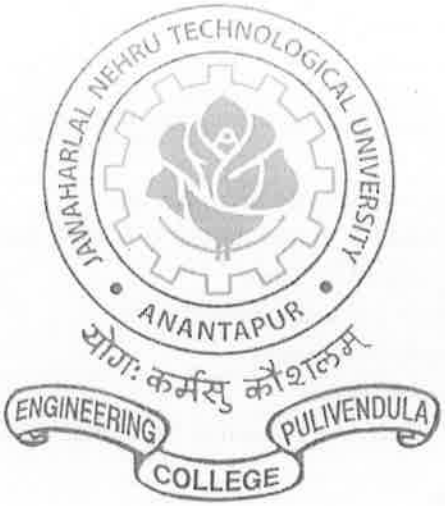

Jawaharlal Nehru Technological University Anantapur College of Engineering

Pulivendula –516 390 (A.P) India

B.Tech. in Civil Engineering

Course Structure

Under R20 Regulations

Effective from AY 2021-22

CIVIL ENGINEERING

Semester –0			
S.No	**Course Name**	**Category**	**L-T-P-C**
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counselling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-0-0
5	Proficiency Modules & Productivity Tools	ES	2-0-0-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-0-3-0
8	Human Values & Professional Ethics	MC	3-0-3-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-0-2-0
10	Concepts of Programming	ES	2-0-0-0

B.Tech I Year I Semester

Semester –1					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ABS05	Linear Algebra and Calculus	BS	3-0-0	3
2	20ABS01	Engineering Physics	BS	3-0-0	3
3	20AHS01	Communicative English	HS	3-0-0	3
4	20ACS06	Basic Python Programming	ES	3-0-0	3
5	20AME04	Engineering workshop	ES	0-0-3	1.5
6	20ACS05	IT workshop	ES	0-0-3	1.5
7	20AHS02	Communicative English lab	HS	0-0-3	1.5
8	20ABS02	Engineering Physics Laboratory	ES	0-0-3	1.5
9	20ACS07	Basic Python Programming Lab	ES	0-0-3	1.5
				Total	**19.5**

B.Tech I Year II Semester

Semester – 2					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ABS06	Differential Equations and Vector Calculus	BS	3-0-0	3
2	20ABS07	Engineering Chemistry	BS	3-0-0	3
3	20ACE03	Building materials and construction	ES	3-0-0	3
4	20ACE01	Strength of materials -I	ES	3-0-0	3
5	20AME01	Engineering Graphics	ES	1-0-4	3
6	20ACE04	Civil Engineering Workshop Lab	ES	0-0-3	1.5
7	20ABS08	Engineering Chemistry Lab	BS	0-0-3	1.5
8	20ACE02	Strength of materials Lab	ES	0-0-3	1.5
				Total	**19.5**

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B.Tech II Year I Semester

Semester – 3					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ABS13	Complex Variables, Transforms and Applications to Partial Differential Equations	BS	3-0-0	3
2	20ACE05	Strength of Materials – II	PC	3-0-0	3
3	20ACE06	Fluid Mechanics	PC	3-0-0	3
4	20ACE07	Surveying	PC	3-0-0	3
5	20ACE09	Concrete Technology	PC	3-0-0	3
6	20AHS03	Universal Human Values	MC	3-0-0	3
7	20ACE11	Building Planning And Drawing (skill oriented course – I)	SC	1-0-2	2
8	20ACE10	Concrete Technology Lab	PC	0-0-3	1.5
9	20ACE08	Surveying Lab-I	PC	0-0-3	1.5
10	20ACE12	Auto Cad Lab	PC	0-0-3	1.5
11	20ACE20	Design Thinking for Innovation	MC	3-0-0	**0**
				Total	**24.5**

B.Tech II Year II Semester

Semester – 4					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ABS15	Numerical methods, Probability and Statistics	BS	3-0-0	3
2	20ACE13	Engineering Geology	ES	3-0-0	3
3	20ACE15	Structural Analysis-I	PC	3-0-0	3
4	20ACE16	Hydraulics and Hydraulic Machinery	PC	3-0-0	3
5		Humanities Elective –I	HS	3-0-0	3
	20AHS04	Managerial Economics & Financial Analysis			
	20AHS05	Entrepreneurship & Incubation			
6	20ACE17	Estimation, Costing and Valuation (Skill Oriented Course – II)	SC	1-0-2	2
7	20ACE14	Engineering Geology Lab	ES	0-0-3	1.5
8	20ACE18	Surveying-II lab	PC	0-0-3	1.5
9	20ACE19	Fluid Mechanics and Hydraulics and Hydraulic Machinery Lab	PC	0-0-3	1.5
10	20ABS09	Environmental Science	MC	3-0-0	0
11	20AMC01	NSS activities	MC	0-0-2	0
				Total	**21.5**
Mandatory Community Service Project/ Internship during Summer Vacation					

- Eligible & interested students are permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Honours or a Minor from V Semester onwards.
- A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline.

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B.Tech III Year I Semester

Semester - 5					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ACE51	Design of Reinforced Concrete Structures	PC	3-0-0	3
2	20ACE52	Geotechnical Engineering	PC	3-0-0	3
3	20ACE53	Environmental Engineering	PC	3-0-0	3
4	20ACE54	Professional Elective Course – I	PE	3-0-0	3
	20ACE54A	Structural Analysis – II			
	20ACE54B	Remote sensing and GIS			
	20ACE54C	Construction Technology and Project Management			
5	20ACE55	Open Elective Course – I	OE	3-0-0	3
6	20ACE50	BIM Fundamentals for Civil Engineers (Skill oriented course – III)	SC	1-0-2	2
7	20ACE57	Environmental Engineering Lab	PC	0-0-3	1.5
8	20ACE58	Geotechnical Engineering Lab	PC	0-0-3	1.5
9	20AMC02	Aptitude and Reasoning Skills	MC	3-0-0	0
10	20ACE59	Evaluation of Community Service Project/Internship	PR	-----	1.5
				Total	**21.5**

Open Elective I (Interdisciplinary)

Branch	Subject Code	Subject
Mathematics	20ABS55A	Fuzzy Set Theory, Arithmetic and Logic
Physics	20ABS55B	Functional Nanomaterials for Engineers
Chemistry	20ABS55C	Chemistry of Energy Materials
EEE	20AEE55A	Basics of Non-Conventional Energy Sources
ME	20AME55A	3D Printing
	20AME55B	Smart Materials
ECE	20AEC55A	Fundamentals of Electronics and Communication Engineering
	20AEC55B	Transducers and Sensors
CSE	20ACS55A	Fundamentals of Internet of Things
	20ACS55B	E-Marketing
	20ACS55C	Computer Architecture and organization

Note: A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.

