learning Outcomes:

At the end of this unit, the student will be able to

- Illustrate code of good conduct for LCA **L2**
- Discuss scope, analyzing the inventory and assessing the environmental impact **L3**
- List evolution and stages of LCA **L1**
- Describe the applications in government & private Sector **L2**

UNIT – II: Environmental Management System Standards: 8 Hrs

Environmental Management Systems – Core Elements, benefits, certification and documentation, EMS Standards – ISO 14000 series – evolution, principles, structure, supporting systems, specification standards, implementation and benefits of Implementing

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain Environmental Management Systems **L3**
- Describe EMS Standards – ISO 14000 series **L2**
- Apply Environmental Management Systems for certification and documentation **L3**

UNIT – III: Environmental Monitoring, Modeling& Risk Assessment 8 Hrs

Forecasting & Growth modeling, sensitivity Analysis, Applications of remote sensing and GIS, Environmental technology Assessment. Environmental risk assessment in industry, ecosystem approach to risk assessment, Eco-Mapping, Environmental Education

Learning Outcomes:

At the end of this unit, the student will be able to

- Illustrate Applications of remote sensing and GIS in Environmental assessment **L2**
- Discuss environmental risk assessment in industry **L3**
- List ecosystem approach to risk assessment, Eco-Mapping, Environmental Education **L1**

UNIT – IV: Environmental Design & Economics **10 Hrs**

Principles, Benefits, Motivation, ED for manufactured products- Considerations in product life stages, Tools for products, Eco-labelling, ED for Building – Principles and Strategies for green building construction, ED for development and planning.

Economics and Environment -environmental cost, benefits, taxes, accounting, environmental Valuation – categorization and valuation techniques.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe principles, benefits and motivation of environmental Design for manufactured products **L2**
- Explain principles and Strategies for green building construction **L2**
- Differentiate ED for Building cost, benefits and taxes **L2**
- Discuss about categorization and valuation techniques w.r.t economics and environment **L3**

UNIT – V: Environmental Auditing **8 Hrs**

Objectives, Scope, types, Basic structure and steps of EA, Elements of Audit process – What, Who, Why, How, Waste audits, EA in industrial projects, Liability audit and site assessment.

Learning Outcomes:

At the end of this unit, the student will be able to

- Illustrate Basic structure and steps of environmental auditing **L2**
- Discuss environmental auditing in industrial projects in terms of liability audit and site assessment **L3**
- List Scope and types environmental auditing **L1**

Text Books:

1. Environmental Management, Vijay Kulkarni & T. V. Ramachandra, Capital Publishing Company, New Delhi, 2006.
2. Concepts of Environmental Management for Sustainable Development, M.C. Dash, Wiley Publications, 2019.

Reference Books:

1. Ajith Sankar, Environmental Management, OXFORD publications, 2015
2. Ni Bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, Tata McGraw-Hill Publications, 2006.
3. Gary Skinner, Ken Crafer, **Environmental Management,** , Cambridge, IGCSE, 2017

Course Outcomes:

At the end of this Course the student will be able to

- Classify the stages in LCA with goal and procedures **L2**
- Describe the structure of EMS, Explain benefits of EMS, Differentiate core elements of EMS, Discuss about certification of ISO 14000 series. **L2**
- Discuss Forecasting & Growth modeling and Ecosystem Approach to Risk Assessment and Environmental Education. **L3**
- Explain Principles and Strategies for green building construction. **L2**
- Illustrate Objectives, Scope of Environmental auditing, elements of Audit process, liability audit and site assessment. **L2**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE65a- ENERGY CONSERVATION & MANAGEMENT

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation Techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient Technologies.

UNIT – I: **09 Hrs**

Basic Principles of Energy Audit and management Energy audit – Definitions – Concept– Types of audit – Energy index – Cost index – Pie charts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – Numerical problems – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions – Language – Questionnaire – Check list for top management.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about various types of Energy Audit **L1**
- To know about various types of Energy conservation schemes and Energy Manager functions **L2**

UNIT – II: **09 Hrs**

Lighting Modification of existing systems – Replacement of existing systems – Priorities: Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level – Illumination of inclined surface to beam – Luminance or brightness – Types of lamps – Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about various Lighting systems and types of lamps. **L1**
- To evaluate illumination level Illumination of inclined surface to beam and Design of Energy efficient lighting systems. **L2**

UNIT – III: **09 Hrs**

Power Factor and energy instruments Power factor – Methods of improvement – Location of capacitors – Power factor with non linear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters – Tong testers – Power analyzer.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about various Methods of Power Factor improvement **L1**
- To know about various Energy Instruments **L3**

UNIT – IV: **09 Hrs**

Space Heating and Ventilation Ventilation – Air–Conditioning (HVAC) and Water Heating: Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning – Insulation–Cooling load – Electric water heating systems – Energy conservation methods

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about analysis of Heating and HVAC **L1**
- To know about Energy conservation methods **L2**

UNIT – V: **09 Hrs**

Economic Aspects and Analysis Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts).Computation of Economic Aspects Calculation of simple payback method – Net present worth method – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about basic concept of Analysis of Economics and different methods **L1**
- To know about Computation of Economic Aspects Calculation **L2**

Text Books:

7. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
8. Energy efficient electric motors by John.C.Andreas, Marcel Dekker Inc Ltd-2nd edition,1995.

Reference Books:

10. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
11. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1stedition, 1998.
12. Energy management hand book by W.C.Turner, John wiley and sons.
13. Energy management and conservation –k v Sharma and pvenkata seshaiah-I K International Publishing House pvt.ltd, 2011.
14. http://www.energymanagertraining.com/download/Gazette_of_IndiaP art IISecI-37_25-08-2010.pdf

Course Outcomes:

At the end of this Course the student will be able to

- Explain energy efficiency, conservation and various technologies. **L1**
- Design energy efficient lighting systems. **L2**
- Calculate power factor of systems and propose suitable compensation techniques. **L3**
- Explain energy conservation in HVAC systems. **L4**
- **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE65b- PLC AND ITS APPLICATIONS

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The student will be able to:

- Understand the basic functions and types of PLCs
- Get exposure of Easy Veep software, its applications
- Classification of PLCs and applications
- Programming using PLCs
- Troubleshooting aspects using PLCs

UNIT – I: Introduction

Basic functions of PLCs, Mechanical relays versus PLC, Different types of PLC's – Allen- Bradley – Micrologix: ML1000, ML1100, SLC500, Compact Logix, Mitsubishi FX series, HMI's, Processor and I/O cards

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand about basic functions of PLCs & classification of PLCs **L1**
- To distinguish between PLCs and Mechanical relays **L2**
- To know about Processor and I/O cards

UNIT – II: 10 Hrs

Introduction to Easy Veep software, Link between mechanical, electrical and programming documentation, Logic diagrams, Flip-Flop Logic, M8000, M8001 internal bits interpretation, Binary code, data table, manipulation and search engine in Mitsubishi environment Communication between PC and PLC, Communication between PC and HMI, PLC and HMI Serial Local network, Introduction to SLC500

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about Easy Veep software & about Logic diagrams **L1**
- To understand about Search engine & interfacing of PC and PLCs **L2**

UNIT – III: PLC software and applications 10 Hrs

Boolean algebra – understanding binary code, ADD and SUB functions, UP and Down Counters, Introduction to k1Y0, MOV function, CPR and ZCP functions, SHWT and SHRD instructions, Introduction to Absolutely Drum Instruction.

Allen Bradley PLC: Introduction to Rockwell Software, Hardware focus, Hardware considerations (Field wiring, Master Control Relay, VFD), Basic programming and applications, Cascade control – subroutine, Different programs.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about basic features of PLCs & various instructions of PLC **L1**
- To know about various PLC versions & understand about Cascade control and subroutines **L2**

UNIT – IV: Programming instructions 10 Hrs

Instructions and binary interpretation, Bit Instruction, Timers and counters, Comparison instructions, Programming Instructions – Math instructions, Move and Logical Instructions, Discussions of programming, communications for PLC-Robotic arm, Exercise of setup and monitoring

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about various Programming instructions & understand Math instructions in PLCs **L1**
- To know about Logical instructions & understand about Communications with PLC using set up and monitoring **L2**

UNIT – V: Analog and Digital parameters **10 Hrs**

Analog and Digital parameters by using SLC5/03-VFD-Panel Mate series 1700, Practical Troubleshooting, troubleshooting technique, Control system stability and tuning basics. Applications: Process to rewind, test, and integrate with extrusion process for wiring and fibre optic industries, Food industry – yeast, flour distribution and control. Process Medical equipment Industry – Gas analyzer, Leak tester (using CO2), plastic wrapping machines etc.

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about analog and digital parameters in certain PLCs & apply PLCs for control system stability aspects **L1**
- To know about troubleshooting techniques & identify few applications of PLCs in Science and Technology fields **L2**

Text Books:

9. Automating manufacturing systems with PLCs by Hugh Jack, 2010.
10. PLC Hand Book (Automation direct Siemens)

Reference Books:

15. Programmable Logic Controllers by R. Bliesener, F Ebel, Festo. Didactic publishers,2002.
16. Programmable Logic Controllers by W. Bolton, 4th Edition, Newnes, 2006.
17. Introduction to PLCs by Jay F. Hooper, 2nd Edition, Carolina Academic Press, 2006.

Course Outcomes:

At the end of this Course the student will be able to

- Understand different types of PLCs **L1**
- Understand the usage of Easy Veep software **L2**
- Understand the hardware details of Allen Bradley PLC **L3**
- Programming of PLCs **L4**
- Know about few applications of PLCs in different fields of Science and Technology **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE65c- SYSTEM RELIABILITY CONCEPTS

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- The Basic concepts, rules for combining probabilities of events, failure density and distribution functions.
- Evaluation of network Reliability / Unreliability and types of redundancies.
- Evaluation of network Reliability / Unreliability using conditional probability method.
- Expected value and standard deviation of Exponential distribution and Measures of reliability.
- Evaluation of Limiting State Probabilities of one, two component repairable models.

UNIT – I: Basic Probability Theory **09 Hrs**

Basic concepts – Rules for combining Probabilities of events – Failure Density and Distribution functions – Bernoulli's trials – Binomial distribution – Expected value and standard deviation for binomial distribution – Examples**.**

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about basic rules for probabilities of events **L1**
- Get detailed information about Probability of failure density and distribution Functions and obtain the expected value and standard deviation for binomial distribution. **L2**

UNIT – II: Network Modeling and Reliability Evaluation **09 Hrs**

Basic concepts – Evaluation of network Reliability / Unreliability – Series systems, Parallel systems, Series - Parallel systems, partially redundant systems – Types of redundancies - Evaluation of network Reliability / Unreliability using conditional probability method – Paths based and Cutset based approach – complete event tree and reduced event tree methods - Examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- How to find the Probability of success and failures of network using different approaches for series-parallel configurations. **L1**
- To find reliability / unreliability of complex systems using different methods **L2**

UNIT – III: Time Dependent Probability **09 Hrs**

Basic concepts – Reliability functions f(t), Q(t), R(t), h(t) – Relationship between these functions – Bath tub curve – Exponential failure density and distribution functions - Expected value and standard deviation of Exponential distribution – Measures of reliability – MTTF, MTTR, MTBF – Evaluation of network reliability / Unreliability of simple Series, Parallel, Series-Parallel systems - Partially redundant systems - Evaluation of reliability measure – MTTF for series and parallel systems – Examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of time domain functions and relationship between them. and obtain the expected value and standard deviation for exponential distribution. **L1**
- To obtain probabilistic measures for fully redundant and partially redundant configurations **L2**

UNIT – IV: Discrete Markov Chains & Continuous Markov Processes **09 Hrs**

Markov Chains: Basic concepts – Stochastic transitional Probability matrix – time dependent probability evaluation – Limiting State Probability evaluation – Absorbing states.
Markov Processes: Modeling concepts – State space diagrams – time dependent reliability evaluation of single component repairable model – Evaluation of Limiting State Probabilities of one, two component repairable models – Frequency and duration concepts – Frequency balance approach - Examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of Stochastic Transitional Probability Matrix, Limiting State Probability **L1**
- Understand the concept of Frequency balance approach. And To distinguish between Markov chains and Markov processes **L2**

UNIT – V: Multi Component & Approximate System Reliability Evaluation 09 Hrs

Recursive relation for evaluation of equivalent transitional rates– cumulative probability and cumulative frequency and 'n' component repairable model – Series systems, Parallel systems, Basic probability indices – Series, Parallel systems – Complex Systems– Cutset approach – Examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of recursive relation for evaluation of equivalent transitional rates. **L1**
- To know about computation of basic probability indices for series, parallel configurations **L2**

Text Books:

11. Reliability Evaluation of Engineering Systems by Roy Billinton and Ronald N. Allan, Reprinted in India B. S. Publications, 2007.
12. Reliability Engineering by E. Balagurusamy, Tata McGraw Hill, 2003.

Reference Books:

18. Introduction to Reliability Engineering by E. E. Lewis by Wiley Publications.
19. Reliability and Maintainability Engineering by Charles E. Ebeling, Tata McGraw Hill, 2000.
20. Reliability and Safety Engineering by Ajit Kumar Verma, SrividyaAjit and Durga Rao Karanki, Springer, Second Edition, 2016. System Reliability Theory Marvin Rausand and ArnljotHoyland, Wiley Publictions.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the concepts for combining Probabilities of events, Bernoulli's trial, and Binomial distribution. **L1**
- Network Reliability/Unreliability using conditional probability, path and cutest based approach, complete event tree and reduced event tree methods. **L2**
- Understanding Reliability functions and to develop relationship between these functions, expected value and standard deviation of Exponential distribution and measures of reliabilities. **L3**
- Analyze the time dependent reliability evaluation of single component repairable model, frequency and duration concepts, Frequency balance approach. **L4**
- `Recursive relation for evaluation of equivalent transitional rates, cumulative probability and cumulative frequency and 'n' component repairable model. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65a- AUTOMOBILE ELECTRONICS, SENSORS AND DRIVES

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Explain the use of electronics in the automobile.
- Explain the importance of various types of sensors and actuators in automotive electronics.
- Demonstrate the various control elements in Engine Management system.
- Familiarize with Vehicle management systems.
- Identify various electronic and the instrumentation systems used in automobile.

UNIT – 1: Introduction to microcomputer: **10 Hrs**

Microcomputer: Buses, memory, timing, CPU registers; Microprocessor architecture: Initialization, operation codes, program counter, branch and jump instructions, subroutine. Analog to digital converters and Digital to analog converters, sampling, polling and interrupts, digital filters, lookup table.

Learning Outcomes:

At the end of this unit, the student will be able to

- Draw the architecture of microprocessor. **L3**
- Explain the importance of subroutines, branch and jump instructions in Microprocessor. **L3**
- Compare Analog to Digital Converters and Digital to Analog Converters. **L4**
- Identify the various components of Microcomputer. **L1**

UNIT – II: Sensors and actuators **10 Hrs**

Speed sensors, Pressure sensors: Manifold Absolute Pressure sensor, knock sensor, Temperature sensors: Coolant and Exhaust gas temperature, Exhaust Oxygen level sensor, Position sensors: Throttle position sensor, accelerator pedal position sensor and crankshaft position sensor, Air mass flow sensor. Solenoids, stepper motors and relays.

Learning Outcomes:

At the end of this unit, the student will be able to

- Recall the working principles of various types of sensors used in automotive electronics. **L1**
- Identify the practical applications of sensors and actuators. **L2**
- Apply the concept of sensors and actuators in real world applications **L3**

UNIT – III: Electronic engine management system **10Hrs**

Electronic engine control: Input, output and control strategies, electronic fuel control system, fuel control modes: open loop and closed loop control at various modes, EGR control, Electronic ignition systems – Spark advance correction schemes, fuel injection timing control.

Learning Outcomes:

At the end of this unit, the student will be able to

- Compare open loop and closed loop control systems. **L4**
- Identify the various elements in Engine Management System. **L2**
- Recall the concepts of electronic ignition system. **L1**

UNIT – IV: Electronic vehicle management system **8 Hrs**

Cruise control system, Antilock braking system, electronic suspension system, electronic steering control, traction control system, Transmission control, Safety: Airbags, collision avoiding system, low tire pressure warning system.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the importance of cruise control system. **L2**
- Outline working of the safety systems. **L1**
- Demonstrate the control of electronic steering and traction. **L2**

UNIT – V: Automotive instrumentation system: 8 Hrs

Input and output signal conversion, multiplexing, fuel quantity measurement, coolant temperature and oil pressure measurement, display devices- LED, LCD, VFD and CRT, Onboard diagnostics(OBD), OBD-II, off board diagnostics.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the method of measurement of fuel quality. **L2**
- Compare onboard diagnostics and off board diagnostics. **L4**
- Discuss various types of display devices. **L2**

Text Books:

1. Understanding Automotive Electronics, William B Ribbens, Newne Butterworth-Heinermann, 6^{th} edition 2003.
2. Crouse W H, Automobile Elctrical Equipment, McGraw Hill Book Co.Inc, Newyork 2005.

Reference Books:

1. Bechhold "Understanding Automotive Electronics", SAE, 1998.
2. Robert Bosch "Automotive Hand Book", SAE (5th Edition), 2000.
3. Tom Denton,"Automobile Electrical and Electronic Systems" 3^{rd} edition- Edward Arnold, London - 2004.
4. Eric Chowanietz - 'Automotive Electronics' - SAE International USA – 1995.

Course Outcomes:

At the end of this Course the student will be able to

- Obtain an overview of automotive components, like sensors, actuators, communication protocols and safety systems employed in today's automotive industry. **L1**
- Interface automotive sensors and actuators with microcontrollers. **L3**
- Know, the various display devices that are used in automobiles. **L2**
- Identify the elements in the engine management and vehicle management system. **L2**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65b- PROGRAMMING OF ROBOT AND ITS CONTROL

(Open Elective - II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Learn the fundamental concepts of industrial robotic technology.
- Apply the basic mathematics to calculate kinematic and dynamic forces in robot manipulator.
- Understand the robot controlling and programming methods.
- Describe concept of robot vision system.

UNIT – 1: Fundamentals of Robots: 10 Hrs

Introduction, definition, classification and history of robotics, robot characteristics and precision of motion, advantages, disadvantages and applications of robots.

Learning Outcomes:

At the end of this unit, the student will be able to

- Outline the advantages, disadvantages and applications of robot. **L2**
- Compare the types of robot manipulators based on applications. **L2**

UNIT – II: Robot Actuators And Feedback Components: 10 Hrs

Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.

Learning Outcomes:

At the end of this unit, the student will be able to

- Compare the types of actuators used in robot manipulator. **L2**
- List out the various types of robots and feedback components. **L2**

UNIT – III: Robot Programming 10Hrs

Methods of programming - requirements and features of programming languages, software packages, problems with programming languages. VAL, RAIL, AML, C, C++.