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B.Tech III Year II Semester

Semester - 6					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ACE61	Design of Steel Structures	PC	3-0-0	3
2	20ACE62	Highway Engineering	PC	3-0-0	3
3	20ACE63	Hydrology and Irrigation Engineering	PC	3-0-0	3
4	20ACE64	Professional Elective Course – II(MOOC-I)	PE	3-0-0	3
5		Humanities Elective –II	HS	3-0-0	3
	20AHS12	Management Science			
	20AHS13	Business Environment			
6	20ACE66	Design Studio Lab	PC	0-0-3	1.5
7	20ACE67	Highway Engineering Lab	PC	0-0-3	1.5
8	20ACE68	Advanced Concrete Technology Lab	PC	0-0-3	1.5
9	20AHS10	Soft Skills (Skill Oriented Course -IV)	SC	1-0-2	2
10	20ACE69	Indian Constitution	MC	3-0-0	0
				Total	**21.5**
Industry Internship (Mandatory) for 6 - 8 weeks duration during summer vacation					

Note: Student shall register for MOOC Course in NPTEL/SWAYAM in concurrence with the department before commencement of semester. The advanced courses should opt which is not repetitive regular courses and syllabus.

B.Tech IV Year I Semester

Semester - 7					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ACE71	Professional Elective Course – III	PE	3-0-0	3
	20ACE71A	Hydraulic structures and Water power engineering			
	20ACE71B	Air pollution and control			
	20ACE71C	Advanced structural Design			
2	20ACE72	Professional Elective Course – IV	PE	3-0-0	3
	20ACE72A	Prestressed Concrete			
	20ACE72B	Design and Drawing of Irrigation Structures			
	20ACE72C	Ground Improvement Techniques			
3	20ACE73	Professional Elective Course –V	PE	3-0-0	3
	20ACE73A	Railways, Airport and harbor Engineering			
	20ACE73B	Bridge Engineering			
	20ACE73C	Foundation engineering			
4	20ACE65	Open Elective Course– II	OE	3-0-0	3
5	20ACE75	Open Elective Course – III	OE	3-0-0	3
6	20ACE76	Open Elective Course – IV (MOOC-II)	OE	3-0-0	3
7	20ACE70	Remote sensing &GIS Lab (Skill oriented course – V)	SC	1-0-2	2
8	20ACE79	Evaluation of Internship	PR	-------	3
				Total	**23**

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Open Elective II (Interdisciplinary)

Branch	Subject Code	Subject Name
Mathematics	20ABS65A	Numerical Techniques
Physics	20ABS65B	Materials Characterization Techniques
Chemistry	20ABS65C	Polymers and their applications
EEE	20AEE65A	Energy Conservation and Management
ME	20AME65A	Programming of Robots and Control
	20AME65B	Non-Conventional sources of Energy
ECE	20AEC65A	Introduction to Microcontrollers & Applications
	20AEC65B	Principles of Digital Signal Processing
CSE	20ACS65A	Machine Learning Applications
	20ACS65B	Object Oriented Programming
	20ACS65C	Web Design

Open Elective III (Interdisciplinary)

Branch	Subject Code	Subject Name
Mathematics	20ABS75A	Mathematical Modeling
Physics	20ABS75B	Sensors and Actuators for Engineering Applications
Chemistry	20ABS75C	Chemistry of Nano-materials and applications
EEE	20AEE75A	IOT Applications in Electrical Engineering
ME	20AME75A	Introduction to Composite Materials
	20AME75B	Customer Relationship Management
ECE	20AEC75A	Fundamentals of Image Processing
	20AEC75B	Basics of VLSI Design
CSE	20ACS75A	Applications of AI
	20ACS75B	Mobile Application Development

Open Elective-IV shall opt any of branch which shall not match with regular course and syllabus.

B.Tech IV Year II Semester

Semester - 8					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1	20ACE99	Full Internship & Project work	PR	---------	12
				Total	**12**

Courses offered for Honours degree

S. No.	Course Code	Course Title	Offered in Semester	Contact Hours per week		Credits
				L	T	
1	20ACEH01	Solid and hazardous waste management		3	1	4
2	20ACEH02	Repair & Rehabilitation of Structures		3	1	4
3	20ACEH03	Earth quake resistant design of structures		3	1	4
4	20ACEH04	Advanced Foundation Engineering		3	1	4
5	20ACEH07	MOOC Course				2
6	20ACEH08	MOOC Course				2

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Title of the Minor Degree
(Disciplines to which the Minor is offered)

S. No	Branch	Name of the Minor degree	Course Code	Course Title	Offered in Semester	Contact Hours per week			Credits
						L	T	P	
1	CE	Construction Technology	20ACEM01	Building Materials	V	3	1	0	4
2			20ACEM02	Building Construction	V	3	1	0	4
3			20ACEM03	Building planning and Drawing	VI	3	1	0	4
4			20ACEM04	Surveying	VI	3	1	0	4
5			20ACEM05	MOOC Course	VII				2
6			20ACEM06	MOOC Course	VII				2
1	EEE	Electrical Systems	20AEEM01	Basic Electric Circuits and Analysis	V	3	1	0	4
2			20AEEM02	Principles of Electrical Measurements	V	3	1	0	4
3			20AEEM03	Basics of Power Electronics and Devices	VI	3	1	0	4
4			20AEEM04	Fundamentals of Control Systems	VI	3	1	0	4
5			20AEEM05	MOOC Course	VII				2
6			20AEEM06	MOOC Course	VII				2
1	ME	3D Printing	20AMEM07	Materials science for Engineers	V	3	1	0	4
2			20AMEM08	Computer Aided Machine Drawing	V	3	1	0	4
3			20AMEM09	3D Printing materials	VI	3	1	0	4
4			20AMEM10	Applications of 3D Printing	VII	3	1	0	4
5			20AMEM11	MOOC Course	VI				2
6			20AMEM12	MOOC Course	VII				2
1	ME	Robotics and Automation	20AMEM13	Introduction to Robotics	V	3	1	0	4
2			20AMEM14	Industrial Automation	V	3	1	0	4
3			20AMEM15	Hydraulic and Pneumatic circuits	VI	3	1	0	4
4			20AMEM16	Programming and control of Robot	VII	3	1	0	4
5			20AMEM17	MOOC Course	VI				2
6			20AMEM18	MOOC Course	VII				2
1	ME	Industrial Engineering	20AMEM19	Production Planning and Control	V	3	1	0	4
2			20AMEM20	Marketing Management	VI	3	1	0	4
3			20AMEM21	Customer Relationship Management	VI	3	1	0	4
4			20AMEM22	Six Sigma & Lean Manufacturing	VII	3	1	0	4
5			20AMEM23	MOOC Course	V				2
6			20AMEM24	MOOC Course	VII				2
1	ECE	Electronics & Communication Engineering	20AECM01	Electronic Circuits	V	3	1	0	4
2			20AECM02	Digital Electronics	V	3	1	0	4
3			20AECM03	Principles of Communications	VI	3	1	0	4
4			20AECM04	Electronic Instrumentation	VI	3	1	0	4
5			20AECM05	MOOC Course	VII				2
6			20AECM06	MOOC Course	VII				2
1	CSE	Web Design & Development	20ACSM01	User Interface Design	V	3	1	0	4
2			20ACSM02	Advanced Java Script	VI	3	1	0	4
3			20ACSM03	Content Management & Distributed systems	VI	3	1	0	4
4			20ACSM04	Mongo DB	VII	3	1	0	4
5			20ACSM05	MOOC Course	V				2
6			20ACSM06	MOOC Course	VII				2