Learning Outcomes:

At the end of this unit, the student will be able to

- List out the various methods of robot programming **L2**
- Explain the requirements and features of programming **L2**

UNIT – IV: Control of Manipulators: 8 Hrs

Open- and close-loop control, the manipulator control problem, linear control schemes, characteristics of second-order linear systems, linear second-order SISO model of a manipulator joint, joint actuators, partitioned PD control scheme, PID control Scheme, computer Torque control, force control of robotic manipulators, description of force-control tasks, force control strategies, hybrid position/force control, impedance force/torque control.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the basic concepts of robot controlling systems. **L2**
- Outline PD and PID control schemes. **L2**
- Use the force control strategies to determine the forces in robot. **L3**
- Explain the force control and torque control techniques. **L2**

UNIT – V: Robot Vision: **8 Hrs**

Introduction, architecture of robotic vision system, image processing, image acquisition camera, image enhancement, image segmentation, imaging transformation, Camera transformation and calibrations, industrial applications of robot vision.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the components of robot vision system. **L3**
- Explain the concept of image enhancement, segmentation and transformation. **L2**
- List the various components of robot vision system. **L1**
- Illustrate the industrial applications of robot vision system. **L2**

Text Books:

1. Mikell P. Groover and Mitchell Weiss, Roger N. Nagel,Nicholas G.Odrey , Industrial Robotics — Mc Graw Hill, 1986.
2. R K Mittal and I J Nagrath, Robotics and control, Illustrated Edition, Tata McGraw Hill India 2003..

Reference Books:

1. Saeed B. Niku, Introduction to Robotics – Analysis, System, Applications, 2nd Edition, John Wiley & Sons, 2010.
2. H. Asada and J.J.E. Slotine, Robot Analysis and Control, 1st Edition Wiley- Interscience, 1986.
3. Robert J. Schillin, Fundamentals of Robotics: Analysis and control, Prentice-Hall Of India Pvt. Limited, 1996.
4. Mohsen shahinpoor, A robot Engineering text book, Harper & Row Publishers,1987.
5. John.J.Craig Addison, Introduction to Robotics: Mechanics and Control, Wesley, 1999.
6. K.S. FU, R.C. Gonzalez and C.S.G Lee, Robotics: Control, sensing, vision, and intelligence . Mc Graw Hill, 1987.
7. Richard D. Klafter, Thomas Robotic Engineering an integrated approach, PHI publications 1988.

Course Outcomes:

At the end of this Course the student will be able to

- Explain fundamentals of Robots. **L2**
- Apply kinematics and differential motions and velocities. **L3**
- Demonstrate control of manipulators. **L2**
- Understand robot vision. **L2**
- Develop robot cell design and programming. **L3**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65c- SENSORS FOR INTELLIGENT MANUFACTURING

(Open Elective - II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize the sensors used in intelligent manufacturing.
- Illustrate sensors used in precision manufacturing and CNC machine tools.
- Explain sensors for monitoring of manufacturing systems.
- Outline advanced sensors used in intelligent manufacturing.

UNIT – 1: Introduction **12 Hrs**

Principles, classifications and characteristics of sensors – Electrical, magnetic, optical, acoustic, pneumatic, magnetic, electro-optical and vision sensors, role of sensors in intelligent manufacturing.

Learning Outcomes:

At the end of this unit, the student will be able to

- List out various types of sensors used in manufacturing. **L1**
- Explain the characteristics of different sensors. **L3**
- Explain optical, magnetic, pneumatic and acoustic sensors. **L3**
- Describe the role of sensors in intelligent manufacturing. **L4**

UNIT – II: Sensors and control in CIM and FMS: **10 Hrs**

Design of CIM, decision support system for CIM, analysis of CIM, development of CIM strategy with sensors and control. FMS-Robot control with machine vision sensors-Architecture of robotic vision system, image processing, image acquisition, enhancement, segmentation, transformation, industrial application of robot vision, multi Sensor controlled robots, measurement of robot density, robot programming.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify various types of inbellisort manufacturing systems. **L2**
- List the various types of sensors in CIM. **L2**
- Explain machine sensors. **L3**
- Describe architecture of robotic design systems. **L4**

UNIT – III: Sensors in Precision Manufacturing: **8Hrs**

Testing of manufacturing components, principles and applications of digital Encoders, opto-electronic colour sensors, control applications in robotics. Sensors for CNC machine tools– linear, position and velocity sensors. Automatic identification techniques for shop floor control.

Learning Outcomes:

At the end of this unit, the student will be able to

- List out different types of sensors in precision manufacturing. **L1**
- Describe the principle behind opto-electronic color sensors **L2**
- Select sensors for CNC machine tools. **L3**
- Explain automatic identification techniques for shop floor control. **L3**

UNIT – IV: Control of Manipulators: **8 Hrs**

Sensors for Monitoring of Manufacturing Systems: Principles – sensors for monitoring temperature, force, vibration and noise. Sensors to detect machinery faults. Selection of sensors and monitoring techniques.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify various types of machine failures in manufacturing systems. **L2**
- Select sensors for monitoring of force, vibration and noise. **L3**
- Explain monitoring techniques for machinery faults. **L3**
- Name sensors used for temperature. **L3**

UNIT – V: Smart / Intelligent sensors: **8 Hrs**

Integrated sensors, micro sensors, nano sensors. Manufacturing of semi conductor sensors. Fibre optic sensors – Fibre optic parameters, configurations, photoelectric sensor for long distance, sensor alignment techniques.

Learning Outcomes:

At the end of this unit, the student will be able to

- List out advance sensors in intelligent manufacturing. **L1**
- Explain about semiconductor and integrated sensors. **L3**
- Describe micro and nano sensors. **L3**
- Discuss principles of fibre optic sensors. **L3**

Text Books:

1. Sabrie Soloman, Sensors and Control systems in Manufacturing, McGraw-Hill, 2/e, 2010.
2. H.K Tonshoff and I.Inasaki, Sensor Applications Vol 1: Sensors in Manufacturing, Wiley-VCH Publications, 2001.

Reference Books:

1. Sabrie soloman, Sensors Handbook, McGraw Hill, 2/e, 20210
2. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel, Nicholas G.Odrey, Industrial Robotics, Tata McGraw-Hill, 2008.

Course Outcomes:

At the end of this Course the student will be able to

- Classify various sensors used in intelligent manufacturing. **L2**
- Describe sensors used in computer integrated manufacturing and machine sensors. **L3**
- Discuss sensors used in precision manufacturing. **L3**
- Identify reasons behind machinery faults. **L3**
- Discuss advanced sensors in intelligent manufacturing. **L3**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65d- NON-CONVENTIONAL SOURCES OF ENERGY

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize with concept of various forms of renewable energy.
- Understand division aspects and utilization of renewable energy sources for both domestics and industrial applications.
- Expose the students in an environmental and cost economics of using renewable energy sources compared to fossil fuels.

UNIT – 1: Principles Of Solar Radiation: **10 Hrs**

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

Learning Outcomes:

At the end of this unit, the student will be able to

- explain the basic concepts of solar radiation and solar collectors **L2**
- develop sun path diagrams **L3**
- Explain environmental impact of solar power. **L2**
- Discuss the instruments for measuring solar radiation and sun shine. **L6**

UNIT – II: Solar Energy Collection: **10 Hrs**

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

Solar Energy Storage and Applications :

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications solar heating technique, solar distillation and drying, photovoltaic energy conversion.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify solar energy collectors. **L1**
- Describe orientation and thermal analysis of solar energy collectors. **L2**
- Explain photovoltaic energy conversion. **L2**
- Illustrate the various solar energy applications. **L2**

UNIT – III: Wind Energy & Bio-Mass **10Hrs**

Wind Energy : Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

BIO-MASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

Learning Outcomes:

At the end of this unit, the student will be able to

- Compare vertical axis and horizontal axis windmills. **L3**
- Illustrate the performance characteristics of vertical axis and horizontal axis windmills. **L2**
- Discuss the principles of Bio-conversion. **L6**
- Explain combustion characterizes of bio-gas. **L2**

UNIT – IV: Geothermal Energy & Ocean Energy **8 Hrs**

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concept of geothermal and ocean energy. **L2**
- Discuss OTEC and principles utilization. **L6**
- Explain mini-hydel power plants and their economics. **L2**

UNIT – V: Direct Energy Conversion **10 Hrs**

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe the working principle of MHD engine. **L2**
- Explain constructional details of various thermo-electric generators. **L2**
- Identify the various economic, thermodynamic aspects of electron gas dynamic conversion system. **L3**

Text Books:

1. Renewable energy resources, Tiwari and Ghosal, Narosa.
2. Non-Conventional Energy Sources, G.D. Rai.

Reference Books:

1. Renewable Energy Sources, Twidell& Weir.
2. Solar Energy, Sukhatme
3. Solar Power Engineering, B.S.Magal Frank Kreith & J.F.Kreith.
4. Non-Conventional Energy, Ashok V Desai, Wiley Eastern
5. Principles of Solar Energy, Frank Krieth & John F Kreider.
6. Non-Conventional Energy Systems, K Mittal , Wheeler.

Course Outcomes:

At the end of this Course the student will be able to

- Outline the various economic, thermodynamic aspects of electron gas dynamic conversion system. **L3**
- Explain the basic concepts of solar radiation and solar collectors. **L2**
- Discus OTEC and principles utilization. **L6**
- Describe orientation and thermal analysis of solar energy collectors. **L2**

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65e- NEMS & MEMS

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize the basics of MEMS and NEMS
- Focus on the available tools and procedures to analyze and design micro/nano-scale engineering systems
- Demonstrate main issues stemming from operating in micro and nano length scale.
- Train MEMS and NEMS devices and their applications
- Impart fabrication and modeling aspects of MEMS and NEMS devices
- Enable a systematic design approach to engineering projects

UNIT – I: INTRODUCTION: 10 Hrs

New trends in Engineering and Science: Micro and Nano scale systems, Overview of Nano and Micro Electromechanical Systems, Micro electromechanical systems devices and structures, Nanotechnology and (N+1) Problem, Physical and Technological limitation of miniaturization;Nanoscale Structures / Nanoparticles: Adhesion, Nanotubes, Nanowires, Quantum Dots, Multilayered structures, Nanocluster Composites Crystals: Lattices, Nanocrystals and nanoparticles.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concepts, nanostructures and nanotechnology. **L2**
- Identify the principles of processing, manufacturing and characterization of nanomaterials and nanoscale systems. **L3**
- Apply electronic microscopy, and nano indentation techniques to characterize nano materials and nanostructures. **L3**

UNIT – II: MODELING OF MEMS AND NEMS: 10 Hrs

Introduction to modeling, analysis and simulation, Scaling laws for length and time and its effect on modeling, Grain size effect on materials properties (mechanical, electrical, magnetic, etc.), basic electro-magnetic with application to MEMS and NEMS, Modeling developments of micro-and nano actuators using electromagnetic fields, Lumped-parameter mathematical models of MEMS, Energy conversion in NEMS and MEMS.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the operation of micro devices, micro systems and their applications. **L1**
- Model MEMS devices and structures. **L3**
- Develop micro devices, micro systems using the MEMS fabrication process. **L3**

UNIT – III: MANUFACTURING TECHNIQUES AND PROCESSES: **10Hrs**

Cleanroom and Fab Procedures, Vacuum: Vacuum Systems, Pumps and Gauges; Materials for MEMS: Silicon, silicon compounds, polymers, metals; Microfabrication Technologies: Beam Machining – Ion-Beam, E-Beam and LASER processing techniques; Lithographic Patterning – Bulk μMachining, Surface μMachining, SU-8 Lithography & Surface forming, LIGA Process: X-Ray Lithography &UV LIGA; Precision Machining – Precision Milling and turning, μEDM, Micromolding & Embossing, Precision Bonding, Thin Films: Processes, Evaporation, Dry and Wet Etching, Sputtering Deposition; Characterization: Optical Techniques/Microscope, SEM, Optical and Electrical, Properties, Auger and Thin Film Analysis, AFM.

Learning Outcomes:
At the end of this unit, the student will be able to

- Outline computer-aided design, fabrication, analysis and characterization of nano-structured materials, micro- and nano-scale devices. **L2**
- Develop micro/nanosystems for photonics and optical applications. **L2**
- Explain manufacturing processes based on diffusion, deposition and patterning of surfaces. **L4**

UNIT – IV: MICRO SENSORS AND MICRO ACTUATORS: 8 Hrs

MEMS Sensors: Piezoresistive pressure sensor, Acoustic wave sensors, Resonant Microsensor, Peizoelectric Rate gyroscope, Capacitive Accelerometer; etc. Nanosensors & Nano biosensors; Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces (Parallel plate, Torsion bar, Comb drive actuators), Micromechanical Motors and pumps; Nanomotor, Molecular Motor, etc.

Learning Outcomes:
At the end of this unit, the student will be able to

- Outline basic approaches for various actuator design. **L2**
- Distinguish between various MEMS sensors. **L4**
- Explain the operation principles of advanced micro- and nanosystems. **L4**

UNIT – V: CONTROL OF MICROELECTROMECHANICAL SYSTEMS 10 Hrs

Introduction to Microelectromechanical Systems Control, Control of Microelectromechanical Systems, Intelligent Control of MEMS; Synthesis, Analysis, Fabrication, and Computer-Aided Design of MEMS, Case studies: Design and Fabrication Analysis of Translational Microtransducers, Single-Phase and three phase Reluctance Micromotors, Modeling, Analysis, and Control of Micromirror Actuators; Application of Nanomotor in Bio-medical applications, Nano robots, Electronics based on CNT - Molecular Electronics.

Learning Outcomes:
At the end of this unit, the student will be able to

- Identify micro electro mechanical system control for a given application. **L3**
- Synthesis intelligent control of MEMS/NEMS. **L4**
- Evaluate MEMS/NEMS for various applications. **L4**

Text Books:

1. Marc Madou, Fundamentals of Micro fabrication, CRC press 1997.
2. Stephen D. Senturia, Micro system Design, Kluwer Academic Publishers,2001
3. J. A. Pelesko and D. H. Bernstein, Modeling of MEMS and NEMS, Chapman & Hall/CRC, 2003.
4. Sergey Edward Lyshevski, Lyshevski Edward Lyshevski, MEMS and NEMS: Systems, Devices and Structures, CRC Press, 2005.

Reference Books:

1. Tai Ran Hsu, MEMS and Microsystems Design and Manufacture, Tata Mcraw Hill, 2002.
2. Chang Liu, Foundations of MEMS, Pearson education India limited, 2006
3. Mahalik N P, MEMS, Tata McGraw-Hill Education, 2008.
4. Gianfranco Cerofolini, Nanoscience and Technology: Nanoscale Devices, Springer, 2009.

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

- Identify processing and characterization of nanomaterials. **L3**
- Plan operation of micro devices, micro systems and their applications. **L3**
- Describe the implementation of MEMS into products. **L4**
- Explain the operation principles of advanced micro- and nanosystems. **L4**
- Apprise the technology implemented in advanced micro- and nanosystem. **L5**
- Design the micro devices, micro systems using the MEMS fabrication process. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME65f – OPTIMIZATION TECHNIQUES THROUGH MATLAB

(Open Elective - II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Introduce basics of MATLAB
- Familiarize the fundamentals of optimization
- Explain single variable optimization using various methods
- Implement multi variable optimization using various methods
- Train various evolutionary algorithms.

UNIT – 1: Introduction to MAT LAB: **10 Hrs**

Overview, MATLAB Preliminaries, Basics of MATLAB, Beyond the Basics of MATLAB, Popular Functions and Commands, Plotting using MATLAB, Optimization with MATLAB.

Learning Outcomes:

At the end of this unit, the student will be able to

- Write simple codes in MATLAB. **L3**
- Plot the data using MATLAB. **L3**
- Implement optimization models in MATLAB. **L3**

UNIT – II: Introduction to Optimization: **10 Hrs**

Statement of an optimization problem, Classifications of optimization Problems: Single variable optimization, Multi variable optimization with no constraints, Multi variable optimization with equality constraints, Multi variable optimization with inequality constraints, Convex and Concave programming.

Learning Outcomes:

At the end of this unit, the student will be able to

- Build optimization problem. **L1**
- Solve various optimization problems **L3**
- Compare convex and concave programming **L4**

UNIT – III: Single Variable Optimization: **10Hrs**

Finite difference method, Central difference method, Runge-Kutta method, interval halving method, golden section method with MATLAB code.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand various methods involving single variable optimization. **L2**
- Develop codes in MATLAB for different methods. **L3**
- Identify methods for solving a single variable optimization problem. **L3**

UNIT – IV: Multi Variable Optimization: **8 Hrs**

Conjugate gradient method, Newton's method, Powell's method, Flectcher- Reeves method, Hooke and Jeeves method, interior penalty function with MATLAB code.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply various methods involving multi variable optimization. **L2**
- Develop codes in MATLAB for solving various multi variable optimization problems. **L3**
- Choose methods for solving a multi variable optimization problem. **L3**

UNIT – V: Evolutionary Algorithms: **8 Hrs**

Overview, Genetic Algorithms: Basics of Genetic Algorithms, Options in MATLAB, Multi Objective Optimization using Genetic Algorithms, Ant Colony Optimization, Simulated Annealing, Particle Swarm Optimization.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply different types of genetic algorithms. (L3) **L3**
- Model optimization problems using genetic algorithms in MATLAB. (L3) **L3**
- Compare different genetic algorithms for performance. (L5) **L5**

Text Books:

1. Rao V.Dukkipati, MATLAB: An Introduction with Applications, Anshan, 2010.
2. Achille Messac, Optimization in practice with MATLAB, Cambridge University Press, 2015.
3. Jasbir S Arora, Introduction to optimum design, 2/e. Elsevier, 2004.

Reference Books:

1. Cesar Perez Lopez, MATLAB Optimization Techniques, Academic press, Springer publications, 2014.
2. Steven C.Chapra, Applied Numerical Methods with MATLAB for Engineers and scientists, 4/e, McGraw-Hill Education, 2018.

Course Outcomes:

At the end of this Course the student will be able to

- Use optimization terminology and concepts, and understand how to classify an optimization problem. **L4**
- Apply optimization methods to engineering problems. **L3**
- Implement optimization algorithms. **L3**
- Compare different genetic algorithms. **L5**
- Solve multivariable optimization problems. **L4**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC65a-INTRODUCTION TO MICROCONTROLLER AND APPLICATIONS

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To understand the basic concepts and architecture of 8051.
- To learn various instructions and addressing modes used in 8051
- To be able to write programs in assembly language for 8051
- To be able to program 8051 Timers and implement serial communication for a given application.
- To learn interfacing of memory, I/O devices and the usage of Interrupts.

UNIT – I:

Architecture of 8051: Introduction, Block diagram of 8051 Microcontroller, Functions of each block, Pin details of 8051, ALU,ROM, RAM, Memory Organization of 8051, Special function registers, Program Counter, PSW register, Stack, I/O Ports, Timer, Interrupt, Serial Port, Oscillator and Clock, Clock Cycle, Machine Cycle, Instruction cycle, Reset, Power on Reset.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the architecture of 8051 microcontroller. **L2**
- Learn the functions of each block of 8051 microcontroller. **L1**

UNIT – II:

Instruction Set of 8051: Instruction set of 8051, Classification of 8051 Instructions, Data transfer instructions, Arithmetic Instructions, Logical instructions, Branching instructions, Bit Manipulation Instructions

Assembler and Addressing Modes: Assembling and running an 8051 program, Structure of Assembly Language, Assembler directives, Different addressing modes of 8051.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know different instructions available in the Instruction set of 8051. **L1**
- Learn and use different types of addressing modes of 8051 microcontroller. **L1**

UNIT – III:

Programs: Arithmetic operations, Biggest Number / Smallest Number, Ascending order / Descending order, BCD to HEX Conversion, HEX to BCD Conversion, Odd Parity Generator Even Parity Generator, Time delay routines

I/O: Bit addresses for I/O and RAM, I/O programming, I/O bit manipulation programming.

Learning Outcomes:

At the end of this unit, the student will be able to

- Write assembly language program in 8051 for simple operations. **L6**
- Gain knowledge about different mappings used in 8051 microcontroller. **L1**

UNIT – IV:

Timer: Programming 8051 Timers, Timer registers, Different modes of Timer, Programming timer in different modes, Counter programming, Different modes of Counter, Sample programs.

Serial Communication: Basics of Serial communication, UART, RS 232 Protocol, 8051 interface to RS 232, 8051 UART Programming, SPI and I^2C implementation on 8051.

Learning Outcomes:

At the end of this unit, the student will be able to

- Write programs to use the 8051 Timers for a given application. **L6**
- Use different types of serial communication devices based on the application. **L3**

UNIT – V:

Interrupt: 8051 Interrupts, Programming Timer Interrupts, Programming external hardware interrupts, Programming the serial communication interrupt, Interrupt priority in 8051.**IC 8255:** IC 8255, Block Diagram, Modes of 8255, Interfacing with 8051.

Interfacing Techniques: Interfacing external memory to 8051, Sensor interfacing, ADC interfacing, DAC interfacing, Keyboard interfacing, Seven segment LED Display Interfacing, Stepper Motor interfacing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Interface memory and I/O devices for specific applications. **L4**
- Learn and apply Interrupts based on the application and usage. **L3**

Text Books:

1. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D McKinlay, "The 8051 Microcontroller and Embedded Systems Using Assembly and C", 2nd Edition, Pearson Education, 2008.
2. Ajit pal, "Microcontrollers, Principles and Applications", – PHI Ltd., - 2011.

Reference Books:

1. Ajay V Deshmukh, "Microcontrollers: Theory and Applications", TATA McGraw Hill publications, 2007.
2. Krishna Kanth, "Microprocessors and Microcontrollers", PHI Publications, 2010

Course Outcomes:

At the end of this Course the student will be able to

- Understand the basic concepts and architecture of 8051. **L2**
- Know the usage of various instructions and addressing modes in 8051 **L1**
- Write programs in assembly language for 8051 **L6**
- Program 8051 Timers and implement serial communication for a given application. **L6**
- Interface memory, I/O devices and use Interrupts. **L4**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC65c-INTRODUCTION TO IMAGE PROCESSING

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To learn the fundamentals of Image Processing and learn the different types of image transforms.
- To study different types of filtering techniques for image enhancement.
- To understand various types of image segmentation and thresholding techniques.
- To gain knowledge on wavelets and multi resolution image processing techniques.
- To comprehend various types of image compression and colour image processing methods.

UNIT – I:

Digital Image Fundamentals: Fundamental steps of digital image processing, Components of Digital Image processing, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures. Applications of Digital Image Processing.

Image Transforms: Fourier Transform and its properties in one dimensional and Two dimensional, Discrete Fourier Transform, Discrete Cosine Transform, Discrete Sine transform, Walsh transform, Hadamard transform, Slant transform, KL Transforms and its properties.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the fundamentals of digital image processing. **L2**
- Analyze the image transforms in one and two dimensions. **L4**

UNIT – II:

Image Enhancements and Filtering: Gray level transformations, Histogram processing, histogram equalization, Enhancement of Frequency domain, Homomorphic filtering, Filtering in the frequency domain. Image Restoration: A Model of the Image Degradation \ Restoration Process, Noise Models, Inverse filtering, Minimum Mean Square Error (Weiner) Filtering, Constrained least squares filtering.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the filters in spatial and frequency domains. **L4**
- Understand the image restoration model and various types of noises in image restoration. **L2**

UNIT – III:

Image Segmentation: Detection of Discontinuities: Point detection, Line detection, Edge detection, Edge linking and boundary detection, Thresholding, Region based segmentation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the concept of image segmentation. **L1**
- Analyze various types of thresholding techniques. **L4**

UNIT – IV:

Wavelets and Multi-resolution image processing: Back ground, Image Pyramids, Sub band coding, The Haar Transform.Multi resolution Expansions: Series Expansions, Scaling Functions, Wavelet Functions, Wavelet Transform in One dimension: The wavelet series expansions, The Discrete wavelet transform, The Continuous Wavelet Transform, The Fast wavelet Transform, Wavelet transform in two dimensions, Wavelet Packets.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the wavelets in one dimension and two dimensions. **L2**
- Explain the multi-resolution expansions and fast wavelet transform. **L1**

UNIT – V:

Image Compression: Redundancy, coding, inter-pixel and psycho-visual; Loss less compression – Huffmann coding, predictive coding; Lossy Image compression- predictive and transform coding; Image compression standards.

Color Image Processing: Color Fundamentals, Color models–RGB, CMY, HSI; Pseudo color Image Processing, Basics of Full color Image Processing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the need for image compression and its types. **L2**
- Learn the color image processing and various types of color models. **L1**

Text Books:

1. R.C. Gonzalez and R.E. Woods, "Digital Image Processing", Second Edition, Pearson Education, 2008.
2. Anil Kumar Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 2nd edition 2004.

Reference Books:

1. Rafael C. Gonzalez, Richard E woods and Steven L. Eddins, "Digital Image processing using MATLAB", Tata McGraw Hill, 2010.
2. S Jayaraman, S Esakkirajan and T Veerakumar, "Digital Image processing", Tata McGraw Hill.
3. William K. Pratt, "Digital Image Processing", John Wiley, 3rd Edition, 2004.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the fundamentals of Image Processing and apply different types of image transforms. **L2**
- Correlate different types of filtering techniques for image enhancement. **L4**
- Understand various types of image segmentation and thresholding techniques. **L2**
- Gain knowledge on wavelets and multi resolution image processing techniques. **L1**
- Summarize different types of image compression and colour image processing methods. **L2**

III B.Tech II SEMESTER
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ACS65a- INTRODUCTION TO MACHINE LEARNING
(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To understand the basic theory underlying machine learning.

UNIT – 1: INTRODUCTION **8 Hrs**

Introduction: An illustrative learning task, and a few approaches to it. What is known from algorithms? Theory, Experiment. Biology. Psychology. Overview of Machine learning, related areas and applications. Linear Regression, Multiple Regression, Logistic Regression, logistic functions.

Learning Outcomes:

At the end of this unit, the student will be able to

- Argue the importance and role of software architecture in large-scale software systems. **L2**
- Design and motivate software architecture for large-scale software systems. **L3**

UNIT – II: DECISION TREE LEARNING **8 Hrs**

Decision Tree Learning: - Minimum Description Length Principle. Occam's razor. Learning with active queries Introduction to information theory, Decision Trees, Cross Validation and Over fitting. Neural Network Learning: Perceptions and gradient descent back propagation, multilayer networks and back propagation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design and motivate software architecture for large-scale software systems. **L3**
- Recognize major software architectural styles and frameworks. **L4**

UNIT – III: SAMPLE COMPLEXITY AND OVER FITTING **8 Hrs**

Sample Complexity and Over fitting: Errors in estimating means. Cross Validation and jackknifing VC dimension. Irrelevant features: Multiplicative rules for weight tuning. Support Vector Machines: functional and geometric margins.

Learning Outcomes:

At the end of this unit, the student will be able to

- Recognize major software architectural styles and frameworks. **L3**
- Describe a software architecture using various documentation approaches and architectural description languages. **L4**

UNIT – IV: INSTANCE-BASED TECHNIQUES **7 Hrs**

Instance-based Techniques: Lazy vs. eager generalization. K nearest neighbor, case- based reasoning. Clustering and Unsupervised Learning: K-means clustering, Gaussian mixture density estimation, model selection

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe a software architecture using various documentation approaches and architectural description languages. **L5**

- Generate architectural alternatives for a problem and selection among them. **L3**

UNIT – V: Genetic Algorithms

Genetic Algorithms: Different search methods for induction - Explanation-based Learning: using prior knowledge to reduce sample complexity. Dimensionality reduction: feature selection, principal component analysis.

Learning Outcomes:

At the end of this unit, the student will be able to

- Use well-understood paradigms for designing new systems. **L3**
- Identify and assess the quality attributes of a system at the architectural level. **L4**

Text Books:

1. Tom Michel, Machine Learning, McGraw Hill, 1997

2. Trevor Has tie, Robert Tibshirani & Jerome Friedman. The Elements of Statically Learning, Springer Verlag, 2001.

Reference Books:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.

2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc.,2001 3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.

Course Outcomes:

At the end of this Course the student will be able to

- Student should be able to understand the basic concepts such as decision trees and neural networks.Ability to formulate machine learning techniques to respective problems. **L2**
- Apply machine learning algorithms to solve problems of moderate complexity. **L3**

III B.Tech II SEMESTER
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ACS65b- INTRODUCTION TO COMPUTER NETWORKS
(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:
This course is designed to:

1. Introduce the basic concepts of Computer Networks.
2. Familiarize with the layered approach and different layers of computer networks.
3. Familiarize with the design issues of different layers.

- Explain the working of different protocols of a computer network..

UNIT – 1: INTRODUCTION **8 Hrs**

Introduction: Uses of computer networks, network hardware, Protocol Hierarchies, Design Issues for the layers, Connection oriented vs Connectionless Service. **The physical layer:** The theoretical basis for data communication, Guided transmission media, wireless transmission, communication satellites.

Learning Outcomes:
At the end of this unit, the student will be able to

- Argue the importance and role of software architecture in large-scale software systems. **L2**
- Design and motivate software architecture for large-scale software systems. **L3**

UNIT – II: THE DATA LINK LAYER **8 Hrs**

The data link layer: Data link layer design issues, error detection and correction, elementary data link protocols, sliding window protocols

The medium access control: The channel allocation problem, multiple access protocols, Ethernet.
. **Learning Outcomes:**
At the end of this unit, the student will be able to

- Design and motivate software architecture for large-scale software systems. **L3**
- Recognize major software architectural styles and frameworks. **L4**

UNIT – III: THE NETWORK LAYER **8 Hrs**

The network layer: Network layer design issues**,** Flooding, Distance Vector Routing, Link state Routing.

Learning Outcomes:
At the end of this unit, the student will be able to

- Recognize major software architectural styles and frameworks. **L3**
- Describe a software architecture using various documentation approaches and architectural description languages. **L4**

UNIT – IV: IP VERSION 4 PROTOCOL **7 Hrs**

The IP version 4 Protocol, IP Addresses, IP version 6, Internet control protocols, OSPF, BGP, Internet multicasting

The transport layer: Elements of transport protocols, congestion control, The internet transport protocols: UDP and TCP.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe a software architecture using various documentation approaches and architectural description languages. **L5**
- Generate architectural alternatives for a problem and selection among them. **L3**

UNIT – V: THE APPLICATION LAYER

The application layer: DNS- The Domain Name System, Electronic Mail, WWW Architectural Overview, Static Web pages, Dynamic web pages and web applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Use well-understood paradigms for designing new systems. **L3**
- Identify and assess the quality attributes of a system at the architectural level. **L4**

Text Books:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.

Reference Books:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.

Course Outcomes:

Students will be able to:

1. Recognize the method of using layered approach for design of computer networks. **L2**
2. Explain the functionality of each layer of a computer network. **L3**
3. Apply the knowledge of layered approach for the design of computer network software. **L4**
4. Analyze the performance of protocols of a computer network. **L4**
5. Recommend the protocols for different applications. **L5**
6. Propose new protocols for a computer networks. **L6**

III B.Tech II SEMESTER
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ACS65c- WEB DESIGN AND MANAGEMENT
(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:
This course is designed to:
• To Learn the basic concepts in HTML, CSS, JavaScript
• To Understand the responsive design and development
• To learn the web project management and maintenance process
• To Design a Website with HTML, JS, CSS / CMS - Word press

UNIT – 1: WEB DESIGN - HTML MARKUP FOR STRUCTURE **8 Hrs**
Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5.

Learning Outcomes:
At the end of this unit, the student will be able to
- Argue the importance and role of software architecture in large-scale software systems. **L2**
- Design and motivate software architecture for large-scale software systems. **L3**

UNIT – II: CSS AND JAVASCRIPT **8 Hrs**
CSS - Formatting text - Colours and Background - Padding, Borders and Margins – Floating and positioning - Page Layout with CSS - Transition, Transforms and Animation – JavaScript - Using Java Script.

. **Learning Outcomes:**
At the end of this unit, the student will be able to
- Design and motivate software architecture for large-scale software systems. **L3**
- Recognize major software architectural styles and frameworks. **L4**

UNIT – III: RESPONSIVE WEB DESIGN **8 Hrs**
Sass for Responsive Web Design - Marking Content with HTML5 - Mobile-First or DesktopFirst - CSS Grids, CSS Frameworks, UI Kits, and Flexbox for RWD - Designing small UIs by Large Finger - Images and Videos in Responsive Web Design - Meaningful Typography for Responsive Web Design.

Learning Outcomes:
At the end of this unit, the student will be able to
- Recognize major software architectural styles and frameworks. **L3**
- Describe a software architecture using various documentation approaches and architectural description languages. **L4**

UNIT – IV: WEB PROJECT MANAGEMENT **7 Hrs**
Project Life Cycle - Project Definition - Discovery and Requirements - Project Schedule and Budgeting - Running the project - Technical Documentation - Development, Communicaton, Documentation - QA and testing -Deployment - Support and operations.

Learning Outcomes:
At the end of this unit, the student will be able to
- Describe a software architecture using various documentation approaches and architectural description languages. **L5**
- Generate architectural alternatives for a problem and selection among them. **L3**

UNIT – V: PROJECT CASE STUDY

Using HTML, CSS, JS or using Opensource CMS like Word press, design and develop a Website having Aesthetics, Advanced and Minimal UI Transitions based on the project - Host and manage the project live in any public hosting.

Learning Outcomes:

At the end of this unit, the student will be able to

- Use well-understood paradigms for designing new systems. **L3**
- Identify and assess the quality attributes of a system at the architectural level. **L4**

Text Books:

1. Jennifer Niederst Robbins, "Learning Web Design", O'REILLY 4th Edition
2. Ricardo Zea, "Mastering Responsive Web Design", PACKT Publishing, 2015
3. Justin Emond, Chris Steins, "Pro Web Project Management", Apress,2011

Reference Books:

1. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wiley and Sons, edition 2014
2. Jon Duckett, Jack Moore, "JavaScript & JQuery: Interactive Front-End Web Development", John Wiley and Sons, edition 2014
3. Uttam K. Roy "Web Technologies" Oxford University Press, 13th impression, 2017 4. Word press - http://www.wpbeginner.com/category/wp-tutorials/

Course Outcomes:

Students will be able to:

7. Recognize the method of using layered approach for design . **L2**
8. Explain the functionality of each layer of a computer network. **L3**
9. Apply the knowledge of layered approach for the design of computer network software. **L4**
10. Analyze the performance of protocols of a computer network. **L4**
11. Recommend the protocols for different applications. **L5**
12. Propose new protocols for a computer networks. **L6**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS15a-MANAGEMENT SCIENCE

(Humanities Elective-II)(Common to CE & ME)

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the role of entrepreneurship in economic development.
- Identify the general characteristics of entrepreneurs.

UNIT – I

INTRODUCTION TO MANAGEMENT

Concepts of Management - Nature, importance and Functions of Management - Taylor‘s Scientific Management Theory, Fayol‘s Principles of Management, Maslow‘s Theory of Human Needs, Douglas McGregor‘s Theory X and Theory Y, Leadership Styles, Social responsibilities of Management.

DESIGNING ORGANIZATIONAL STRUCTURES

Basic concepts related to Organization - Departmentation and Decentralization, Types of mechanistic and organic structures of organization (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, team structure) their merits, demerits and suitability.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of management and organization. **L1**
- Apply the concepts & principles of management in real life industry. **L2**

UNIT – II

OPERATIONS MANAGEMENT:

Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study. Statistical Quality Control**:** *c* chart, *p* chart, (simple Problems) Deming‘s contribution to quality.

MATERIALS MANAGEMENT: EOQ, Purchase Procedure and Stores Management. Inventory — functions. Types, inventory classification techniques.

Marketing: Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the core concepts of Management Science and Operations Management. **L1**
- Evaluate Materials departments & Determine EOQ. **L2**

UNIT – III

HUMAN RESOURCES MANAGEMENT (HRM):

Concepts of HRM, Personnel Management and Industrial Relations (PMIR), Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation, Merit Rating and methods.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of HRM in Recruitment, Selection, Training & Development. **L1**

- Apply Managerial and operative Functions. **L2**

UNIT – IV

STRATEGIC MANAGEMENT:

Vision, Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives.

PROJECT MANAGEMENT (PERT/CPM):

Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems).

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand Mission, Objectives, Goals & strategies for an enterprise. **L1**
- Evaluate PERT and CPM Techniques. **L2**

UNIT – V

CONTEMPORARY MANAGEMENT PRACTICES:

Basic concepts of MIS, Materials Requirement Planning (MRP), Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma concept, Supply Chain Management, Enterprise Resource Planning (ERP), Performance Management, Business Process outsourcing (BPO), Business Process Re-engineering and Bench Marking, Balanced Score Card.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze CRM, MRP, TQM. **L1**
- Understand modern management techniques. **L2**

Text Books:

1. **Management Science**, Aryasri: TMH, 2004.
2. **Management**, Stoner, Freeman, Gilbert, 6th Ed, Pearson Education, New Delhi, 2004.

Reference Books:

1. **Marketing Mangement**, Kotler Philip & Keller Kevin Lane: 12/e, PHI,2005.
2. **Essentials of Management** ,Koontz & Weihrich:, 6/e, TMH, 2005.
3. **Management—Principles and Guidelines**, Thomas N.Duening & John M.Biztantra, 2003.
4. **Production and Operations Management**, Kanishka Bedi, , Oxford University Press, 2004.

Course Outcomes:

At the end of this Course the student will be able to

- Equipping engineers for a lifelong career addressing the critical technical and managerial needs of private and public organizations. **L1**
- Exploring and developing analytic abilities, making better decisions, developing and executing strategies while also leading people who innovate. **L2**
- Cultivating the technical skills as well as the behavioral challenges of running organizations and complex systems. **L3**
- Emphasizing quantitative analytic skills and an entrepreneurial spirit **L4**
- Have an introductory understanding of global entrepreneurship concepts. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS15b-BUSINESS ENVIRONMENT

(Humanities Elective-II)(Common to CE & ME)

L	T	P	C
3	0	0	3

Course Objectives:

- To make the student understand about the business environment.
- To enable them in knowing the importance of fiscal and monitory policy.