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4	PSE	Data Science	20ACSS07	Data Science	V	3	1	0	4
5			20ACSS08	Data Analytics using Python and Lab	V	2	0	2	3
6			20ACSS09	Data Visualization	VII	3	1	0	4
7			20ACSS10	Machine Learning	VI	3	1	0	4
8			20ACSM11	MOOC Course	VI				2
9			20ACSM12	MOOC Course	VII				2

BOS Chairman

Vice-Principal

Principal

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF MATHEMATICS
I B.TECH – I SEMESTER (R20)
(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 series and 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).

BOS Chairman
Mathematics

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.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA

B.Tech. I Year Syllabus (R20 Regulation)

Engineering Physics

(Civil & Mechanical Branches)

L T P C
3 0 0 3

COURSE OBJECTIVES	
1	To make a bridge between the physics in school and engineering courses.
2	To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications.
3	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 fibres along with engineering applications
4	To open new avenues of knowledge in dielectric and magnetic materials which find potential in the emerging micro device applications. Considering the significance of micro miniaturization of electronic devices and significance of low dimensional materials, the basic concepts of nano materials, their properties and applications in modern emerging technologies are elicited.
5	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.
6.	To enlighten the periodic arrangement of atoms in crystals, Bragg's law and to provide fundamentals related to structural analysis through powder diffraction method, SEM and TEM.

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

Interference- Principle of superposition – Interference of light –Interference by wavefront and amplitude division - Interference in thin films (Reflection Geometry) – Colours in thin films – Newton's Rings – Determination of wavelength of light source and refractive index of liquid.

Diffraction- Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit - Diffraction grating – Grating spectrum.

Polarization- Introduction – Types of polarization – Polarization by reflection, refraction and double refraction (Qualitative) - Nicol's Prism - Half wave and Quarter wave plates with applications.

Unit Outcomes:

The students will be able to

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

Unit-II: Lasers and Fiber optics **8hrs**

Lasers- Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Lasing action – Pumping mechanisms – CO_2 laser – Semi conductor Laser - Applications of lasers.

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

Unit Outcomes:

The students will be able to

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

UNIT III: Engineering Materials **12hrs**

Dielectric Materials- Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Orientation polarizations (Qualitative), Ionic and Electronic Polarizations – Lorentz internal field – Clausius-Mossotti equation – Dielectric breakdown and Loss – Piezoelectricity and Ferro electricity.

Magnetic Materials- Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Classification of magnetic materials: Dia, Para Ferro, Ferri & Antiferro – Domain concept of Ferromagnetism (Qualitative) – Hysteresis – Soft and Hard magnetic materials.

Nanomaterials- Introduction – 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.

Unit Outcomes:

The students will be able to

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- **Apply** the concept of polarization to materials like piezoelectric and ferroelectrics (L3)
- **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).

Unit-IV: Acoustics and Ultrasonics **08hrs**

Acoustics- Introduction – Requirements of acoustically good auditorium – Reverberation – Reverberation time – Sabine's formula (Derivation using growth and decay method) – Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedies.

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

Unit Outcomes:

The students will be able to

- **Explain** how sound is propagated in buildings (L2)
- **Analyze** acoustic properties of typically used materials in buildings (L4)
- **Recognize** sound level disruptors and their use in architectural acoustics (L2)
- **Identify** the use of ultrasonics in different fields (L3)

Unit-V: Crystallography and Characterization Techniques **8hrs**

Crystallography- Space lattice, Basis, unit cell and lattice parameters – Bravais Lattice – Crystal systems – Packing fraction – Coordination number – Packing fraction of SC, BCC & FCC – NaCl Crystal - Miller indices – Separation between successive (hkl) planes.

Characterization Techniques: X-Ray Diffraction: Bragg's law – Bragg's X-ray Diffractometer – Crystal structure determination by Laue method – Electron microscopy: Scanning Electron Microscope – Transmission Electron Microscope.

Unit Outcomes:

The students will be able to

- **Classify** various crystal systems (L2)
- **Identify** different planes in the crystal structure (L3)
- **Analyze** the crystalline structure by Bragg's X-ray diffractometer (L4)
- **Apply** powder method to measure the crystallinity of a solid (L4)
- **Analyze** the crystal structure using electron microscopes (L4)

Text books:

1. Engineering Physics by M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy S.Chand Publications, 11th Edition (2019).
2. Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2018).

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons, 11th Edition (2018).
2. Solid State Physics, A J Dekker, Macmillan India Limited (Publisher) (2000)
3. Engineering Physics – K. Thyagarajan, McGraw Hill Publishers (2018).
3. Engineering Physics by M.R.Srinivasan, New Age international publishers (2014).
4. Engineering Physics by B.K. Pandey and S. Chaturvedi, Cengage Learning(2018)
5. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press(2016)
6. University Physics by H.D.Young and R.A. Freedman,Pearson(2017)

COURSE OUTCOMES	
CO1	**Study** the different realms of physics and their applications in both scientific and technological systems through physical optics. (L2)
CO2	**Identify** the wave properties of light and the interaction of energy with the matter (L3). **Asses** the electromagnetic wave propagation and its power in different media (L5).
CO3	**Understands** the response of dielectric and magnetic materials to the applied electric and magnetic fields. (L3) **Elucidates** the importance of nano materials along with their engineering applications. (L5)
CO4	**Explain** the basic concepts of acoustics and ultrasonics. (L2) **Apply** the concept of NDT to material testing. (L3)
CO5	**Study** the important properties of crystals like the presence of long-range order, periodicity and structure determination using X-ray diffraction technique (L5) and **Analyze** the crystal structure using electron microscopes (L4)

JNTUA COLLEGE OF ENGINEERING :(AUTONOMOUS), PULIVENDULA

I B.TECH

COMMUNICATIVE ENGLISH (R20)

(Common to All Branches of Engineering)

L	T	P	C
3	0	0	3

1. 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*. 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.