UNIT – I: BUSINESS ENVIRONMENT

Meaning – Various environments affecting business – Social Economic; Political and Legal; Culture; Competitive Demographic; Technological and International environments.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of Business environment. **L1**
- Explain various types of business environment. **L2**

UNIT – II: FISCAL & MONETARY POLICY

FISCAL POLICY - Public Revenues - Public Expenditure - Public debt - Development activities financed by public expenditure - Evaluation of recent fiscal policy of Government of India - Highlights of Budget - **MONETARY POLICY** - Demand and Supply of Money – RBI - Objectives of monetary and credit policy - Recent trends - Role of Finance Commission.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of public revenue and public Expenditure **L1**
- **E**xplain the functions of RBI and its role. **L2**

UNIT – III: TRADE POLICY

INDIA'S TRADE POLICY - Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank - **BALANCE OF PAYMENTS** – Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the role of Indian international trade. **L1**
- Analyze causes for Disequilibrium and correction measure. **L2**

UNIT – IV: WORLD TRADE ORGANIZATION

WORLD TRADE ORGANIZATION - Nature and Scope - Organization and Structure - Role and functions of WTO in promoting world trade - Agreements in the Uruguay Round – TRIPS, TRIMS, and GATT - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Dispute Settlement Mechanism. **L1**
- Compare and contrast the Dumping and Anti-dumping Measures. **L2**

UNIT – V: MARKETS

MONEY MARKETS AND CAPITAL MARKETS - Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI - Stock Exchanges - Investor protection and role of SEBI.

Learning Outcomes:
At the end of this unit, the student will be able to

- Apply the knowledge in future investments. **L1**
- Understand the role of SEBI in investor protection. **L2**

Text Books:

1. Francis Cherunilam (2009), "International Business": Text and Cases, Prentice Hall of India.
2. K. Aswathappa, "Essentials of Business Environment": Texts and Cases & Exercises 13th Revised Edition.HPH2016.

Reference Books:

1. K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari. S. N (2009), International Business, Wiley India.
4. E. Bhattacharya (2009), International Business, Excel Publications, New Delhi.

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

- Apply the knowledge of Money markets in future investment. **L1**
- Analyze India's Trade Policy. **L2**
- Evaluate fiscal and monitory policy. **L3**
- Develop a personal synthesis and approach for identifying business opportunities. **L4**
- `Understand various types of business environment. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS13-ENGLISH LANGUAGE SKILLS LAB

(Common to CE & ME)

L	T	P	C
0	0	3	1.5

Course Objectives:

- Students will cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL and GMAT etc.
- students will be trained to use language effectively to face interviews, group discussions, public speaking

UNIT – I: **12Hrs**

1. Phonetics for listening comprehension of various accents -2
2. Formal Presentations using PPT slides without Graphic Elements.
3. Paraphrasing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand different accents spoken by native speakers of English **L1**
- Make formal structured presentations on general topics using PPT slides without graphical elements **L2**

UNIT – II: **12Hrs**

1. Debate – 2 (Following Argument).
2. Listening to short speeches/ short stories for note-making and summarizing.
3. E-mail Writing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Participate in formal discussions and speak clearly on a specific topic using suitable discourse markers. **L1**
- Make formal structured presentations on academic topics using ppt slides with relevant graphical elements. **L2**

UNIT – III **12Hrs**

1. Listening for Discussions.
2. Group Discussions.
3. Writing Persuasive/argumentative essays on general topics.

Learning Outcomes:

At the end of this unit, the student will be able to

- Participate in group discussions using appropriate conventions and language strategies. **L1**
- Produce logically coherent persuasive/argumentative essays. **L2**

UNIT – IV **12Hrs**

1. Reviewing film/book.
2. Group Discussions – reaching consensus in Group Work.
3. Resume Writing – Cover Letter – Applying for Internship.

Learning Outcomes:

At the end of this unit, the student will be able to

- Express thoughts and ideas with acceptable accuracy and fluency with a view to reach consensus in group discussions **L1**
- Prepare a CV and write a cover letter to seek internship/job **L2**

UNIT – V **12Hrs**

1. Writing Project Reports.
2. Editing Short Texts.
3. Answering FAQs in Interviews.

Learning Outcomes:

At the end of this unit, the student will be able to

- Collaborate with a partner to make effective presentations. **L1**
- Understand the structure and produce an effective project report. **L2**

Suggested Software

- Walden Infotech English Language Communication Skills.
- iTell- Orell Digital Language Lab.
- Digital Teacher.
- LES(Learn English Select) by British council.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.
- Lingua TOEFL CBT Insider, by Dreamtech.
- English Pronunciation in Use (Elementary, Intermediate, Advanced)CUP**.**
- Cambridge Advanced Learners' English Dictionary withCD.

Reference Books:

1. Meenakshi Raman &Sangeeta Sharma, "Technical Communication**"** O U Press2009.
2. Barron's Books on TOEFL/GRE/GMAT/CAT/IELTS /DELTA/Cambridge University Press.2012
3. Butterfield Jeff, "Soft Skills for Everyone"**,** Cengage Publications,2011.
4. "Practice Psychometric Tests": How to familiarize yourself with genuine recruitment tests, 2012.
5. David A McMurrey & Joanne Buckely **"**Handbook for Technical Writing**"** CENGAGE Learning2008.
6. "A Textbook of English Phonetics for Indian Students", 2nd Edition, T.Balasubramanyam. (Macmillan),2012.
7. "A Handbook for English Laboratories", E. Suresh Kumar, P. Sreehari, Foundation Books, 2011.
8. Sambaiah.M. ***Technical English***, Wiley publishers India. New Delhi. 2014.

Course Outcomes:

At the end of this Course the student will be able to

- Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills. **L1**
- Apply communication skills through various language learning activities. **L2**
- Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. **L3**
- Evaluate and exhibit acceptable etiquette essential in social and professional settings **L4**
- Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English. **L5**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE66- ENVIRONMENTAL ENGINEERING – LAB

L	T	P	C
0	0	2	1

Course Objectives: The objectives of the course are to make the students learn about

The laboratory provides knowledge of estimating various parameters like pH, Chlorides, Sulphates, Nitratesin water. For effective water treatment, determination of optimum dosage and chloride demand are also included. The estimation status of Industrial effluents will also be taught in the laboratory by estimating BOD and COD ofeffluent.

LIST OF EXPERIMENTS:

1. Determination of pH and Turbidity.
2. Determination of Conductivity.
3. Determination and Estimation of total solids, total volatile solids and total fixed solids.
4. Determination and Estimation of Total dissolved solids and Total suspended solids.
5. Determination of Alkalinity/Acidity.
6. Determination of Chlorides.
7. Determination of iron.
8. Determination of Nitrogen.
9. Determination of total Phosphorous.
10. Determination of Optimum coagulant dose – Jartest.
11. Determination of Chlorine demand.
12. Determination of Dissolved Oxygen.
13. Determination of B.O.D
14. Determination of C.O.D
15. Presumptive coliformtest.

NOTE: At least 8 of the above experiments are to be conducted.

LIST OF EQUIPMENT:

12. PH meter,
13. Turbidity meter,
14. Conductivity meter,
15. Hot air oven,
16. Mufflefurnace,
17. Dissolved Oxygen meter,
18. U – V visible spectrophotometer,
19. Reflux Apparatus,
20. Jar Test Apparatus,
21. BOD incubator.
22. COD Extraction apparatus

Text Books:

4. Chemistry for Environmental Engineering by Sawyer and Mc.Carty
5. Standard Methods for Analysis of water and Waste Water –APHA
6. Environmental Engineering Lab Manual by Dr.G.Kotaiah and Dr.N.KumaraSwamy, Charotar Publishers, Anand.

Course Outcomes:

At the end of this Course the student will be able to

- Estimate various parameters of water
- Assess quality of waste water parameters

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AHS17-RESEARCH METHODOLOGY

(Common to CE & ME)

L	T	P	C
3	0	0	0

Course Objectives:

- Students should understand a general definition of research design.
- Students should be able to identify the overall process of designing a research study from its inception to its report.

UNIT – 1:

Meaning of Research — Objectives of Research — Types of Research — Research Approaches — Guidelines for Selecting and Defining a Research Problem — research Design — Concepts related to Research Design — Basic Principles of Experimental Design.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of research and its process. **L1**
- Explain various types of research. **L2**

UNIT – II:

Sampling Design — steps in Sampling Design —Characteristics of a Good Sample Design — Random Sampling Design. Measurement and Scaling Techniques-Errors in Measurement — Tests of Sound Measurement — Scaling and Scale Construction Techniques — Time Seri. Analysis — Interpolation and Extrapolation. Data Collection Methods — Primary Data — Secondary data — Questionnaire Survey and Interviews.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of sampling and sampling design. **L1**
- Explain various techniques in measurement and scaling. **L2**

UNIT – III:

Correlation and Regression Analysis — Method of Least Squares — Regression on Correlation — Correlation on Determination — Types of Correlations and Their Applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the association of two variables. **L1**
- Understand the importance of correlation and regression. **L2**

UNIT – IV:

Statistical Inference: Tests of Hypothesis — Hypothesis Testing Procedure — Sampling Theory — Sampling Distribution — Chi-square Test — Multi-variate Analysis.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the statistical inference. **L1**
- Understand the hypothesis testing procedure. **L2**

UNIT – V:

Report Writing and Professional Ethics: Interpretation of Data — Report Writing — Layout of a Research Paper — Techniques of Interpretation- Making Scientific Presentations in Conferences and Seminars — Professional Ethics in Research.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about report writing. **L1**
- Understand how to write research paper. **L2**

Text Books:

1. C.R.Kothari, "Research Methodology: Methods and Techniques",2nd edition, New Age International Publishers.
2. A Step by Step Guide for Beginners, "Research Methodology":Ranjit Kumar, Sage Publications.

Reference Books:

1. P.Narayana Reddy and G.V.R.K.Acharyulu, "Research Methodology and Statistical Tools", 1st Edition, Excel Books, New Delhi.
2. Donald R. "Business Research Methods", Cooper & Pamela S Schindler, 9th edition.
3. S C Gupta, "Fundamentals of Statistics", 7th edition Himalaya Publications.
4. Dr. P.Satyanarayana, "a Companion to Literary Research", 1st edition 2020, HSRA publications.

Course Outcomes:

At the end of this Course the student will be able to

- Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling. **L1**
- Identify and discuss the complex issues inherent in selecting a research problem, selecting an appropriate research design, and implementing a research project. **L2**
- Have basic knowledge on qualitative research techniques. **L3**
- Identify and discuss the concepts and procedures of sampling, data collection, analysis and reporting. **L4**
- Have basic awareness of data analysis-and hypothesis testing procedures. **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE71- ESTIMATION COSTING &VALUATION

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To impart basic knowledge on different types of estimation
- To enrich with specifications and tender procedures.
- To give insights on various types of contract agreements.
- To inculcate data preparation for abstract estimation
- To teach procedure for valuation of buildings.

UNIT – I:

INTRODUCTION:

General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

STANDARD SPECIFICATIONS:

Standard specifications for different items of building construction

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand methods of Estimation
- Prepare detailed and general specifications for a project

UNIT – II:

ESTIMATION OF BUILDINGS:

Detailed Estimates of Buildings--detailed estimates of residential buildings single storied and multi-storied buildings-earthwork-foundations-Super structure-Fittings including sanitary and electrical fittings-paintings.

Learning Outcomes:

At the end of this unit, the student will be able to

- Carryout estimation of quantities for structural components
- Estimate cost while using different types of sanitary and electrical fittings

UNIT – III:

EARTHWORK ESTIMATION: Earthwork for roads and canals.

REINFORCEMENT ESTIMATION: Reinforcement bar bending and bar requirement schedules.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the reinforcement requirement estimation
- Calculate the earthwork for roads and canals

UNIT – IV:

CONTRACTS AND TENDERS:
Contracts – Types of contracts – Contract Documents – Conditions of contract – Types of Tenders – Requirement of Tendering.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand tender schedule and tender notices
- Draft tender documents for projects
- Prepare documents for different types of contracts
- Identify arbitration and legal issues and mitigation methods

UNIT – V:
RATE ANALYSIS:
Working out data for various items of work over head and contigent charges.

VALUATION: Principles of valuation-Value and Cost-value engineering-value analysis-phases in value engineering-information-function-escalation-evaluation-recommendation-implementation-Audit.

Learning Outcomes:
At the end of this unit, the student will be able to

- Carry out valuation of buildings.
- Explain Auditing procedures and implementation
- Understand procedures for entries in measurement books and its importance
- Prepare abstract estimates based on SSR.

Text Books:

1. Estimating and Costing by B.N. Dutta, UBS publishers,2000.
2. Contracts and estimations by B.S.Patil, Universities.Press,Hyderabad.
3. Estimation, Costing and Specifications by M. Chakraborthi; Laxmipublications.

Reference Books:

1. Estimating and Costing by G.S. Birdie, DhanpatRai Publishing Company (P)Ltd
2. A Text book of Estimating and Costing by D.D.Kohli, S.ChandPubilishers.

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

- Understand basics on methods and types of estimation.
- Formulate specifications and tender documents.
- Prepare contract agreements
- Determine rate analysis of different items.
- Valuation of buildings

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE72- CONSTRUCTION TECHNOLOGY & PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Understand about fundamentals of construction management and techniques to be used to perform and complete the construction works In time
- Describe the basic concepts and skills required for construction project management
- Apply the techniques of project planning and management in construction projects.
- Plan and Schedule a civil engineering project by using techniques like CPM, PERT.
- Understand about fundamentals of construction management and techniques to be used to perform and complete the construction works In time

UNIT – I: FUNDAMENTALS OF CONSTRUCTION TECHNOLOGY

Definitions and Discussion – Construction Activities – Construction Processes - Construction Works – Construction Estimating – Construction Schedule – Productivity and Mechanized Construction – Construction Documents – Construction Records – Quality – Safety – Codes and Regulations. PREPARATORY WORK AND IMPLEMENTATION Site layout – Infrastructure Development – Construction Methods – Construction Materials – Deployment of Construction Equipment – Prefabrication in Construction – False work and Temporary Works.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the different construction stages
- Learn various activities in project implementation
- Knowledge on prefabrication in construction

UNIT – II: EARTH WORK

Classification of Soils – Project Site – Development – Setting Out - Mechanized Excavation – Groundwater Control – Trenchless (No-dig) Technology – Grading – Dredging. Rock Excavation– Basic Mechanics of Breakage – Blasting Theory – Durability of Rocks – Kinds of Drilling – Selection of the Drilling Method and Equipment – Explosives – Blasting Patterns and Firing Sequence – Smooth Blasting – Environmental Effect of Blasting.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn dewatering techniques
- Knowledge on drilling and blasting and its suitability

UNIT – III: PROJECT MANAGEMENT AND BAR CHARTS AND MILESTONE CHARTS

Introduction – Project planning – Scheduling – Controlling – Role of decision in project management – Techniques for analyzing alternatives Operation research – Methods of planning and programming problems – Development of bar chart – Illustrative examples – Shortcomings of bar charts and remedial measures – Milestone charts – Development of PERT network problems.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand and application of Network techniques in construction
- Application of Management tools like Bar Chart, Gant Chart, CPM and PERT

UNIT – IV: ELEMENTS OF NETWORK AND DEVELOPMENT OF NETWORK

Introduction – Event – Activity – Dummy – Network rules – Graphical guidelines for network – Common partial situations in network – Numbering the events – Cycles Problems – Planning for network construction – Modes of network construction – Steps in development of network – Work breakdown structure –Hierarchies – Illustrative examples – Problems.

Learning Outcomes:
At the end of this unit, the student will be able to

- Learn Elements of CPM and Pert network
- Analyze Steps in developing a network

UNIT – V: PERT AND CPM: TIME COMPUTATIONS & NETWORK ANALYSIS

Introduction – Uncertainties : Use of PERT – Time estimates – Frequency distribution – Mean, variance and standard deviation – Probability distribution – Beta distribution – Expected time Problems -Earliest expected time – Formulation for TE - Latest allowable occurrence time – Formulation for TL - Combined tabular computations for TE and TL problem. Introduction - Slack – Critical path – Illustrative examples – Probability of meeting scheduled date Problems – CPM : process – CPM : Networks – Activity time estimate – Earliest event time – Latest allowable occurrence time – Combined tabular computations for TE and TL - Start and finish times of activity – Float – Critical activities and critical path – Illustrative examples Problems.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the resource allocation and scheduling
- Analyse how delay in activities effect the total estimated time of project

Text Books:

1. Construction project management by JhaPearson pubilications,NewDelhi.
2. Construction Technology by SubirK.Sarkar and SubhajitSaraswati – Oxford Higher Education- Univ.Press,Delhi.
3. Project Planning and Control with PERT and CPM by Dr.B.C.Punmia, K.K.Khandelwal, Lakshmi Publications NewDelhi.

Reference Books:

1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003
2. Total Project management, the Indian context- by: P.K.JOY- Mac Millan Publishers India Limited.

Course Outcomes:

At the end of this Course the student will be able to

- Understand different construction techniques and practices.
- List out the requirements for substructure and superstructure in any construction project.
- Learn Network Techniques in construction management – Bar chart, Gant chart, CPM, PERT-
- Comprehending in Resource planning – planning for manpower, materials, equipment.

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE73- ADVANCED STRUCTURALDESIGN

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To make the student more conversant with the design principals of multistoried buildings, roof system, foundation and other important structures.

UNIT – I:

Design of a flat slab(Interior panel only)

Learning Outcomes:

At the end of this unit, the student will be able to

- To know the components of interior slab panel
- To understand the design procedure and detailing of reinforcement of interior panel of

UNIT – II:

Design of concrete bunkers of circular shape – (excluding staging) – Introduction tosilos

Learning Outcomes:

At the end of this unit, the student will be able to

- To know and understand the components of bunker
- To have a clear view of the design procedure and detailing of reinforcement of bunker

UNIT – III:

Design of concrete chimney

Learning Outcomes:

At the end of this unit, the student will be able to

- To have a comprehensive understanding of various forces acting on the chimney.
- To design the concrete chimney.

UNIT – IV:

Design of circular and rectangular water tank resting on the ground

Learning Outcomes:

At the end of this unit, the student will be able to

- To have a good understanding of design of water tanks resting on the ground.

UNIT – V:

Design of cantilever and counter forte retaining wall with horizontal backfill

Learning Outcomes:

At the end of this unit, the student will be able to

- To know the applications of cantilever and counter forte retaining walls.
- To perform the stability analysis of the retaining walls
- To design and detailing of the cantilever and counter forte retaining walls

FINAL EXAMINATION PATTERN:

The question paper shall contain 2 questions of either or type covering all the syllabus where each question carries 35 marks out of 35 marks, 20 marks shall be for the design and 15 marks are for the drawing.