2. COURSE OBJECTIVES

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

3. COURSE OUTCOMES

CO1	Retrieve the knowledge of basic grammatical concepts.
CO2	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken and the improve the fluency of English..
CO3	Apply grammatical structures to formulate sentences and correct word forms
CO4	Analyze discourse markers to speak clearly on a specific topic in informal discussions
CO5	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
CO6	Create a coherent paragraph interpreting a figure/graph/chart/table.

4. SYLLABUS:

UNIT –I

***Reading*: What Is My Name? —P Sathyavathi**

- ***Writing:*** Paragraph writing
- ***Listening***: Listening for theme-main
- ***Functional English***: Greeting, taking leave and introducing oneself and others
- ***Grammar:*** Parts of speech- Nouns –classification-usages- Pronouns - classifications-usages-
- ***Vocabulary*:** Homonyms- Homophones- Homographs

Non Detailed Study: Listening Skills from **English and Soft Skills**

UNIT-II

***Reading* : The Kitchen — Vimala**

- ***Writing*** : Essay Writing –Descriptive Essays
- ***Listening*** : Listening for theme -1
- ***Functional English***: Making requests
- ***Grammar:*** Types of sentences- Question Tags
- ***Vocabulary*** : Synonyms - Antonyms

Non detailed Study: Teamwork Skills from **English and Soft Skills**

UNIT-III

***Reading* : Adivasis — Kancha Ilaiah**

- ***Writing*** : Statement of Purpose
- ***Listening:*** Listening for main ideas
- ***Functional English:*** Inviting -Apologizing
- ***Grammar:***– Kinds of verbs – Auxiliaries- Tenses,
- ***Vocabulary*** : Prefixes –Suffixes – One-word substitutes

Non detailed Study: Assertive Skills from **English and Soft Skills**

UNIT-IV

***Reading*: The Bet – Anton Chekhov**

- ***Writing:*** Letter Writing –Official letters-business Letters-Application Letters
- ***Listening***: Listening for details
- ***Functional English:*** Interrupting - Asking for and giving opinions
- ***Grammar:*** Adjectives- Conjunctions- Articles – Active & Passive Voice
- ***Vocabulary***: Phrasal verbs -Idioms

Non detailed Study: Learning Skills from **English and Soft Skills**

UNIT-V

Reading **: The Gift of the Magi - O. Henry**

- ***Writing:*** Information Transfer
- ***Listening*** : Listening for opinions
- ***Functional English*** : Asking for the time and directions
- ***Grammar:*** Prepositions- Reported Speech
- ***Vocabulary*** : Commonly confused words

Non detailed Study : Emotional Intelligence Skills from **English and Soft Skills**

5. Prescribed Text books:

[1] **Detailed text: English for Fluency**, K Purushottam, Orient Black Swan,2013.

[2] **Non detailed text: English and Soft Skills**, S P Dhanavel, Orient Black Swan 2013Edition.

6. REFERENCES:

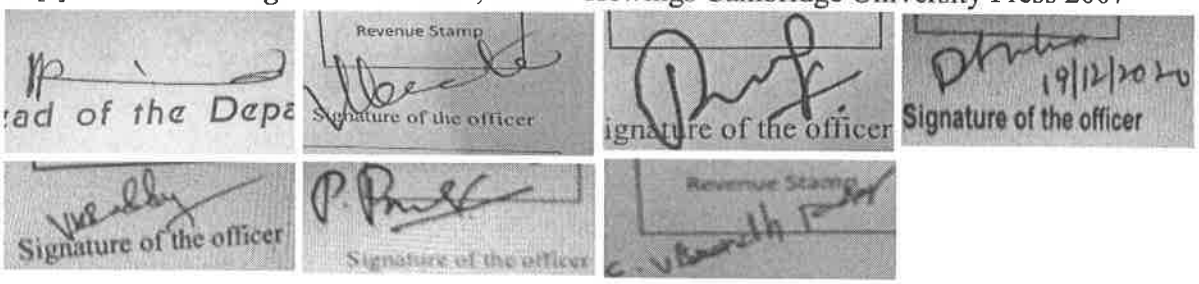
[1] **A Practical Course in Effective English Speaking Skills**. J.K.Gangal, PHI, New Delhi.2012

[2] **Fundamentals of Technical Communication,** Meenakshi Raman, Oxford University Press,2015.

[3] **Spoken English,** R.K. Bansal & JB Harrison, Orient Longman,2013, 4Th edition.

[4] **Murphy's English Grammar** with CD, Murphy, Cambridge University Press,3 Rd edition.

[5] **Advanced English Grammar** , Martin Hewings Cambridge University Press 2007



B.Tech I Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ACS06 - BASIC PYTHON PROGRAMMING

(CIVIL)

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce programming through Visual programming tool – Scratch
- To teach problem solving through Flow charting tool – Raptor
- To elucidate problem solving through python programming language
- To introduce function-oriented programming paradigm through python
- To train in development of solutions using modular concepts
- To teach practical Pythonic solution patterns

UNIT – I: Computer Fundamentals **8hrs**

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, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Learning Outcomes:

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

- To understand the Basic Computer fundamentals. **L1**
- To learn about Algorithms. **L1**

UNIT – II: Flowchart design through Raptor **8hrs**

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, Interest calculators, multiplication tables, GCD of 2 numbers, Factorial of a number, sum of even 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:

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

- To learn about flowchart. **L2**
- To learn how to flowchart in Raptor. **L2**

UNIT – III: Introduction to Python **8hrs**

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:

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

- To understand why Python is a useful scripting language for developers. **L1**
- To learn how to design and program Python applications. **L1**

UNIT – IV: Data Structures and Idiomatic Programming in Python **7 Hrs**

Lists, Tuples, Dictionaries, Strings, Files and their libraries. Beautiful idiomatic approach to solve programming problems.

Learning Outcomes:

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

- To learn about Data Structures. **L3**
- To learn how to read and write files in Python. **L3**
- To learn how to design object-oriented programs with Python classes. **L3**

UNIT – V: Event driven Programming

Turtle Bar Chart, Event Driven programming, Key press events, Mouse events, timer events, Turtle Graphics.

Learning Outcomes:

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

- To learn how to use Event Driven programming in Python for reusability. **L4**
- To learn how to use Turtle Graphics in Python applications. **L5**

Text Books:

1. "Introduction to Python Programming" by Y. Daniel Liang, Georgia Southern University, Pearson Education, 2013.
2. "Computer Fundamentals and Programming in C" by Prof. P. Chenna Reddy, JNTUA, BSP Publications.
3. https://raptor.martincarlisle.com/
4. "A Practical Introduction toPython Programming" by Brian Heinold, Mount St Mary's University 2012.

Reference Books:

1. "Introduction to Computation and Programming Using Python: with applications to understanding Data" by John. V. Guttag, 2nd Edition, the MIT Press.
2. "How to Think like a Computer Scientist: Learning with Python 3 documentation" by Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, 3rdEdition, 2012.

Course Outcomes:

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

- Explain basic principles of Python programming language. **L2**
- Implement object oriented concepts. **L3**
- Implement Event Driven Programming. **L3**

B.Tech I Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ACS05 - IT – WORKSHOP

(Common for CSE, CIVIL & MECH)

L	T	P	C
0	0	3	1.5

Course Objectives:

- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations
- To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
- To learn about Networking of computers and use Internet facility for Browsing and Searching

List of Experiments:

Task 1: Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2: Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

Task 3: Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4: **Productivity tools (6 weeks)**

Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

Task 5: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

Task 6: Presentations : creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

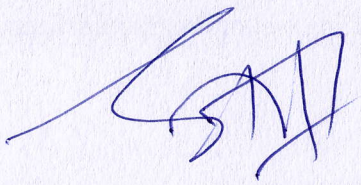
Optional Tasks:

Task 7: Laboratory Equipment: Students may submit a report on specifications of various equipment that may be used by them for the laboratories in their curriculum starting from I B.tech to IV. B.Tech. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop computer
- Server computer
- Switch (computer science related)
- Microprocessor kit
- Micro controller kit
- Lathe machine
- Generators
- Construction material
- Air conditioner
- UPS and Inverter
- RO system
- Electrical Rectifier
- CRO
- Function Generator
- Microwave benches

References:

1. "Introduction to Computers", Peter Norton, Mc Graw Hill
2. "LaTeX Companion" – Leslie Lamport, PHI/Pearson.
3. "MOS study guide for word, Excel, Powerpoint & Outlook Exams", Joan Lambert, Joyce Cox, PHI.
4. "Introduction to Information Technology", ITL Education Solutions limited, Pearson Education.
5. "Networking your computers and devices", Rusen, PHI



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

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use
- Prepare the Documents using Word processors
- Prepare Slide presentations using the presentation tool
- Interconnect two or more computers for information sharing
- Access the Internet and Browse it to obtain the required information
- Install single or dual operating systems on computer

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

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use
- Prepare the Documents using Word processors
- Prepare Slide presentations using the presentation tool
- Interconnect two or more computers for information sharing
- Access the Internet and Browse it to obtain the required information
- Install single or dual operating systems on computer

JNTUA COLLEGE OF ENGINEERING :(AUTONOMOUS), PULIVENDULA
I B.TECH
COMMUNICATIVE ENGLISH LABORATORY (R20)
(Common to All Branches of Engineering)

L	T	P	C
0	0	3	1.5

Course Objectives

- students will be exposed to a variety of self-instructional, learner friendly modes of language learning
- students will learn better pronunciation through stress, intonation and rhythm
- students will be trained to use language effectively to face interviews, group discussions, public speaking
- students will be initiated into greater use of the computer in resume preparation, report writing, format making etc

Course Outcomes

- CO1: Listening and repeating the sounds of English Language
- CO2: Understand the different aspects of the English language proficiency with emphasis on LSRW skills
- CO3: Apply communication skills through various language learning activities
- CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- CO5: Evaluate and exhibit acceptable etiquette essential in social and professional settings
- CO6: Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

Unit 1

1. Phonetics-Importance -Introduction to Sounds of Speech
2. Vowels and Consonants Sounds
3. Phonetic Transcription

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. Word Stress & Intonation
2. Communication skills
3. Role Play & JAM

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. Describing people/objects/places
2. Speeches for Special Occasions
3. Etiquettes of Telephonic Communication

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

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

Unit4

1. Group Discussions
2. Debates
3. Interviews Skills

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. Resume writing & Practicing
2. Oral Presentations
3. Writing Video Speeches as it is & Book reviews – oral and written

Learning Outcomes

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

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

Suggested Software

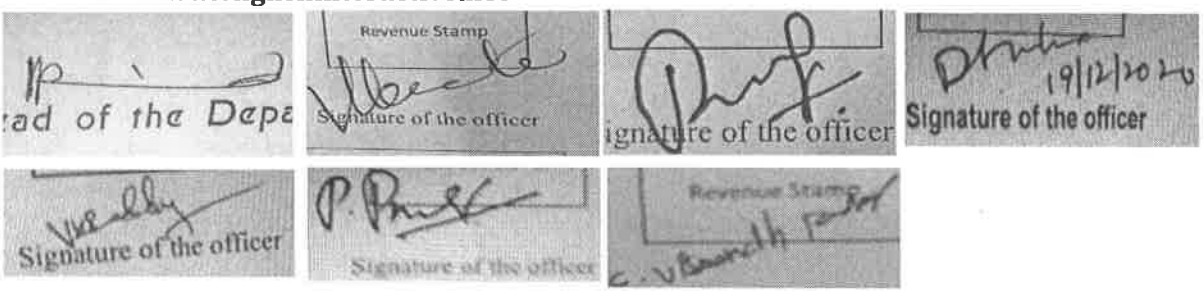
- Orell
- Walden Infotech
- Young India Films

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

Web Links

- **www.esl-lab.com**
- **www.englishmedialab.com**
- **www.englishinteractive.net**



JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)
PULIVENDULA
B.Tech I Year Syllabus (R20 Regulation)
Engineering Physics Laboratory
(Civil & Mechanical Branches)

L T P C
0 0 3 1.5

Course Objectives:

- Understand the role of Optical fiber parameters in engineering applications.
- Recognize the significance of laser by studying its characteristics and its application in finding the particle size.
- Illustrates the magnetic and dielectric materials applications.
- Identifies the various sensor applications.

Note: - In the following list of experiments, out of 15 experiments any 10 experiments must be performed in a semester.