Text Books:

JNTUACollege of Engg.,Pulivendula

1. Structural Design and drawing (RCC and steel) by KrishnamRaju, Universites .Press NewDelhi.
2. R.C.C Structures byDr. B. C. Punmia,Ashok Kumar Jain,Arun Kumar Jain, Laxmi Publications, NewDelhi
3. Advanced RCC by Varghese , PHI Publications, NewDelhi.
4. Design of RCC structures by M.L.Gambhir P.H.I. Publications, NewDelhi.

Reference Books:

1. R.C.C Designs by Sushilkumar , standard publishinghouse.
2 . Fundamentals of RCC by N.C.Sinha and S.K.Roy, S.Chand Publications

Course Outcomes:

At the end of this Course the student will be able to

- Design and detail the flatslabs
- Design and detail bunkers and silos
- Design and detail concrete chimney
- Design and detail water tanks resting on the ground
- Design and detail cantilever and counterforte retaining walls

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE74a- BRIDGE ENGINEERING

(Professional Elective – III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- It deals with different types of loads on the bridges as per the I.R.C code provisions.
- It deals with the design procedures of bridges such as deck slab bridge, T – Beam Bridge, Plate Girder Bridge and Box culvert etc., based on the I.R.C provisions.
- It gives a good knowledge on different components like bridge bearing, piers and abutments of the bridges.
- It gives good knowledge on design of bridge bearings based on the I.R.C provisions
- It makes the student to design a bridge independently as per the I.R.C provisions

UNIT – I:

INTRODUCTION: Importance of site investigation in Bridge design. Highway Bridge loading standards. Impact factor. Railway Bridge loading standards (B.G. ML Bridge) various loads in bridges.

BRIDGE BEARINGS : General features – Types of Bearings – Design principles of steel Rocker & Roller Bearings – Design of a steel Rocker Bearing – Design of Elastomeric pad Bearing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand different types of I.R.C loads on the bridges.
- Understand the different types of bridge bearings and their suitability.

UNIT – II:

DECK SLAB BRIDGE: Introduction – Effective width method of Analysis Design of deck slab bridge (Simply supported) subjected to class AA Tracked Vehicle only.

BOX CULVERT: General aspects. Design loads, Design of Box culvert subjected to IRC class AA tracked vehicle only.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the effective width method of analysis of bridge decks
- Know the design of the deck slab bridges
- Understand the different forces acting on the box culverts and its design.

UNIT – III:

BEAM & SLAB BRIDGE (T-BEAM BRIDGE) General features – Design of interior panel of slab – Pigeauds method – Design of a T-beam bridge subjected to class AA tracked vehicle only.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the pigeauds method of analysis of deck slabs of T beam bridges
- Design the T beam bridges

UNIT – IV:
PLATE GIRDER BRIDGE: Introduction – elements of a plate girder and their design. Design of a Deck type welded plate girder – Bridge of single line B.G.

Learning Outcomes:
At the end of this unit, the student will be able to
- Know the forces acting on the plate girder bridge
- Understand the design of plate girder bridge

UNIT – V:
PIERS & ABUTMENTS: General features – Bed Block – Materials piers & Abutments Types of piers – Forces acting on piers – Stability analysis of piers – General features of Abutments – forces acting on abutments – Stability analysis of abutments – Types of wing walls – Approaches – Types of Bridge foundations (excluding Design).

Learning Outcomes:

After completing this Unit, students will be able to
- Know the forces acting on the piers and abutments and their stability analysis.
- Know the different types of wings walls

Text Books:
1. Bridge Engineering by PonnuSwamy, TATA Mcgraw Hill Company, NewDelhi.
2. Design of Bridges by N.KrishnamRaju, Oxford & IBH, Publishing Company Pvt.ltd., Delhi.
3. Relevant – IRC & Railway bridgeCodes

Reference Books:
1. Design of Steel structures, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, NewDelhi.
2. Design of Bridges Structure byD.J.Victor
3. Design of Steel structures byRamachandra.
4. Design of R.C.C. structures B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, NewDelhi.
5. Design of Bridges Structure by T.R.Jagadish&M.A.Jayaram Prentice Hall of India Pvt., Delhi.

Course Outcomes:
At the end of this Course the student will be able to
- Understand different types of bridges and loads coming over the bridge as per the I.R.C codal provisions.
- Understand the design procedures of the bridges as per the I.R.C recommendations
- Understand the different forces acting on the piers and abutments and their stability analysis

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE74b- EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(professional Elective - III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To provide a coherent development to the students for the courses in sector of earthquake engineering
- To present the foundations of many basic engineering concepts related earthquake Engineering
- To give an experience in the implementation of engineering concepts which are applied in field of earthquake engineering
- To involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.

UNIT – I:

Introduction to Structural Dynamics : – Theory of vibrations – Lumped mass and continuous mass systems – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Undamped and damped free vibration – Damping – Response to harmonic excitation – Impulse Response function- Concept of response spectrum.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply Knowledge of mathematics, science and engineering by developing the equation of motion for vibratory systems and solving for the free and forced response.
- Calculate the earthquake design forces using appropriate methods as per IS 1893-2002(Part-I).

UNIT – II:

Multi-Degree of Freedom (MDOF) Systems: - Formulation of equations of motion – Free vibration – Determination of natural frequencies of vibration and mode shapes – Orthogonal properties of normal modes – Mode superposition method of obtaining response.

Learning Outcomes:

At the end of this unit, the student will be able to

- To formulate analytical model of MDOF systems subjected to earthquake loading for a given time history and analyze using response spectrum methods.
- Design the structure using IS 13920 code provisions

UNIT – III:

Earthquake Engineering : - Engineering Seismology – Earthquake phenomenon – Causes and effects of earthquakes – Faults – Structure of earth – Plate Tectonics – Elastic Rebound Theory – Earthquake Terminology – Source, Focus, Epicenter etc – Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes – Seismic waves – Seismic zones – Seismic Zoning Map of India – Strong motion data - Review of the latest Indian Seismic codes IS:4326 and IS:13920 provisions for ductile detailing of R.C buildings – Beam, column andjoints

Learning Outcomes:
At the end of this unit, the student will be able to

- To explain the basic concepts in seismology and correlate to earthquake engineering.
- Plan a good structural configuration for seismic resistance and Apply the concept of Ductility and Base isolation in designing earthquake resistant structures.

UNIT – IV:
Earthquake Analysis : - Introduction – Rigid base excitation – Formulation of equations of motion for SDOF and MDOF Systems – Earthquake response analysis of single and multi- storyed buildings – Use of response spectra.-Review of the latest Indian seismic code IS:1893 – 2002 (Part-I) provisions for buildings – Earthquake design philosophy – Assumptions – Design by seismic coefficient and response spectrum methods – Displacements and drift requirements – Provisions for torsion.

Learning Outcomes:
At the end of this unit, the student will be able to

- To apply the code procedures for seismic analysis, design and detailing of RC building frames.

UNIT – V:
Aseismic Planning : - Plan Configurations – Torsion Irregularities – Re-entrant corners – Non-parallel systems – Diaphragm Discontinuity – Vertical Discontinuities in load path – Irregularity in strength and stiffness – Mass Irregularities – Vertical Geometric Irregularity – Proximity of Adjacent Buildings.

Shear walls : - Types – Design of Shear walls as per IS:13920 – Detailing of reinforcements.

Learning Outcomes:
At the end of this unit, the student will be able to

- To explain and suggest a suitable seismic resistant measure for masonry load bearing structures.
- Intercept dynamic analysis result for design analysis and research purposes.
- Design and detailing of shear walls

Text Books:

1. Dynamics of Structures by A.K.Chopra – Pearson Education, Indian Branch,Delhi.
2. Dynamics of Structures – Clough &Penzien, McGraw Hill – InternationalEdition
3. Earthquake Resistant Design of Structures by S.K.Duggal, Oxford University press, NewDelhi

Reference Books:

1. Structural Dynamics by Mario Paaz , AcademicPubilishers.
2. Earthquake Resistant Design of Structures – Pankaj Agarwal & Manish Shrikhande – Printice Hall of India, NewDelhi
3. Earthquake Tips by C.V.R.Murty, I.I.T.Kanpur.
4. Earthquake Hazardous Mitijation by R.Ayothiraman and HemanthHazarika, I.K. International Publishing House Pvt.Ltd., NewDelhi.

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

- The students will gain an experience in the implementation of Earthquake Engineering on engineering concepts which are applied in field Structural Engineering.
- The students will get a diverse knowledge of earthquake engineering practices applied to real life problems
- The students will learn to understand the theoretical and practical aspects of earthquake engineering along with the planning and design aspects

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE74c- AIR POLLUTION AND CONTROL

(professional Elective - III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To teach the basics of air pollution
- To impart the behavior of air due to metrological influence
- To throw light on air quality management
- To teach the design of air pollution control methods

UNIT – I:

INTRODUCTION : Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution- stationary and mobile sources.

EFFECTS OF AIR POLLUTION : Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holesetc.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn the basics of air pollutants.
- Estimate the impact of air pollution

UNIT – II:

Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like Sox, Nox, CO, HC etc., air-fuel ratio. Computation and Control of products of combustion.

PLUME BEHAVIOUR : Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rosediagrams.

Learning Outcomes:

At the end of this unit, the student will be able to

- Study properties of atmosphere
- Learn plume behavior in different environmental conditions
- Analyse and compute the parameters of air pollutants
- Evaluate procedures for control of pollution

UNIT – III:

POLLUTANT DISPERSION MODELS : Lapse Rates, Pressure Systems, Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.

CONTROL OF PARTICULATES : Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control, Equipment‟s – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

Learning Outcomes:
At the end of this unit, the student will be able to

- Learn the design principles of particulate control.
- Learn and design pollutant dispersion models

UNIT – IV:
CONTROL OF GASEOUS POLLUTANTS : General Methods of Control of Nox and Sox emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

Learning Outcomes:
At the end of this unit, the student will be able to

- Learn the design principles of gaseous control.
- Develop environmental friendly fuels and study their properties.

UNIT – V:
AIR QUALITY MANAGEMENT : Air Quality Management – Monitoring of SPM, SO; NO and CO Emission Standards.
Learning Outcomes:
At the end of this unit, the student will be able to

- Study the air quality management.
- Visualize emissions and their permissible standards

Text Books:

1. Air Quality by Thodgodish, Levis Publishers, Special India Edition, NewDelhi
2. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw HillCompany.
3. Air pollution by Wark and Warner.- Harper & Row, NewYork.

Reference Books:

1. An introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S.Publications.
2. Air Pollution and Control by K.V.S.G.Murali Krishna, Kousal& Co. Publications, New Delhi.
3. Enivronmental meteorology by S.Padmanabhammurthy ,I.K.Internationals PvtLtd, New Delhi.

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

- Evaluating the ambient air quality based on the analysis of air pollutants
- Design particulate and gaseous control measures for an industry
- Judge the plume behavior in a prevailing environmental condition
- Estimate carbon credits for various day to day activities

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE76a- ADVANCED FOUNDATION ENGINEERING

(Professional Elective-IV)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To impart how Meyerhof's general bearing capacity equations are important over Terzaghi's bearing capacity equation.
- To teach special methods of computation of settlements and the corrections to be applied to settlements and to understand the advanced concepts of design of pile foundations.
- To throw light shallow and deep foundation designs.
- To teach the difference between isolated and combined footings, the determination of bearing capacity and proportioning of footings.

UNIT – I:

SHALLOWFOUNDATIONS:

General Requirements Of Foundations. Types Of Shallow Foundations And The Factors Governing The Selection Of A Type Of Shallow Foundation. Bearing Capacity Of Shallow Foundations By Terzaghi‟s Theory And Meyerhof‟s Theory (Derivation Of Expressions And Solution To Problems Based On These Theories). Local Shear And General Shear Failure And Their Identification. Bearing Capacity Of Isolated Footing Subjected To Eccentric And Inclined Loads. Bearing Capacity Of Isolated Footing Resting On Stratified Soils-Button‟s Theory And Siva Reddy Analysis.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Meyerhof's general bearing capacity equations are important over Terzaghi's bearing capacity equation

UNIT – II:

Earth Retaining Structures :Retaining walls: Uses, types, stability and design principles of retaining walls, backfill drainage, settlement and tilting.

Earth dams- Stability analysis: Classification, seepage control in embankments and foundations, seepage analysis, stability analysis: upstream and down stream for steady seepage, rapid draw down, end of construction, method of slices and Bishop's method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain need and importance of earth retaining structures
- Design of earth retaining structures according to stability concepts.

UNIT – III: DEEPFOUNDATIONS

Pile foundations-types of pile foundations. Estimation of bearing capacity of pile foundation by dynamic and static formulae. Bearing capacity and settlement analysis of pile groups. Negative skin Friction, Pile load tests. Well foundations – elements of well foundation. Forces acting a on a well foundation. Depth and bearing capacity of well foundation. Design of individual components of well foundation (only forces acting and principles of design). Problems associated with wellsinking.

Learning Outcomes:
At the end of this unit, the student will be able to

- Explain conditions for adopting pile foundations and well foundations
- Design well foundations

UNIT – IV:
SHEET PILE WALLS:
Cantilever sheet piles and anchored bulkheads, Earth Pressure diagram, Determination of depth of embedment in sands and clays-Timbering of Trenches – Earth Pressure Diagrams – Forces in struts.

DESIGN OF UNDER REAMED PILES FOUNDATIONS:
Under reamed piles-principle of functioning of under reamed pile-Analysis and structural design of under reamed pile.

Learning Outcomes:
At the end of this unit, the student will be able to

- Analysis of under reamed piles and their action on soils.

UNIT – V:
FOUNDATIONS IN PROBLEMATIC SOILS :
Foundations in black cotton soils- basic foundation problems associated with black cotton soils. Lime column techniques – Principles and execution. Use of Cohesive Non Swelling (CNS) layer below shallow foundations.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the problems associated with black cotton soils for foundation
- Understand the principles and execution of lime column techniques

Text Books:

1. Analysis and Design of Foundations and Retaining Structures- Shamsher Prakash, GopalRanjan and SwamiSaran.
2. Soil Mechanics and Foundation Engineering by Purushtoma Raj, PearsonPubilications
3. 3.Geotechnical Engg. – C.Venkatramaiah. New age International Pvt . Ltd, (2002).

Reference Books:

1. Analysis and Design of Foundations –E.W.Bowles.
2. Foundation engineering by Brije.M.Das, Cengagepubilications,NewDelhi.
3. Foundations Design and Construction –Tomlinson.

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

- Compute the safe bearing capacity of footings subjected to vertical and inclined loads.
- Understand the advanced methods of settlement computations and proportion foundation footings.
- Judging the methods of computing the pull-out capacity and negative skin friction of piles and compute the settlements of pile groups in clays.
- Evaluate the problems posed by expansive soils and the different foundation practices devised.

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE76b- PRESTRESSED CONCRETE

(Professional Elective-IV)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Analyze PSC beams with straight, concentric, eccentric, bent and parabolic tendons and design beams of rectangular and I sections for flexure.
- Design shear reinforcements, structural elements for shear, torsion and anchorage as per the provisions of BIS.
- Interpret the transmission mechanism of pre-stressing force by bond and compute deflection of beams under loads

UNIT – I:

INTRODUCTION:

Historic development – General principles of prestressingpretensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics.

METHODS OF PRESTRESSING:-

Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System Freyssinet system and Gifford – UdallSystem.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand pre tensioning and post tensioning
- Identify different type of prestressing systems.

UNIT – II:

ANALYSIS & DESIGN OF SECTIONS FOR FLEXURE;-

Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.Allowable stress, Design criteria as per I.S.Code – Elastic design of simple rectangular and I-section for flexure – Kern – lines, cable profile.

DESIGN OF SECTION FOR SHEAR :

Shear and Principal Stresses – Design for Shear in beams.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze beams for flexure and shear
- Understand prestressing with different types of tendons on beams of varying shape
- Know the end block characteristics and its significance

UNIT – III:

LOSSES OF PRESTRESS:-
Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation of stress in steel, slip in anchorage ,bending of member and wobble frictionallosses

Learning Outcomes:
At the end of this unit, the student will be able to
- Classify different types of losses in prescreening
- Estimate losses of pre stress

UNIT – IV:
COMPOSITE SECTION:
Introduction Different Types- Propped and Un-propped- stress distribution- – Analysis of stress – Differential shrinkage – General designs considerations.

Learning Outcomes:
At the end of this unit, the student will be able to
- Identify different types of composite beams
- Analyze PSC composite beams.

UNIT – V:
DEFLECTIONS OF PRESTRESSED CONCRETE BEAMS:
Importance of control of deflections – factors influencing deflections – short term deflections of un cracked member's prediction of long term deflections.

Learning Outcomes:
At the end of this unit, the student will be able to
- Distinguish between short term and long term deflections in PSC beams
- Estimate the short and long term deflections of PSC beam.

Text Books:
1. Prestressed Concrete by N. Krishna Raju; - Tata Mc.GrawHillPublications.
2. Prestressed Concrete by Ramamrutham, DhanpatraiPublications
3. Prestressed Concrete design Praveen Nagrajan, Pearson publications, 2013editions.

Reference Books:
1. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns
2. Pre stressed concrete: A Fundamental Approach byE.G.Nawy 5^{th} edition

Codes/Tables:
Codes: BIS code on prestressed concrete, IS 1343 to be permitted into the examination Hall

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE76c- DESIGN AND DRAWING OF IRRIGATION STRUCTURES

(Professional Elective-IV)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Sloping glacis weir.
- Tank sluice with tower head
- Surplus weir.
- Trapezoidal notch fall.
- Canal regulator.

Design and drawing of the following irrigation structures.

1. Sloping glacisweir
2. Surplusweir.
3. Tank sluice with towerhead
4. Trapezoidal Notch fall
5. Canalregulator.

Final Examination pattern: Any two questions of the above Five designs may be asked out of which the candidate has to answer one question. The duration of examination will be three hours.

At the end of this unit, the student will be able to

Text Books:

1. Design of minor irrigation and canal structures by C.Satyanarayana Murthy, Wileyeastern Ltd.
2. Irrigation engineering and Hydraulic structures by S.K.Garg, Standard BookHouse.

Course Outcomes:

At the end of this Course the student will be able to

- Design and draw the plan and cross section of Sloping glacis weir.
- Design and draw the plan and cross section of Tank sluice with tower head
- Design and draw the plan and cross section of Surplus weir.
- Design and draw the plan and cross section of Trapezoidal notch fall.
- Design and draw the plan and cross section of Canal regulator

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE75a-ARCHITECTURE AND TOWN PLANNING

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To know the western architecture and Indian architecture and also to gain knowledge on the principles of architectural design and historical background of town planning.