List of Engineering Physics Experiments

1. Determination of the thickness of the wire using wedge shape method
   Experimental outcomes:
   Operates optical instrument like travelling microscope. (L2)
   Estimate the thickness of the wire using wedge shape method (L2)
   Identifies the formation of interference fringes due to reflected light from non-uniform thin film. (L2)
2. Determination of the radius of curvature of the lens by Newton's ring method
   Experimental outcomes:
   Operates optical instrument like travelling microscope. (L2)
   Estimate the radius of curvature of the lens (L2)
   Identifies the formation of interference fringes due to reflected light from non-uniform thin film. (L2)
   Plots the square of the diameter of a ring with no. of rings (L3)
3. Determination of wavelengths of various spectral lines of mercury source using diffraction grating in normal incidence method
   Experimental outcomes:
   Operates optical instrument like spectrometer. (L2)
   Estimate the wavelength of the given source (L2)
   Identifies the formation of grating spectrum due diffraction. (L2)
4. Determination of dispersive power of prism.
   Experimental outcomes:
   Operates optical instrument like spectrometer. (L2)
   Estimate the refractive index and dispersive power of the given prism (L2)
   Identifies the formation of spectrum due to dispersion. (L2)
5. Determination of wavelength of LASER light using diffraction grating.
   Experimental outcomes:
   Operates various instrument (L2)
   Estimate the wavelength of laser source (L2)
   Identifies the formation of grating spectrum due diffraction. (L2)
6. Determination of particle size using LASER.
   Experimental outcomes:
   Operates various instrument (L2)
   Estimate the Particles size using laser (L2)
   Identifies the application of laser (L2)
7. To determine the numerical aperture and acceptance angle of an optical fiber
   Experimental outcomes:
   Operates various instruments and connect them as per the circuit. (L2)
   Estimate the numerical aperture and acceptance angle of a given optical fiber. (L2)
   Identifies the significance of numerical aperture and acceptance angle of an optical fiber in various engineering applications. (L2)
8. Determination of dielectric constant by charging and discharging method.
   Experimental outcomes:

Operates various instruments and connect them as per the circuit. (L2)
Estimate the dielectric constant of the given substance. (L2)
Identifies the significance of dielectric constant in various devices. (L2)

9. Study of variation of Magnetic field along the axis of a current carrying coil – Stewart-Gee's Method.

Experimental outcomes:
Operates various instruments and connect them as per the circuit. (L2)
Estimate the magnetic field along the axis of a circular coil carrying current. (L2)
Plots the intensity of the magnetic field of circular coil carrying current with distance (L3)

10. Measurement of magnetic susceptibility by Gouy's method

Experimental outcomes:
Operates various instruments and connect them as per the circuit. (L2)
Estimate the magnetic susceptibility of the given material. (L2)
Identifies the significance of magnetic susceptibility in various engineering applications. (L2)

11. Study of B-H curve of Ferromagnetic material

Experimental outcomes:
Operates various instruments and connect them as per the circuit. (L2)
Estimate the hysteresis loss, coercivity and retentivity of the ferromagnetic material. (L2)
Classifies the soft and hard magnetic material based on B-H curve. (L2)
Plots the magnetic field H and flux density B (L3)

12. Determination of ultrasonic velocity in liquid (Acoustic grating)

Experimental outcomes:
Operates various instruments. (L2)
Estimate the velocity of ultrasonic waves in liquids. (L2)
Illustrates the basic applications of ultrasonics. (L3)

13. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum)

Experimental outcomes:
Operates various instruments. (L2)
Estimate the rigidity modules of a given wire (L2)
Plots length of the pendulum (l) with time period T^2 (L3)

14. Sonometer: Verification of the three laws of stretched strings

Experimental outcomes:
Operates various instruments. (L2)
Estimate the linear density of a given wire (L2)
Identify the frequency of tuning fork (L3)

15. Determination of losses in optical fiber.

Experimental outcomes:
Operates various instruments and connect them as per the circuit. (L2)
Estimate the numerical aperture and acceptance angle of a given optical fiber. (L2)
Identifies the significance of losses in optical fiber and its engineering applications. (L2)

Course Outcomes:

The students will be able to

- **Operate** various optical instruments (L2)
- **Estimate** wavelength of laser and particles size using laser(L2)
- **Evaluate** the acceptance angle of an optical fiber and numerical aperture (L3)
- **Estimate** the susceptibility and related magnetic parameters of magnetic materials (L2)
- **Plot** the intensity of the magnetic field of circular coil carrying current with distance (L3)
- **Determine** magnetic susceptibility of the material and its losses by B-H curve (L3)
- **Apply** the concepts of ultrasonics by acoustic grating (L2)

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

B.Tech I Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ACS07 - BASIC PYTHON PROGRAMMING LABORATORY

(CIVIL)

L	T	P	C
0	0	3	1.5

Course Objectives:

- To introduce object oriented programming using an easy-to-use language.
- To use iterators and generators.
- To test objects and handle changing requirements.
- To be exposed to programming over the web.

List of Experiments:

1. Download and install the Python IDLE
2. Construct flowcharts to
   a. Calculate the maximum, minimum and average of N numbers
   b. Develop a calculator to convert time, distance, area, volume and temperature from one unit to another

3. Construct flowcharts with separate procedures to
a. calculate simple and compound interest for various parameters specified by the user
b. calculate the greatest common divisor using iteration and recursion for two numbers 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. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)
7. Design a flowchart to determine the number of characters and lines in a text file specified by the user
8. Design a Python script to convert a Binary number to Decimal number and verify if it is a 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. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.

12. Design a Python Script to determine the Square Root of a given number without using 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. Design a Python Script to find the value of (Sine, Cosine, Log, PI, *e*) of a given number using infinite series of the function.
15. Design a Python Script to convert 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.

Course Outcomes:

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

- Explain basic principles of Python programming language L2 **L2**
- 2. Implement object oriented concepts, L3 **L3**
- 3. Implement database and GUI applications. L3 **L3**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF MATHEMATICS
I B.TECH – II SEMESTER (R20)
(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.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA

B.Tech – I Yr II Sem (R20)

L	T	P	C
3	0	0	3

Engineering Chemistry
(MECH and CIVIL)

Course Objectives:

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

Unit 1: Water Technology (8 hrs)

Introduction: hardness of water and units, Estimation of hardness of water by EDTA Method - Boiler troubles – Priming, foaming, scale and sludge, Caustic embrittlement, Municipal water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, ion-exchange processes – desalination of brackish water - reverse osmosis (RO) and electrodialysis.

Learning outcomes:

The student will be able to

- **list** the differences between temporary and permanent hardness of water (L1)
- **explain** the principles of reverse osmosis and electro dialysis. (L2)
- **compare** quality of drinking water with BIS and WHO standards. (L2)
- **illustrate** problems associated with hard water - scale and sludge. (L2)
- **explain** the working principles of different Industrial water treatment processes (L2)
-

Unit 2: Electrochemistry and Applications: (10 hrs)

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

Primary cells – Zinc-air, Na-air batteries, Secondary cells – Nickel-Cadmium (NiCd),and lithium ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

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

Learning Outcomes:

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

- **apply** Nernst equation for calculating electrode and cell potentials (L3)
- **recall** working and importance of batteries(L1)
- **apply** Pilling Bedworth rule for corrosion and corrosion prevention (L3)
- **demonstrate** the corrosion prevention methods and factors affecting corrosion (L2)

- **compare** primary and secondary batteries and their applications (L2)

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 poly styrene. PVC and Bakelite, Calculation of molecular Weight of polymer by weight average and number average methods, Poly dispersity Index

Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol, Calculation of Molecular Wt of Polymer by Wt Avg. and Number Avg methods, poldispersity Index.

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 Cetane values, cracking of oils; alternative fuels- propane, methanol and ethanol, bio-fuels(Coal gas, Biogas).

Learning Outcomes:

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

- **explain** different types of polymers and their applications (L2)
- **find** various alternate fuels and its importance (L1)
- **solve** the numerical problems based on Calorific value(L3)
- **select** suitable fuels for IC engines (L3)
- **explain** calorific values, octane number, refining of petroleum and cracking of oils (L2)

UNIT-4 Advanced Engineering Materials (8 hrs)

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

Refractories- Classification, Properties, Factors affecting the refractory materials (Refractoriness, Refractory under load, Porosity, Refractive index, Dimensional stability) and Applications.

Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils – Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.

Building materials- Portland Cement, Rapid Hardening Cement, Quick Setting Cement, constituents, phases and reactivity of clinker, Setting and Hardening of cement.

Learning Outcomes:

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

- **explain** the constituents of Composites and its classification (L2)
- **recall** properties of refractories and lubricants (L1)
- **identify** the factors affecting the refractory material(L3)
- **illustrate** the functions and properties of lubricants (L2)
- **demonstrate** the phases and reactivity of concrete formation (L2)
- **identify** the constituents of Portland cement (L3)

- **enumerate** the reactions at setting and hardening of the cement (L3)

Unit 5: Surface Chemistry and Applications: (10 hrs)

Introduction to surface chemistry, colloids, micelle formation, synthesis of colloids (Chemical methods - double decomposition, reduction, hydrolysis and oxidation; electrical disintegration or Bredig's Arc method), chemical and electrochemical methods (sol-gel method, Thermally activated chemical vapor deposition method) of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, solid-gas interface, solid-liquid interface, adsorption isotherm- Langmuir, Freundlich, BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors.

Learning Outcomes:

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

- **summarize** the concepts of colloids, micelle and nanomaterials (L2)
- **explain** the synthesis of colloids with examples (L2)
- **select** suitable methods for synthesis of Nanometals (L1)
- **outline** the preparation of nanomaterials and metal oxides (L2)
- **identify** the application of colloids and nanomaterials in medicine, sensors and catalysis (L2)

Text Books:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Arun Bahl, B.S. Bahl and G.D. Tuli, Essentials of Physical Chemistry, S.Chand Publication, New Delhi 2012..

Reference Books:

1. G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.
2. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
3. K. Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry, Pearson Publication Pvt. Ltd.
4. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman,1992.

Course Outcomes:

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

- **demonstrate** the corrosion prevention methods and factors affecting corrosion (L2)
- **explain** the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers. (L2)
- **find** important properties of various engineering materials, polymers, colloids and its applications(L1)
- **explain** calorific values, octane number, refining of petroleum and cracking of oils (L2)
- **explain** the setting and hardening of cement and concrete phase (L2)
- **summarize** the concepts of colloids, micelle and nanomaterials (L2).

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF CIVIL ENGINEERING
I B.TECH – II SEMESTER (R20)

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

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF CIVIL ENGINEERING
I B.TECH – II SEMESTER (R20)

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

B.Tech I Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME01 - ENGINEERING GRAPHICS

(Common to CIVIL,MECHANICAL & CSE)

L	T	P	C
1	0	2	2

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 train the usage of 2D and 3D modeling

UNIT – 1: Introduction to Engineering Graphics **6 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 **7 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 **7Hrs**

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

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)

UNIT – IV: Sections of Solids **7 Hrs**

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

- Use section plane to show the sectional view of regular solids. (L3)
- Draw sectional view of prism and cylinder (L3)
- Draw true shape of sections.(L3)

UNIT – V: 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)

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
DEPARTMENT OF CIVIL ENGINEERING
I B.TECH – II SEMESTER (R20)

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

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS), PULIVENDULA

B.Tech – I Yr II Sem(R20)(R20) **L T P C**

0 0 3 1.5

Engineering Chemistry Lab

(MECH and CIVIL)

Course Objectives:

- To Verify the fundamental concepts with experiments

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of dissolved oxygen by Winklers method.
3. Estimation of Copper by EDTA method.
4. Determination of Strength of an acid in Pb-Acid battery.
5. Estimation of Ferrous Iron by dichrometry.
6. Preparation of a polymer- Bakelite .
7. Determination of percentage of Iron in Cement sample by colorimetry.
8. Estimation of Calcium in port land Cement.
9. Preparation of nanomaterials by precipitation.
10. Adsorption of acetic acid by charcoal.
11. Determination of percentage Moisture content in a coal sample.
12. Determination of Viscosity of lubricating oil by Redwood Viscometer 1.
13. Determination of Viscosity of lubricating oil by Redwood Viscometer 2.
14. Determination of Calorific value of gases by Junker's gas Calorimeter

Course Outcomes:

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

- **determine** the cell constant and conductance of solutions (L3)
- **prepare** advanced polymer materials (L2)
- **determine** the physical properties like surface tension, adsorption and viscosity (L3)
- **estimate** the Iron and Calcium in cement (L3)
- **calculate** the hardness of water (L4)
- **find** calorific values of various fuels, hardness of water samples (L1)

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF CIVIL ENGINEERING
I B.TECH – II SEMESTER (R20)

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.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

II Year B.Tech. I-Sem (R20)

20ABS13 - COMPLEX VARIABLES, TRANSFORMS & APPLICATIONS TO PARTIAL DIFFERENTIAL EQUATIONS

(Common for MECH & CIVIL)

L	T	P	C
3	0	0	3

Course Objectives: This course aims at providing the student

- To acquire the knowledge on the calculus of functions of complex variables. (L2)
- To acquire the knowledge on Laplace transforms and its applications in solving ordinary differential equations. (L3)
- To expand the given function in Fourier series in a given interval. (L3)
- Evaluate improper integrals of complex functions using Residue theorem. (L3)
- To analyze the solutions of partial differential equations. (L4)

UNIT – 1: 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.

Learning Outcomes:

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

- Understand functions of Complex variable and its properties. L2
- Find derivatives of complex functions. L3
- Understand the analyticity of complex functions. L2

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).

Learning Outcomes:

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

- Understand the integration of complex functions. L2
- Apply Cauchy's integral theorem and Cauchy's integral formula. L3
- Understand singularities of complex functions. L2
- Evaluate improper integrals of complex functions using Residue theorem. L3

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.

Learning Outcomes:

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

- Understand the concept of Laplace transforms and finds the Laplace transforms of elementary functions. L2
- Find the Laplace transforms of general functions using its properties. L3
- Understand Laplace transforms of special functions (Unit step function, Unit Impulse & Periodic). L2
- Apply Laplace transforms to solve Differential Equations. L3

UNIT – IV: Fourier series:

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.