A) ARCHITECTURE:

UNIT – I:

At the end of this unit, the student will be able to

History of Architecture:

a) Western Architecture: Egyptian, Greek, Roman Architectures; influences- Comparative Analysis Orders

b) Indian Architecture: Vedic age - Indus Valley civilization - Buddhist period; stambas, Slenstas. Roranas, Chaityans, Viharas with one example for each Hindu temples - Evaluation of Dravidian and Indo Aryan Styles - Principle factors. Temple of Aibole, Mahabalipuram, Madurai, Deograph, Bhuvaneshwar, Mount Abu.

c) Indo - Sarsanic Architecture; Mosque - Place- FortTomb

Learning Outcomes:

Understand the different architectures of Indian and western countries

Understand the various principle factors of architecture

UNIT – II:

Architectural Design:

a) Principle of designing : Composition of plan Relationship between plan and elevation elements, form, surface Mass, Texture, Color,Tone.

b) Principle of Compositions: Unity, contrast, proportion, scale, Bab Rhuthm, character. Principles of Planning a Residence; Site Orientation prospect, Grouping, circulation, privacy, services and otherfactors

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the design pricnciples and compositions of architecture

UNIT – III:

Introduction of Post-classic Architecture and contribution of eminent architects to modern period.Brief summary of post - classic architecture - Indian and Western Architectural contribution of Edward Lutyens, Le Corbusier), Frank Lloyd Wrigt, Walter Groping, Vender Rohe, Caarihan, Nervi, Oscar Niemyer, Edward Durell stone

Learning Outcomes:

At the end of this unit, the student will be able to

- Obtain the knowledge of contribution of different architects in architecture

B) TOWNPLANNING:

UNIT – IV:

Historical Back Ground: Town planning in India - town plans of Magad - town plans of ancient Indian towns; Mourya, Pataliputravijayanagara, Delhi.Town planning in the West-town plans of Acropolis, Rome, Paris, London

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the need of town planning
- Knowledge on planning of different towns in India and other countries

UNIT – V:
Components of Planning;

a) Zoning
b) Roads and road Traffic.
c) Housing-Slums, Parks, Playgrounds.
d) Public Utility Services.
e) Surveys and maps for planning.
f) Neighbourhood Planning

Planning New town, planning standards, National and regional Planning, town planning and legislation.Garden cities and satellite town

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the different components of town planning
- Knowledge on national standards in country and town planning

Text Books:

Reference Books:

A) ARCHITECTURE

1. Indian Architecture – Vol:- I and II by Percy Brown, Taraporevala Publications, Bombay.
2. Planning and 'Design of Building -Section of Architecture byY.S.Sane.
3. Modern Architecture and Design by Nikolans,Pevshar.
4. Modern Ideal Hol11nes for India byR.S.Deshpande.

B) TOWNPLANNING

1. Town and Country .Planning - A.J.Brown andH.M.Sherrard.
2. Town Design .-FederikGibbard, Architectural press,London.
3. National Building Code ofIndia.
4. Town Planning in India - Town and Country Planning Organisation, New Delhi1962.
5. Regional Planning - Misra R.P., Mysore University.
6. Urban and Regional Planning; Principles and case studies by K.S.Rama Gouda, Mysore University Publications.
7. Town and Country Planning - P. Abercrombe, Oxford University press.

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

- Learn the importance of architecture and its principles in designing
- The different architectures till date and the contribution of different architects
- The necessity of town planning and different components of planning

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE75b-EXPERIMENTAL STRESS ANALYSIS

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To bring awareness on experimental method of finding the response of the structure to different types of load
- Demonstrates principles of experimental approach
- Teaches regarding the working principles of various strain gauges
- Throws knowledge on strain rosettes and principles of non destructive testing of concrete
- Gives an insight into the principles of photo elasticity

UNIT – I:

PRINCIPLES OF EXPERIMENTAL APPROACH: - Merits of Experimental Analysis Introduction, uses of experimental stress analysis advantages of experimental stress analysis, Different methods –Simplification of problems

Learning Outcomes:

At the end of this unit, the student will be able to

- Demonstrate the merits and principles of experimental approach
- Give an insight into the uses and advantages of experimental stress analysis

UNIT – II:

STRAIN MEASUREMENT USING STRAIN GAUGES:-

Definition of strain and its relation of experimental Determinations Properties of Strain Gauge Systems-Types of Strain Gauges – Mechanical, Acoustic and Optical Strain Gauges. Introduction to Electrical strain gauges - Inductance strain gauges – LVDT – Resistance strain gauges – various types –Gauge factor – Materials of adhesion base.

Learning Outcomes:

At the end of this unit, the student will be able to

- Introduce various strain gauge systems and their properties
- Give information regarding the gauge factor and materials of adhesion bases

UNIT – III:

STRAIN ROSSETTES AND NON – DESTRUCTIVE TESTING OF CONCRETE:- Introduction – the three elements Rectangular Rosette – The Delta Rosette Corrections for Transverse Strain Gauge. Ultrasonic Pulse Velocity method –Application to Concrete. Hammer Test – Application to Concrete.

Learning Outcomes:

At the end of this unit, the student will be able to

- Introduces various strain rosettes and corrections for strain gauges
- Gives an insight into the destructive and non destructive testing of concrete

UNIT – IV:

THEORY OF PHOTOELASTICITY: - Introduction –Temporary Double refraction – The stress Optic Law –Effects of stressed model in a polariscope for various arrangements – Fringe Sharpening. Brewster‟s Stress Optic law.

Learning Outcomes:
At the end of this unit, the student will be able to

- Introduces stress optic laws.
- Gives the arrangements and working principles of polariscope

UNIT – V:
TWO DIMENSIONAL PHOTOELASTICITY: - Introduction – Iso-chromatic Fringe patternsIsoclinic Fringe patterns passage of light through plane Polariscope and Circular polariscope Isoclinic Fringe patterns – Compensation techniques – Calibration methods – Separation methods – Scaling Model to prototype Stresses – Materials for photo – Elasticity Properties of Photoelastic Materials

Learning Outcomes:
At the end of this unit, the student will be able to

- Introduces the understanding of different fringe patterns.
- Introduces model analysis and properties of photo elastic materials

Text Books:

1. J.W.Dally and W.F.Riley, “Experimental stress analysis College House Enterprises”
2. Dr.Sadhu Singh, “Experimental stress analysis”, khanna Publishers

Reference Books:

1. U.C.Jindal, “Experimental Stress analysis”, Pearson Publications.
2. L.S.Srinath, “Experimental Stress Analysis”, MC.Graw Hill Company Publishers.

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

- The student will be able to understand different methods of experimental stress analysis
- The student will be able to understand the use of strain gauges for measurement of strain
- The student will be exposed to different Non destructive methods of concrete
- The student will be able to understand the theory of photo elasticity and its applications in analysis of structures

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE75c-FINITE ELEMENT ANALYSIS

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Familiarize basic principles of finite element analysis procedure.
- Explain theory and characteristics of finite elements that represent engineering structures.
- Apply finite element solutions to structural, thermal, dynamic problem
- Learn to model complex geometry problems and solution techniques

UNIT – I:

INTRODUCTION: Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh –Ritz method of functional approximation.

PRINCIPLES OF ELASTICITY: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with axi-symmetric loading.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of nodes and elements.(L2)
- Understand the general steps of finite element methods.(l2)
- Understand the role and significance of shape functions in finite element formulations (l2)

UNIT – II:

ONE DIMENSIONAL & TWO DIMENSIONAL ELEMENTS: Stiffness matrix for bar element – shape functions for one dimensional elements – one dimensional problems .Two Dimensional Elements - Different types of elements for plane stress and plane strain analysis – Displacement models – generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the formulation of one dimensional and two – dimensional elements (L2)
- Apply the formulation techniques to solveone dimensional two – dimensional problems (L2)
- Formulate and solve axisymmetric problems.(L6)

UNIT – III:

GENERATION OF ELEMENT : Generation of element stiffness and nodal load matrices for 3-node triangular element and four noded rectangular elements.

Learning Outcomes:

At the end of this unit, the student will be able to

Apply the formulation techniques to solve problems using triangle and quadrilateral elements. (L3)

UNIT – IV:

ISOPARAMETRIC FORMULATION : Concepts of, isoparametric elements for 2D analysis – formulation of CST element, 4 –Noded and 8-noded iso-parametric quadrilateral elements – Lagrangian and Serendipity elements. **AXI-SYMMETRIC ANALYSIS:** Basic principles- Formulation of 4-noded iso-parametric axi-symmetric element

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand concepts of isoparametric elements(L1)
- Formulate and solve axisymmetric problems.(L6)

UNIT – V:

SOLUTION TECHNIQUES: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads

Learning Outcomes:

At the end of this unit, the student will be able to

Text Books:

1. Finite Element Analysis for Engineering and Technology, Tirupathi R Chandraputla, Universities Press Pvt Ltd, Hyderabad.2003.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers

Reference Books:

1. Finite element analysis and procedures in engineering by H.V.Lakshminaryana, 3rd edition, universities press,Hyderabad
2. Finite element analysis in Engineering Design by S.Rajasekharan, S.Chand Publications, NewDelhi
3. Finite element analysis by S.S. Bhavakatti-New age internationalpublishers

Course Outcomes:

At the end of this Course the student will be able to

- Demonstrate the differential equilibrium equations and the irrelationship
- Apply numerical methods tofem
- Demonstrate the displacement models and loadvectors
- Compute the stiffness matrix for isoperimetricelements
- Analyze plane stress and plane strainproblems

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE75a- ELECTRICAL ENGINEERING MATERIALS

(Open Elective-III)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- Classification of materials.
- Properties of materials and its applications.
- Domestic wiring and earthling
- Concept of polarization and dipolar polarization
- Classification of materials.

UNIT – I: Conducting Materials **10 Hrs**

Introduction – classification of materials – Metals and Non metals, physical, thermal, mechanical and electrical properties of materials–classification of electrical materials–concept of atom – electron configuration of atom, conductors, general properties of conductors, factors effecting resistivity of electrical materials–electrical / mechanical / thermal properties of copper, aluminum, iron, steel, lead, tin and their alloys–applications.

Learning Outcomes:

At the end of this unit, the student will be able to

1. Understand the classification of conducting materials. **L1**
2. Analyze the properties of different conducting materials **L2**

UNIT – II: Dielectric and High Resistivity Materials **10 Hrs**

Introduction–solid, liquid and gaseous di electrics, leakage current, permittivity, dielectric constant, dielectric loss –loss angle –loss constant, Breakdown voltage and di electric strength of –solid, liquid and gaseous dielectrics, effect of break down–electrical and thermal effects, Polarization – electric, ionic and dipolar polarization. Effect of temperature and Frequency on dielectric constant of polar dielectrics. High Resistivity materials – electrical / thermal /mechanical properties of Manganin, Constantan, Nichrome, Tungsten, Carbon and Graphite and their applications in electrical equipment.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the classification of di electric and high resistivity materials. **L1**
- Analyze the properties of di electric and high resistivity materials **L2**

UNIT – III: Solid Insulating Materials **10 Hrs**

Introduction–characteristics of a good electrical insulating materials–classification of insulating materials – electrical, thermal, chemical and mechanical properties of solid insulating materials-Asbestos, Bakelite, rubber, plastics, thermoplastics. Resins, polystyrene, PVC, porcelain, glass, cotton and paper.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand about various characteristics of solid insulating materials **L1**
- Understand the classification of solid insulating materials. **L2**

UNIT – IV: Liquid & Gas Insulating Materials **10 Hrs**

Liquid insulating materials – Mineral oils, synthetic liquids, fluorinated liquids– Electrical, thermal and chemical properties – transformer oil – properties – effect of moisture on insulation properties Gaseous insulators– classification based on dielectric strength – dielectric loss, chemical stability properties and their applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the classification of liquid insulating materials. **L1**
- Analyze the properties of liquid insulating materials **L2**

UNIT – V: Domestic Wiring **10 Hrs**

Wiring materials and accessories–Types of wiring–Types of Switches-Specification of Wiring–Staircase wiring- Fluorescent lamp wiring-God own wiring–Basics of earthling– single phase wiring layout for residential building.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand about wiring materials and accessories **L1**
- Understand about earthing and wiring layout of domestic buildings **L2**

Text Books:

13. Electrical Engineering Materials by G.K. Mithal, Khanna publishers, 2nd edition,1991.
14. Acourse in Electrical Engineering Materials by R.K. Rajput, Laxmi publications,2009.

Reference Books:

21. An Introduction to Electrical Engineering Materials by C.S.Indulkar and S.Thiruvengadam, SChand&Company,2008.
22. Electrical engineering Materials by Technical Teachers Training Institute, Madras, McGraw Hill Education,1st Edition,2004.
23. A course in Electrical Engineering Materials Physics Properties & Applications by S P.Seth, Dhanapat Rai & Sons Publications,2018.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the classification of materials, domestic wiring materials and earthing. **L1**
- Analyze the properties of different electrical materials **L2**
- Apply where the materials are applicable based on properties of materials **L3**
- Design and develop Residential wiring, go down wiring and earthing. **L4**
- `Understand the characteristics of materials **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE75b- DIGITAL SIGNAL PROCESSORS AND APPLICATIONS

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- Provide the basic knowledge of different DSP Processors.
- Interfacing Memory and I/O Peripherals to different Programmable DSP Devices
- Operation of the ADC and programming modes
- Introduction to Field Programmable Gate Arrays
- Provide the basic knowledge of different DSP Processors.

UNIT – I: **10 Hrs**

Introduction to the TMSLF2407 DSP Controller: Brief Introduction to Peripherals - Types of Physical Memory - Software Tools

C2XX DSP CPU and instruction set: Introduction to the C2xx DSP Core and Code Generation - The Components of the C2xx DSP Core - Mapping External Devices to the C2xx Core and the Peripheral Interface -System Configuration Registers –Memory - Memory Addressing Modes - Assembly Programming Using the C2xx DSP Instruction Set

Learning Outcomes:

At the end of this unit, the student will be able to

- Able to understand the basic concepts of DSP controller **L1**
- Able to understand the Assembly language programming **L2**

UNIT – II: **10 Hrs**

Parallel and Serial Data Transfer: Pin Multiplexing (MUX) and General Purpose I/O Overview - Multiplexing and General Purpose I/O Control Registers - Using the General Purpose I/O Ports, Serial Communication

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Pin Multiplexing and GPIO pins **L1**
- Analyze the serial Communication concepts **L2**
- Understand the concept of control Registers **L3**

UNIT – III: **10 Hrs**

Interrupt system of TMS320LF2407: Introduction to Interrupts - Interrupt Hierarchy - Interrupt Control Registers - Initializing and Servicing Interrupts in Software, real time control with interrupts

The analog-to-digital converter (ADC): ADC Overview - Operation of the ADC and programming modes

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of Interrupts **L1**
- Analyze the concept of Analog to digital converter **L2**

UNIT – IV: **10 Hrs**

Event Managers (EVA, EVB): Overview of the Event Manager (EV) - Event Manager Interrupts - General Purpose (GP) Timers- Compare Units - Capture Units and Quadrature Encoded Pulse (QEP) Circuitry - General Event Manager Information – PWM Signal Generation with Event Managers and interrupts, Measurement of speed with Capture Units, Implementation of Space Vector Modulation with DSP TMSLF2407A

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the concept of Event Manager and Interrupts **L1**
- Apply the concept of Space Vector Modulation with processor **L2**

UNIT – V: **10 Hrs**

Field Programmable Gate Arrays: Introduction to Field Programmable Gate Arrays – CPLD Vs FPGA – Types of FPGA , Configurable logic Blocks (CLB), Input/Output Block (IOB) – Programmable Interconnect Point (PIP)- HDL programming –overview of Spartan 6 & ISE Design Suite, Implementation of PWM technique with SPARTAN-6 FPGA

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the concept of Field Programmable Gate Arrays. **L1**
- Apply the concept of HDL programming and PWM technique implementation **L2**

Text Books:

1. Hamid A. Tolyat**, "**DSP based Electromechanical Motion Control**"-**CRC press, 2004
2. Wayne Wolf,„FPGA based system design", Prentice hall, 2004

Reference Books:

24. Application Notes from the website of Texas Instruments
25. Spartan-6 FPGA Configurable Logic Block, 2010
26. Xilinx Spartan 6 Data sheets

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

- Write Assembly Language Programs for the Digital Signal Processors **L1**
- Configure and use Digital Input / Output lines and ADCs **L2**
- Configure and use Interrupts and Event Managers for PWM generation **L3**
- Employ DSPs & **L4**
- FPGAs for the real time control of Power Electronic Controllers **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEE75c- IOT APPLICATIONS IN ELECTRICAL ENGINEERING

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To learn about a few applications of Internet of Things
- To distinguish between motion less and motion detectors as IOT applications
- To know about Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process
- To understand about applications of IOT in smart grid
- To introduce the new concept of Internet of Energy for various applications

UNIT – I: SENSORS **10 Hrs**

Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about basic principles of sensors and their classification **L1**
- To learn about various motion less sensors **L2**

UNIT – II: Occupancy and Motion detectors **10 Hrs**

Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors - Resistive microphones, Piezoelectric, Photo resistors

Learning Outcomes:

At the end of this unit, the student will be able to

- To know about Capacitive occupancy **L1**
- To understand about Motion detectors **L2**

UNIT – III: MEMS **10 Hrs**

Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors

Learning Outcomes:

At the end of this unit, the student will be able to

- To understand about the basic concept of MEMS **L1**
- To know about electrostatic actuation **L2**

UNIT – IV: IOT FOR SMART GRID **10 Hrs**

Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home

Learning Outcomes:

At the end of this unit, the student will be able to

- To get exposure fundamental applications of IoT to Smart grid **L1**
- To learn about driving factors of IoT in Generation level **L2**

UNIT – V: IOE - Internet of Energy **10 Hrs**

Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IOE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid.

Learning Outcomes:

At the end of this unit, the student will be able to

- To get exposed the new concept of internet of energy **L1**
- To learn about architecture of IOE **L2**

Text Books:

1. Jon S. Wilson, Sensor Technology Hand book, Newnes Publisher, 2004
2. Tai Ran Hsu, MEMS and Microsystems: Design and manufacture, 1st Edition, Mc Grawhill Education, 2017
3. ErsanKabalci and YasinKabalci, From Smart grid to Internet of Energy, 1st Edition, Academic Press, 2019

Reference Books:

1. Raj Kumar Buyya and Amir VahidDastjerdi, Internet of Things: Principles and Paradigms, Kindle Edition, Morgan Kaufmann Publisher, 2016
2. Yen Kheng Tan and Mark Wong, Energy Harvesting Systems for IoT Applications: Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3. RMD SundaramShriram, K. Vasudevan and Abhishek S. Nagarajan, Internet of Things, Wiley, 2019

Course Outcomes:

At the end of this Course the student will be able to

- To get exposed to recent trends in few applications of IoT in Electrical Engineering **L1**
- To understand about usage of various types of motionless sensors **L2**
- To understand about usage of various types of motion detectors **L3**
- To get exposed to various applications of IoT in smart grid **L4**
- To get exposed to future working environment with Energy internet **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME75a – SPECIAL TYPE OF VEHICLES

(Open Elective-III)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- Introduce the various types of special vehicles.
- Familiarize with the function of graders.
- Identify the applications of haulage vehicles and lift truck
- Understand the functions of scarifiers and scrapers
- Discuss the specifications of special purpose vehicles

UNIT – I: TRACTORS & CRANES AND EXCAVATORS 8 Hrs

TRACTORS : General description, specification and functions, light, medium and heavy wheeled tractors, crawler tracks mounted / wheeled - Bull dozers, tilt dozers and angle dozers, front end loaders, factors affecting efficiency of output of tractors, simple problems, merits and demerits.

CRANES AND EXCAVATORS: General description, specifications and functions, excavator mounted cranes, mobile cranes with strut and cantilever type jibs, tractor towed and tractor mounted cranes. General description, specification and functions, classification based on attachments, face shovel, drag shovel, hoe, drag-line and grab or clam shell, advantages and limitations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify various types of tractors **L1**
- Calculate the efficiency of output of tractors **L4**
- Discuss the functions of cranes and excavators **L2**
- Recall the advantages and limitations of cranes and excavators **L2**

UNIT – II: GRADERS 6Hrs

Description, specification of tractor towed graders and motor graders, classification and functions of graders, functional details of spreading, mixing, ditching, bank sloping, snow removal, stripping, scarifying, and finishing, elementary details of transmission system (coupling, clutches, gear box, driving axles, propeller shafts), running gear and operating equipment air braking system; hydraulic system and its components, steering system of lights, medium and heavy graders, merits and limitations of graders.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the terms spreading, mixing, ditching, back sloping, scarifying. **L2**
- Discuss elementary details of transmission system **L2**
- Demonstrate the hydraulic system and its components. **L3**
- List the merits and limitations of graders. **L2**

UNIT – III: HAULAGE VEHICLES AND LIFT TRUCKS **6Hrs**

General description, specification and functions, self-propelled and tractor towed haulage vehicles and pneumatic – tires, dumpers – front tipping; trucks – rear tipping, tractor towed semi-trailers and trailers (rear and side tipping, bottom dumping). General description, specification and functions, fork lift trucks, alternative front end equipment (attachments) – Jib arm, shovel bucket, squeeze clamp, boom, fork extensions, barrel forks. Scissors lift trucks - Applications in industry, advantages and disadvantages.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the importance of haulage vehicles and trucks in industries. **L2**
- Select haulage vehicles for a given application **L6**
- Illustrate the function of fork lift trucks. **L3**

UNIT – IV: Rooters, Scarifiers And Scrapers **6 Hrs**

General description, specification and functions, tractor towed rooters and scarifiers - Heavy duty, light duty. General description, specification and functions, tractor towed and motorized scrapers, scraper work in cutting, cambering, side hill cutting, spreading on embankments, compaction of fill merits and demerits.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe the specifications of rooters **L2**
- Categorize Heavy duty and light duty scarifiers **L4**
- Recall the merits and demerits of scrapers. **L1**

UNIT – V: Compaction Vehicles And Other Special Purpose Vehicles **6Hrs**

General description, specification and functions, smooth wheeled rollers, pneumatic tired rollers, agricultural Rollers, sheep's foot rollers, vibrating compactors. General description, specification and functions, Ambulance, oil tankers, surveillance vehicle, television recording mobile UNIT, reefer vehicle, double decker bus, vestibule bus, fire fighting vehicle.

Learning Outcomes:

At the end of this unit, the student will be able to

- List various types of special purpose vehicles. **L1**
- Choose the rollers for a given application. **L1**
- Discuss the function of compactors. **L2**
- Explain the importance of special purpose vehicles in the society. **L2**

Text Books:

1. Peurifoy R L "Construction Planning, Equipment and Methods", Tata McGraw-Hill, NewDelhi, 2002.
2. Ian Graham, "Off-Road vehicles", Heinemann Library, 2008.

Reference Books:

1. Wong J "Terramechanics and Off-Road Vehicle Engineering", Butterworth-Heinemann, 2009.
2. Roninson E G, "Motor Graders", MIR Publications, Moscow, 1985.
3. Rodhiev and Rodhiev, "Tractors and Automobiles", MIR Publishers, Moscow, 1984.
4. Greenwich and Soreking, "Tractors", MIR Publishers, Moscow, 1967.

Course Outcomes:

At the end of this Course the student will be able to

- Classify excavators based on attachments. **L2**
- Understand the importance of graders. **L2**
- Identify the various types of fork lift attachments. **L2**
- Recall the advantages and disadvantages of special purpose vehicles. **L1**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME75b - SIX SIGMA AND LEAN MANUFACTURING

(Open Elective-III)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- Introduce the students, the basic concepts of six sigma and lean manufacturing.
- Expose with various quality issues in Inspection.
- Gain Knowledge on quality control and its applications to real time.
- Know the extent of cellular manufacturing and 5S.
- Understand the importance of Quality standards in manufacturing.

UNIT – 1: Introduction to Six-Sigma **8 Hrs**

Probabilistic models-Six Sigma measures-Yield-DPMO-Quality level-Reliability function using Six-Sigma-MTTF using Six Sigma-Maintenance free operating period- Availability using Six-Sigma-Point availability-Achieved availability-Operational Availability-Examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concepts of probabilistic models **L2**
- Determine the reliability function using six-sigma **L3**
- Explain about MTTF using six sigma concepts **L2**
- Illustrate the examples of availability using sigma **L2**

UNIT – II: The Elements of Six Sigma and their Determination **6Hrs**

The Quality Measurement Techniques: SQC, Six Sigma, Cp and Cpk- The Statistical quality control (SQC) methods-The relationship of control charts and six sigma-The process capability index (Cp)-Six sigma approach-Six sigma and the 1.5 σ shift-The Cpk Approach Versus Six Sigma-Cpk and process average shift- Negative Cpk-Choosing six sigma or Cpk-Setting the process capability index-Examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- List the quality measurement techniques **L1**
- Discuss the process capability index (Cp).
- Compare the Cpk Approach and Six Sigma
- Explain about different statistical quality control methods
- State the relationship of control charts and six sigma **L2**

UNIT – III: Introduction To Lean Manufacturing **6Hrs**

Conventional Manufacturing versus Lean Manufacturing – Principles of Lean Manufacturing – Basic elements of lean manufacturing – Introduction to LM Tools.

Learning Outcomes:

At the end of this unit, the student will be able to

- Illustrate the basic elements of lean manufacturing **L2**
- List the various lean manufacturing tools. **L1**

- Describe the principles of lean manufacturing **L2**
- Compare conventional manufacturing and lean manufacturing system **L2**

UNIT – IV: Cellular Manufacturing, JIT, TPM **6 Hrs**

Cellular Manufacturing – Types of Layout, Principles of Cell layout, Implementation. JIT – Principles of JIT and Implementation of Kanban. TPM – Pillars of TPM, Principles and implementation of TPM.

Learning Outcomes:
At the end of this unit, the student will be able to

- Explain the concept of cellular manufacturing **L2**
- Indentify the types of layouts. **L3**
- Describe the concepts of JIT and TPM **L2**
- Demonstrate the pillars of TPM **L2**
- Create the cell layout. **L6**

UNIT – V: Set Up Time Reduction, TQM, 5S, VSM 10 **6Hrs**
Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles.

Learning Outcomes:
At the end of this unit, the student will be able to

- Define set up time reduction. **L1**
- Illustrate the principles and implementation of 5S techniques. **L2**
- Discuss procedure and principles of value stream mapping **L6**
- List the various reduction approaches **L1**

Text Books:

1. U Dinesh Kumar, Crocker, Chitra and Harithe Saranga, Reliability and Six Sigma, Springer Publishers.
2. Sung H. Park, Six Sigma for Quality and Productivity Promotion, Asian Productivity Organization

Reference Books:

1. Sammy G. Shina, Six Sigma for Electronics Design and Manufacturing, McGraw-Hill.
2. Design and Analysis of Lean Production Systems, Ronald G. Askin & Jeffrey B. Goldberg, John Wiley & Sons, 2003.
3. Mikell P. Groover (2002) _Automation, Production Systems and CIM.
4. Rother M. and Shook J, 1999 _Learning to See: Value Stream Mapping to Add Value and Eliminate Muda‘ , Lean Enterprise Institute, Brookline, MA.

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

- Summarize various techniques that are related to the six-sigma and lean manufacturing **L2**
- Outline the concepts of cellular manufacturing, JIT and TPM **L2**
- Illustrate the principles and implementation of 5S techniques **L2**
- Discuss procedure and principles of value stream mapping **L6**
- Determine the reliability function using six-sigma. **L3**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME75c – REVERSE ENGINEERING

(Open Elective-III)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- Introduce the concepts of reverse engineering
- Familiarize with the tools and techniques for reverse engineering
- Teach the principles of various rapid prototyping methods
- Discuss the legal aspects of reverse engineering.

UNIT – 1: Introduction **8 Hrs**

Scope and tasks of RE, Process of duplicating, Definition and use of Reverse Engineering, Reverse Engineering as a Generic Process

Learning Outcomes:

At the end of this unit, the student will be able to

- Recall the definition and use of reverse engineering. **L1**
- Identify reverse engineering as a generic process. **L2**
- List various tasks of reverse engineering. **L1**

UNIT – II: Tools and Techniques for RE **6Hrs**

Object scanning: contact scanners, noncontact scanners, destructive method, coordinate measuring machine, Point Data Processing: pre processing and post processing of captured data, geometric model development, construction of surface model, solid model, noise reduction, feature identification, model verification

Learning Outcomes:

At the end of this unit, the student will be able to

- Summarize various techniques in reverse engineering. **L2**
- Compare preprocessing and post processing of captured data. **L4**
- Explain noise reduction, feature identification and model verification. **L2**

UNIT – III: Rapid Prototyping **6Hrs**

Introduction, current RP techniques and materials, Stereo Lithography, Selective Laser Sintering, Fused Deposition Modelling, Three-dimensional Printing, Laminated Object Manufacturing, Multi – jet Modelling, Laser-engineered Net Shaping, Rapid Prototyping, Rapid Tooling, Rapid Manufacturing

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the developments in the rapid prototyping techniques **L2**
- Classify rapid prototyping techniques. **L2**
- List the advantages and disadvantages of rapid prototyping methods. **L1**

UNIT – IV: Integration **6 Hrs**

Cognitive approach to RE, Integration of formal and structured methods in reverse engineering, Integration of reverse engineering and reuse.

Learning Outcomes:
At the end of this unit, the student will be able to
- Explain the cognitive approach to reverse engineering. **L2**
- Discuss the integration of formal and structured methods in reverse engineering. **L2**

UNIT – V: Legal Aspects of Reverse Engineering **6Hrs**
Legal Aspects of Reverse Engineering: Introduction, Copyright Law.

Learning Outcomes:
At the end of this unit, the student will be able to
- Identify the legal aspects of reverse engineering **L2**
- Understand the concepts of copyright law. **L2**

Text Books:
1. Biggerstaff T. J., "Design Recovery for Maintenance and Reuse", IEEE Corporation, 1991.
2. Katheryn, A. Ingle, "Reverse Engineering", McGraw-Hill, 1994.

Reference Books:
1. Aiken Peter, "Data Reverse Engineering", McGraw-Hill, 1996.
2. Linda Wills,"Reverse Engineering" ,Kluiver Academic Publishers, 1996.
3. Donald R. Honsa , "Co-ordinate Measurement and reverse engineering", American Gear Manufacturers Association, 1996.

Course Outcomes:
At the end of this Course the student will be able to
- Understand the importance of reverse engineering. **L2**
- Make use of tools and techniques of reverse engineering. **L3**
- Identify the applications of rapid prototyping techniques. **L2**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME75d – ENERGY AUDITING

(Open Elective-III)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- Introduce the concepts of energy scenario and need for energy policy for industries in India.
- Familiarize with the Energy Audit concepts and its approaches.
- Teach the principles and objectives of the Energy management.

UNIT – I: General Aspects 8 Hrs

Review of energy scenario in India, General Philosophy and need of Energy Audit and Management, Basic elements and measurements - Mass and energy balances – Scope of energy auditing industries - Evaluation of energy conserving opportunities, Energy performance contracts, Fuel and Energy substitution, Need for Energy Policy for Industries, National & State level energy Policies.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the fundamental aspects of energy scenario in India. **L2**
- List the various national and state level energy policy. **L1**
- Identify the basic elements and measurements of energy audit. **L3**
- Summarize the evaluation of energy conserving balances **L2**

UNIT – II: Energy Audit Concepts 6Hrs

Need of Energy audit - Types of energy audit – Energy management (audit) approach - understanding energy costs - Bench marking – Energy performance - Matching energy use to requirement - Maximizing system efficiencies -Optimizing the input energy requirements - Duties and responsibilities of energy auditors- Energy audit instruments - Procedures and Techniques.

Learning Outcomes:

At the end of this unit, the student will be able to

- Summarize various concepts of energy audit. **L2**
- Compare various energy management approaches. **L4**
- Explain Bench marking and energy performance in energy auditing. **L2**

UNIT – III: Principles and Objectives of Energy Management 6Hrs

Design of Energy Management Programmes - Development of energy management systems – Importance - Indian need of Energy Management - Duties of Energy Manager - Preparation and presentation of energy audit reports - Monitoring and targeting, some case study and potential energy savings.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the developments of energy management systems **L2**
- Explain the importance of energy management **L2**
- List the various duties of energy manager **L1**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME75e – INTRODUCTION TO COMPOSITE MATERIALS

(Open Elective-III)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- Introduce composite materials and their applications.
- Build proper background for stress analysis in the design of composite structures.
- Familiarize various properties of composite materials.
- Focus on biodegradable composites.

UNIT – I: Introduction to composites **8 Hrs**

Fundamentals of composites – Definition – classification– based on Matrix – based on structure – Advantages and applications of composites - Reinforcement – whiskers – glass fiber – carbon fiber - Aramid fiber – ceramic fiber – Properties and applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the fundamentals of composites. **L2**
- Classify the composites based on matrix and structure. **L2**
- Identify the practical applications of composites. **L3**
- Summarize the properties and advantages of reinforcement materials **L2**

UNIT – II: Polymer matrix composites **6Hrs**

Polymers - Polymer matrix materials – PMC processes - hand layup process – spray up process – resin transfer moulding – Pultrusion – Filament winding – Auto clave based methods - Injection moulding – sheet moulding compound – properties and applications of PMC's.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the properties of polymer matrix composites. **L2**
- Identify the polymer matrix composites. **L3**
- Explain various process used in making the polymer matrix composites **L2**
- Discuss the auto clave based methods. **L6**

UNIT – III: Metal matrix composites **6Hrs**

Metals - types of metal matrix composites – Metallic Matrices. Processing of MMC – Liquid state processes – solid state processes – In-situ processes. Properties and applications of MMC's.

Learning Outcomes:

At the end of this unit, the student will be able to

- Outline the various types of metal matrix composite **L2**
- Explain liquid state processes and solid state processes in MMCs preparation **L2**
- Demonstrate In-situ processes **L2**
- Identify the properties and applications of MMCs **L2**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME75f – CUSTOMER RELATIONSHIP MANAGEMENT

(Open Elective-III)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- Introduce basic concepts and principles of customer relationship management (CRM).
- Familiarize with appreciate the role and changing face of CRM as an IT enabled function.
- Describe concept of managing and sharing customer data.
- Explain the principles of CRM links in e-Business.
- Expose the students on Enterprise resource planning (ERP),supply chain management (SCM) and Supplier relationship management (SRM).

UNIT – 1: CRM concepts **8 Hrs**

CRM concepts - Acquiring customers, - Customer loyalty and optimizing customer relationships - CRM defined - success factors, the three levels of Service/ Sales Profiling - Service Level Agreements (SLAs), creating and managing effective SLAs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concepts of customer relationship management **L2**
- Define customer relationship management (CRM) **L1**
- Illustrate the service level agreements (SLAs) **L2**

UNIT – II: CRM in Marketing **6Hrs**

CRM in Marketing - One-to-one Relationship Marketing - Cross Selling & Up Selling - Customer Retention, Behaviour Prediction - Customer Profitability & Value Modeling, - Channel Optimization - Event-based marketing. - CRM and Customer Service - The Call Centre, Call Scripting - Customer Satisfaction Measurement.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concept of one-to-one relationship marketing **L2**
- Develop the skills related to predict the behaviour and retention of the customer **L6**
- Discus about customer profitability and value modeling. **L6**
- Illustrate the various methods for CRM and customer service **L2**

UNIT – III: Sales Force Automation **6Hrs**

Sales Force Automation - Sales Process, Activity, Contact- Lead and Knowledge Management - Field Force Automation. - CRM links in e-Business - E-Commerce and Customer Relationships on the Internet - Enterprise Resource Planning (ERP), - Supply Chain Management (SCM), - Supplier Relationship Management (SRM), - Partner relationship Management (PRM).

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the concept of CRM links in e-Business. **L2**
- Discus E-commerce and customer relationship on the internet. **L6**
- Describe Enterprise resource planning (ERP), Supply chain management (SCM). **L2**
- Explain terms supplier relationship management and partner relationship management. **L2**

UNIT – IV: Analytical CRM **6 Hrs**

Analytical CRM - Managing and sharing customer data - Customer information databases - Ethics and legalities of data use - Data Warehousing and Data Mining concepts - Data analysis - Market Basket Analysis (MBA), Click stream Analysis, Personalization and Collaborative Filtering.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain how to manage and sharing the customer data **L2**
- List the various ethics and legalities of customer database use **L1**
- Describe various data warehousing and data mining concepts **L3**
- Discus about market basket analysis (MBA) **L6**

UNIT – V: CRM Implementation **6Hrs**

CRM Implementation - Defining success factors - Preparing a business plan requirements, justification and processes. - Choosing CRM tools - Defining functionalities - Homegrown versus out-sourced approaches - Managing customer relationships - conflict, complacency, Resetting the CRM strategy. Selling CRM internally - CRM development Team - Scoping and prioritizing - Development and delivery - Measurement.

Learning Outcomes:

At the end of this unit, the student will be able to

- Define success factors for implementing the customer relationship management. **L1**
- Define functionalities of CRM. **L1**
- Explain the functions of CRM development team. **L2**
- Compare Home grown and out-sourced approaches. **L2**

Text Books:

1. Alok Kumar Rai, Customer Relationship Management Concept & Cases, Prentice Hall Of India Private Limted, New Delhi. 2011.
2. S. Shanmugasundaram, Customer Rela Tionship Management, Prentice Hall Of India Private Limted, New Delhi, 2008.

Reference Books:

1. Kaushik Mukherjee, Customer Relationship Management, Prentice Hall Of India Private Limted, New Delhi, 2008.
2. Jagdish Seth, Et Al, Customer Rela Tionship Management.
3. V. Kumar & Werner J., Customer Rela Tionship Management, Willey India, 2008.

Course Outcomes:

At the end of this Course the student will be able to

- Summarizes the how CRM works in industries. **L2**
- Discus about market basket analysis (MBA). **L6**
- Develop the skills related to predict the behaviour and retention of the customer. **L6**
- Explain the concepts of customer relationship management. **L2**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC75a-EMBEDDED SYSTEMS & IOT

(Open Elective-III)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- To understand the basics of Embedded Systems and IOT.
- To learn the architecture and programming of ARM Microcontroller.
- To be able to work with Raspberry Pi using Python Programming.
- To know about the IOT standards, communication technologies and protocols.
- To implement real time projects using the tools and techniques of IOT Platform.

UNIT – I:

Introduction to Embedded Systems and Internet of Things (IOT): Architecture of Embedded Systems, Embedded Systems Development process, Architecture of Internet of Things, Applications of Embedded Systems and IOT, Design Methodology for IOT Products

Learning Outcomes:

At the end of this unit, the student will be able to

- Gain knowledge on basics of embedded systems and IOT Architectures. **L1**
- Understand the design methodology and applications of embedded systems and IOT. **L2**

UNIT – II:

ARM Microcontrollers Architecture and Programming: Architecture, Instruction set, Programming ports, Timer/Counter, Serial communication, interrupts in C, Introduction ARM mBed platform.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the architecture and programming of ARM Microcontrollers. **L2**
- Work with ARM Microcontrollers in implementing real time projects. **L6**

UNIT – III:

Fundamentals of Python Programming & Raspberry Pi: Introduction to python programming, Working with functions, classes, REST full Web Services, Client Libraries, Introduction & programming Raspberry Pi3, Integrating Input Output devices with Raspberry Pi3.

Learning Outcomes:

At the end of this unit, the student will be able to

- Write programs using Python to implement the given task. **L6**
- Use Raspberry Pi3 for integrating Input & Output devices. **L3**

UNIT – IV:

IOT Technologies, Standards and Tools: Fundamental characteristics and high level requirements of IOT, IOT Reference models; Introduction to Communication Technologies & Protocols of IOT: BLE, Wi-Fi, LORA, 3G/4G Technologies and HTTP, MQTT, COAP protocols; Relevant Practicals on above technologies.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the characteristics and high level requirements to design new IoT devices. **L2**
- Summarize different Communication Technologies & Protocols of IoT. **L2**

UNIT – V:

IOT Platform, Cloud Computing Platforms for IoT Development: IOT Platform Architecture (IBM Internet of Things & Watson Platforms); API Endpoints for Platform Services; Devices Creation and Data Transmission; Introduction to NODE-RED and Application deployment.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn how to use API Endpoints for Platform Services, Devices Creation and Data Transmission. **L1**
- To implement real time projects using the tools and techniques of IoT Platform. **L6**

Text Books:

1. ArsheepBahga, Vijay Madisetti, "Internet of Things: A Hands-On Approach", 1st Edition, VPT, 2014.
2. K.V.K.K.Prasad, "Embedded Real Time Systems: Concepts, Design and Programming", 1st Edition, Dreamtech Publication, 2014.
3. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley Publications, 2013

Reference Books:

1. Jonathan W Valvano, "Embedded Microcomputer Systems: Real-Time Interfacing", 3rd Edition, Thomson Engineering, 2012.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key applications and Protocols", 2nd Edition, Wiley Publications, 2012.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the basics of Embedded Systems and IOT. **L2**
- Correlate the architecture and programming of ARM Microcontroller. **L4**
- Work with Raspberry Pi using Python Programming. **L6**
- Summarize IOT standards, communication technologies and protocols. **L2**
- Implement real time projects using the tools and techniques of IOT Platform. **L6**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC75b-ELECTRONIC INSTRUMENTATION

(Open Elective-III)

L	T	P	C
2	0	0	2

Course Objectives: The objectives of the course are to make the students learn about

- To know about the performance characteristics of instruments and measurement of electrical quantities.
- To understand the construction, working and applications of different types of CRO"s.
- To analyze the working of different types of bridges.
- To study the working of signal & function generators.
- To analyze the working of transducers in measuring physical parameters

UNIT – I:

Measuring Instruments: Introduction, Errors in Measurement, Accuracy, Precision, Resolution and Significant figures. Basic PMMC Meter- construction and working, DC and AC Voltmeters- Multirange, Range extension, DC Ammeter, Multimeter for Voltage, Current and resistance measurements.

Digital Instruments: Digital Voltmeters – Introduction, DVM's based on V–T, V–F and Successive approximation principles, Resolution and sensitivity, General specifications, Digital Multimeters, Digital frequency meters, Digital measurement of time.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the performance characteristics of the instruments. **L1**
- Understand the working of different types of ammeters, voltmeters and multimeters. **L2**

UNIT – II:

Oscilloscopes: Introduction, Block diagram of CRO, Basic principle of CRT, CRT Construction and features, vertical amplifiers, horizontal dPeflection system- sweep, trigger pulse, delay line, sync selector circuits. Dual beam and dual trace CROs, Sampling and Digital storage oscilloscopes.

Learning Outcomes:

At the end of this unit, the student will be able to

- Grasp the construction and working of different types of oscilloscopes. **L1**
- Use CRO to measure the amplitude, frequency, phase and time period of given signals. **L3**

UNIT – III:

Bridges: DC Bridges for Measurement of resistance - Wheat stone bridge, Kelvin's Bridge, AC Bridges for Measurement of inductance- Maxwell's bridge, Hay's Bridge, Anderson bridge, Measurement of capacitance - Schearing Bridge, Wien Bridge, Errors and precautions in using bridges.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the construction and working of different types of bridges. **L2**
- Measure parameters like resistance, capacitance, and inductance using bridges. **L3**

UNIT – IV:

Signal Generators: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the working and applications of signal generators. **L2**
- Gain knowledge on the working and applications of function generators. **L1**

UNIT – V:

Transducers: Introduction, Types of Transducers, Electrical transducers, Selecting a transducer, Resistive transducer, Strain gauges, Piezoelectric transducer, Photoelectric transducer, Photovoltaic transducer, Temperature transducers-RTD, LVDT.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic working principle and applications of transducers. **L2**
- Measure physical parameters using different types transducers. **L3**

Text Books:

1. H.S.Kalsi, "Electronic Instrumentation", Third edition, Tata McGraw Hill, 2010.
2. A.D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 6th Edition, 2010.

Reference Books:

1. A.K. Sawhney, Dhanpat Rai & Co., "A course in Electrical and Electronic Measurements and Instrumentation", 9th Edition, 2010.
2. David A. Bell, "Electronic Instrumentation & Measurements", PHI, 2nd Edition, 2006.

Course Outcomes:

At the end of this Course the student will be able to

- Know about the performance characteristics of instruments and measurement of electrical quantities. **L1**
- Understand the construction, working and applications of different types of CRO"s. **L2**
- Compare the working of different types of bridges. **L2**
- Learn the working of signal & function generators. **L1**
- Analyze the working of transducers in measuring physical parameters. **L4**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC75c-BASICS OF VLSI DESIGN

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about

- To give exposure to different steps involved in the fabrication of ICs and electrical properties of MOS devices.
- To know the design rules in drawing the layout of any logic circuit.
- To design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
- To learn the concepts scaling and designing building blocks of data path of any system using gates.
- Understand the design and operation of basic programmable logic devices.

UNIT – I:

MOS Technology: Introduction to IC Technology. The IC Era, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, nMOS and CMOS Fabrication processes.

Basic Electrical Properties of MOS Circuits: I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Transconductance and Output Conductance, nMOS Inverter, Determination of Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, CMOS Inverter.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand different steps involved in the fabrication of ICs and electrical properties of MOS devices. **L2**
- Analyze the operation of NMOS, CMOS and BiCMOS inverters. **L4**

UNIT – II:

MOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2µm Double Metal, Double Poly CMOS rules, Layout Diagrams-A Brief Introduction, Symbolic Diagrams-Translation to Mask Form.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the VLSI design flow and stick diagrams. **L1**
- Understand the design rules in drawing the layout of any logic circuit. **L2**

UNIT – III:

Basic Circuit Concepts: Sheet Resistance. Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, standard unit of capacitance, area Capacitance calculations, the Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand different types of logics in gate level design. **L2**
- Learn and compare different performance parameters in gate level design. **L1**

UNIT – IV:

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling.

Sub System Design and Layout: Switch logic, Gate logic, Examples of Structured Design, parity generator, multiplexers, and grey to binary code converter.

Learning Outcomes:

At the end of this unit, the student will be able to

- Appreciate the importance, models and limitations of scaling. **L1**
- Explain the building blocks of data path of any system using gates. **L1**

UNIT – V:

Programmable Logic Devices: Read only memories, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL), Complex programmable logic devices, Field programmable gate arrays.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain different programmable logic devices. **L1**
- Compare the performance parameters and applications of different programmable logic devices. **L2**

Text Books:

1. Kamran Eshraghian. Douglas, A. Pucknell and Sholeh Eshraghian, "Essentials of LSI Circuits and Systems", Prentice Hall of India Private Limited, 2005 Edition.
2. Neil H.E.WESTE, David Harris andAyan Banerjee, "CMOS VLSI Design A Circuits and systems perspective", Pearson Education, 2006 Third Edition

Reference Books:

1. Richa Jain and Amrita Rai, "Principles of VLSI and CMOS Integrated Circuits", S.Chand and Company Limited. First edition.2012.
2. Wayne Wolf, "Modern VLSI Design", Pearson Education, 3rd Edition.

Course Outcomes:

At the end of this Course the student will be able to

- Understand different steps involved in the fabrication of ICs and electrical properties of MOS devices. **L2**
- Know the design rules in drawing the layout of any logic circuit. **L1**
- Compare different types of logic gates using CMOS inverter and their transfer characteristics. **L2**
- Learn the concepts to design building blocks of data path of any system using gates. **L1**
- Gain knowledge about basic programmable logic devices and testing of CMOS circuits. **L1**

IV B.Tech I SEMESTER
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ACS75a-MOBILE APPLICATION DEVELOPMENT
(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives:

- Android Application Development course is designed to quickly get you up to speed with writing apps for Android devices. The student will learn the basics of Android platform and get to understand the application lifecycle

UNIT – 1: 8 Hrs

Introduction Android Programming: What is Android, Activities, Linking Activities Using Intents, Fragments, Calling Built – in Applications using Intents, Displaying Notifications.

Learning Outcomes:

At the end of this unit, the student will be able to

- demonstrate their understanding of the fundamentals of Android operating systems **L2**
- demonstrate their skills of using Android software development tools **L2**

UNIT – II: 8 Hrs

Android User Interface: Understanding the Components of a Screen, Adapting to Display Orientation, Managing Changes to Screen Orientation, Utilizing the Action Bar, Listening for UI Notifications.

Learning Outcomes:

At the end of this unit, the student will be able to

- demonstrate their ability to develop software with reasonable complexity on mobile platform **L3**
- demonstrate their ability to deploy software to mobile devices **L3**

UNIT – III: 8 Hrs

Designing User Interface with Views: Basic Views, Picker Views, Using List Views to Display Long Lists.

Learning Outcomes:

At the end of this unit, the student will be able to

- demonstrate their ability to debug programs running on mobile devices **L4**
- demonstrate their ability to deploy software to mobile devices **L4**

UNIT – IV: 7 Hrs

Displaying pictures and menus with views and Data Persistence: Views to Display pictures, menus with views, additional views, saving and loading user preferences, persisting data to files, creating and using databases.

Learning Outcomes:

At the end of this unit, the student will be able to

- demonstrate their skills of using Android software development tools **L4**
- demonstrate their ability to develop software with reasonable complexity on mobile platform **L5**

UNIT – V: 08 Hrs

Content Providers: Sharing data in android, using a content provider, creating your own content providers.

Messaging and Networking: SMS Messaging, Sending E-Mail, Networking

Location-Based Services: Displaying Maps, Getting Location Data.

Learning Outcomes:

At the end of this unit, the student will be able to

- demonstrate their ability to deploy software to mobile devices **L5**
- demonstrate their ability to debug programs running on mobile devices **L5**

Text Books:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India
2. Beginning Swift Programming, Wei-Meng Lee, December 2014, ISBN: 978-1-119-00931-3

Reference Books:

1. Enterprise J2ME: Developing Mobile Java Applications, Michael Juntao Yuan, Pearson Education, 2004.
2. Android Application Development for Java programming by James C. Sheusi, Cengage Learning
3. Android A Programmers Guide by Jerome DiMargio, TMH.

Course Outcomes:

At the end of this Course the student will be able to

- demonstrate their understanding of the fundamentals of Android operating systems **L3**
- demonstrate their skills of using Android software development tools **L4**
- demonstrate their ability to develop software with reasonable complexity on mobile platform **L5**

IV B.Tech I SEMESTER
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ACS75b- REAL TIME OPERATING SYSTEMS AND APPLICATIONS
(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives:
COURSE OBJECTIVES:
The objective of this course is to

- develop an understanding of various Real Time systems Application
- obtain a broad understanding of the technologies and applications for the emerging and exciting domain of real-time systems
- get in-depth hands-on experience in designing and developing a real operational system.

UNIT – 1: Introduction **8 Hrs**
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Dead-lines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.
Learning Outcomes:
At the end of this unit, the student will be able to

- List a range of different software testing techniques and statergies and be able to apply specific(automated) unit testing method to the projects. **L1**
- Distinguish characterstics of structural testing methods **L2**

UNIT – II: Real Time Scheduling **8 Hrs**
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling A periodic and Sporadic jobs in Priority Driven and Clock Driven Systems..
Learning Outcomes:
At the end of this unit, the student will be able to

- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. **L3**
- Discuss about the functional and system testing methods **L3**

UNIT – III: Resources Sharing **8 Hrs**
Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority- Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Module Resources, Controlling Concurrent Accesses to Data Objects.
Learning Outcomes:
At the end of this unit, the student will be able to

- Discuss about the functional and system testing methods. **L4**
- Demonstrate various issues for object oriented testing. **L4**

UNIT – IV: Real Time Communication **7 Hrs**

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols..

Learning Outcomes:

At the end of this unit, the student will be able to

- Distinguish characterstics of structural testing methods. **L5**
- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. **L4**

UNIT – V: Real Time Operating Systems and Databases **08 Hrs**

Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Con-currency Control, Overview of Commercial Real Time databases..

Learning Outcomes:

At the end of this unit, the student will be able to

- Discuss about the functional and system testing methods. **L5**
- Demonstrate various issues for object oriented testing. **L5**

Text Books:

1. Real Time Systems – Jane W. S. Liu, Pearson Education Publication.

Reference Books:

1. Real Time Systems – Mall Rajib, Pearson Education.
2. Real-Time Systems: Scheduling, Analysis, and Verification – Albert M. K. Cheng, Wiley.

Course Outcomes:

At the end of this Course the student will be able to

- List a range of different software testing techniques and statergies and be able to apply specific(automated) unit testing method to the projects. **L3**
- Distinguish characterstics of structural testing methods. **L4**
- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. **L5**
- Discuss about the functional and system testing methods. **L5**

IV B.Tech I SEMESTER
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19ACS75c- FUNDAMENTALS OF BLOCKCHAIN AND APPLICATIONS
(Open Eletive-III)

L	T	P	C
3	0	0	3

Course Objectives:
1. To study fundamental concepts in software testing
2. To discuss various software testing issues and solutions in software unit test, integration and system testing.
3. To expose the advanced software testing topics, such as object--oriented software testing methods.

UNIT – 1: Introduction **8 Hrs**
Grasping Blockchain Fundamentals, Tracing Blockchain's Origin,The shortcomings of current transaction systems, The emergence of bitcoin , 5 The birth of blockchain, Revolutionizing the Traditional Business, Network Exploring a blockchain application, Recognizing the key business benefits, Building trust with blockchain.

Learning Outcomes:
At the end of this unit, the student will be able to
- List a range of different software testing techniques and statergies and be able to apply specific(automated) unit testing method to the projects. **L1**
- Distinguish characterstics of structural testing methods **L2**

UNIT – II: Blokchain working **8 Hrs**
Taking a Look at How Blockchain Works,Why It's Called "Blockchain", What Makes a Blockchain Suitable for Business, Shared ledger, Permissions Consensus, Smart contracts, Identifying Participants and Their Roles, Fundamentals of Blockchain.

Learning Outcomes:
At the end of this unit, the student will be able to
- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. **L3**
- Discuss about the functional and system testing methods **L3**

UNIT – III: Business with Blockchain **8 Hrs**
Propelling Business with Blockchains, Recognizing Types of Market Friction, Information frictions, Interaction frictions, Innovation frictions, Moving Closer to Friction-Free Business, Networks Reducing information friction, Easing interaction friction, Easing innovation friction, Transforming Ecosystems through Increased Visibility.

Learning Outcomes:
At the end of this unit, the student will be able to
- Discuss about the functional and system testing methods. **L4**
- Demonstrate various issues for object oriented testing. **L4**

UNIT – IV: Blockchain in Action **7 Hrs**
Blockchain in Action: Use Cases, Financial Services, Commercial financing, Trade finance, Cross-border transactions, Insurance, Government Supply Chain Management Healthcare, Electronic medical records, Healthcare payments pre-authorization, The Internet of Things (IoT).

Learning Outcomes:
At the end of this unit, the student will be able to
- Distinguish characterstics of structural testing methods. **L5**
- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. **L4**

UNIT – V: Hyperledger **10 Hrs**
Hyperledger, a Linux Foundation Project, Hyperledger Vision, Hyperledger Fabric, How Can IBM Help Developers Innovate With Blockchain?, Offering an easily accessible cloud and development platform, Individualized attention and industry expertise.
Learning Outcomes:
At the end of this unit, the student will be able to
- Discuss about the functional and system testing methods. **L5**
- Demonstrate various issues for object oriented testing. **L5**

Text Books:
1. Fundamentals of Blockchain., Ravindhar Vadapalli

Reference Books:
1. Block chain Technology Concepts and Applications, Kumar Saurabh, Ashutosh Saxena

Course Outcomes:
At the end of this Course the student will be able to
- List a range of different software testing techniques and statergies and be able to apply specific(automated) unit testing method to the projects. **L3**
- Distinguish characterstics of structural testing methods. **L4**
- Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. **L5**
- Discuss about the functional and system testing methods. **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19ACE77- CAD–LAB

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of the course are to make the students learn about

- To introduce fundamentals of computer aided Design and drawing in Civil Engineering.
- To enable the students Communicate designs graphically

UNIT – I:

SOFTWARE:

1. STAAD PRO or Equivalent

EXCERCISIES:

1. 2-D Frame Analysis and Design
2. Steel Tabular Truss Analysis and Design
3. 3-D Frame Analysis and Design
4. Retaining Wall Analysis and Design
5. Simple tower Analysis and Design
6. One Way Slab Analysis & Design
7. Two Way Slab Analysis & Design
8. Column Analysis & Design

Text Books:

1. Computer Aided Design Lab Manual by Dr.M.N.Sesha Prakash And Dr.C.S.Suresh

Course Outcomes:

At the end of this Course the student will be able to

- Design frames using Computer Aided Design and Drafting software's.
- Develop engineering project structural design using STAAD software