Learning Outcomes:

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

- Understand finding Fourier series expression of the given function. L2
- Determine Fourier coefficients (Euler's) and identify existence of Fourier series of the given function. L3
- Expand the given function in Fourier series given in Half range interval. L3

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.

Learning Outcomes:

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

- Understand the method of separation of variables. L2
- Solve applications of Partial Differential Equations. L3

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.

Course Outcomes:

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

- Understand the analyticity of complex functions and conformal mappings. L1
- Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours. L3
- Understand the usage of Laplace Transforms. L2
- Evaluate the Fourier series expansion of periodic functions. L3
- Formulate/solve/classify the solutions of Partial differential equations and also find the solution of one dimensional wave equation and heat equation. L4

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-20 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

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 Outcomes:

- Identify critical planes in two dimensional stress systems
- Estimate principals stresses
- Assess safety of structural elements under principal stresses

UNIT -II

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 Outcomes

- Analyze members subjected to torsion, combined torsion and bending moment
- Calculate power transmission through shafts
- Estimate energy absorption in springs.

UNIT -III

Combined 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 Outcomes:

- To know about the effect of eccentricity effect in columns
- To know about the various theories of failures

UNIT -IV

Deflection of Beams:

Uniform bending – 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 Outcomes:**

- Understand types of loads acting on beams
- Compute slopes and deflections of beams with different boundary conditions
- Evaluate effect of different loads on propped cantilever beams

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.

Unit Outcomes

- Classify columns
- Understand Euler's theory on columns and assess crippling loads
- Analyze compression members using different theories
- Assess load carrying capacity using different formulae

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, Mc Graw 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 Pvt Ltd, 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-20 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 Outcomes :

Student will be able to

1. Understand basic characteristics of fluids
2. Understand Newton's Law of Viscosity
3. Understand concepts of fluid statics
.4. Demonstrate 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 Outcomes :

Student will be able to

Understand fundamentals of fluid kinematics

- Understands different types of fluid flows
- Derivation of Continuity equations of using 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 Outcomes :

Student will be able to

Demonstrate applications of Bernoulli's equations

- Experiment with different equipments under fluid flow
- Apply principles of fluid dynamics along with governing equations.

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 Outcomes :

Student will be able to

Estimate Energy losses in pipelines

- Determine flow characteristics through Pipes.

Unit-V

DIMENSIONAL ANALYSIS: Introduction, dimensions Dimensional homogeneity, Methods of dimensional analysis- Rayleigh's method Buckingham Pi theorem, model analysis, similitude-types of similarities. Dimensionless numbers. Model laws Partially submerged objects types of models, Scale effect

BOUNDARY LAYER THEORY & DRAG AND LIFT: Boundary layer - concepts. Prandtl's contribution, Characteristics of boundary layer along a thin flat plate laminar and turbulent Boundary layers, separation of BL. expression for drag and lift Lift and Drag Coefficients, pressure drag and friction drag, Streamlined and bluff bodies

Unit Outcomes :

Student will be able to

Under stand dimensional analysis

Under stand boundary layer theory and its charcterstics

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

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COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-20 Civil Engineering)
Semester-3 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	SURVEYING	2	1	--	3

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 Outcomes

- To impart basic concepts of surveying.
- To introduce the usage and applications of linear and angular measurements through chain, tape, compass and plane table.

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 Outcomes

- To impart basic principles in levelling and contouring.
- To calculate the areas of irregular boundaries and volumes of earth work quantities.

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 Outcomes

- To impart basic principles in Trigonometric levelling.
- To inculcate the knowledge of traversing.

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 Outcomes

- To impart basic principles in Tacheometric surveying.
- To inculcate the knowledge of simple horizontal circular curve setting.

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.

Unit Outcomes:

- To induce the knowledge of construction surveying.
- To inculcate the knowledge of advanced surveying instrument such as total station.

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.

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.

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Semester-3 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 INGREDIENTS :
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 Outcomes
- List different ingredients of concrete
- Conduct tests on materials
- Explain characteristics of water
- Understand conformity to IS Codes

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 Outcomes
- List various properties of fresh concrete
- Conduct experiments for determination of fresh concrete properties
- List various properties of hardened concrete
- Conduct experiments for determination of hardened concrete properties • Carryout Non Destructive tests on Concrete

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 Outcomes

- Understand curing methods and its importance
- Understand phenomenon of shrinkage and creep of concrete.
- Evaluate factors influencing creep and concrete

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 Outcomes

- Study properties of concrete mixes
- Design concrete mixes using different methods
- Estimate quantities for target strength of concretes

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)

Unit Outcomes

- Label different types of special concretes with the objectives
- Understand properties of special concretes.

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.

Course 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

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AHS03 - UNIVERSAL HUMAN VALUES

(Common to all branches)

L	T	P	C
3	0	0	0

Course Objectives:

- Exposure to the value of life, society and harmony.
- Leading towards holistic perspective based on self-exploration about themselves (human being), family, and society and nature/existence.
- Bringing transition from the present state to Universal Human Order.
- Instill commitment and courage to act.
- Know about appropriate technologies and management patterns.

UNIT –I : HUMAN VALUES 12 Hrs

Importance of UHV- Morals-Values –Ethics- definitions and differences-Integrity-Work Ethic-Service learning –Respect for others –Caring and Sharing – Honesty – self confidence-Courage-Co Operation –Commitment – Empathy –Character-Spirituality- Moral dilemmas.

Learning Outcomes:

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

Understand the concept of morals, Ethics. **L1**

Able to analyse Moral dilemmas. **L2**

UNIT – II: PERSONALITY DEVELOPMENT 12 Hrs

Concept Of Personality- Types-Determinants-Intrapersonal Skills-meaning-types- Techniques -Interpersonal Skills- meaning-types- Techniques-SWOT Analysis -Building Right Attitude.-Communication skills-Non Verbal Communication skills.

Learning Outcomes:

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

Analysing SWOT. **L1**

Knowing about self personality. **L2**

UNIT – III : ENGINEERING AS EXPERIMENTATION 12 Hrs

Engineering as an Experimentation-Engineers as Responsible Experimenters -Codes Of Ethics and Industrial Standards-Case Study: The Challenger-Confidentiality-Conflicts of Interests-Risk and Analysis methods-Safety and Safety Measures.

Learning Outcomes:

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

Understand the concept of Ethics in industry. **L1**

Able to assesment safety standards. **L2**

UNIT – IV : FAMILY AND SCOCIETY **12 Hrs**

Family -Importance –Types-Functions-Influences and generation gap- Premarital counseling-Good family-Characteristics-Building a healthy family- Parents and Children -Honouring Parents-Society Definition—Types-Roles-Responsibilities-Social Evils-reasons-remedies.

Learning Outcomes:

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

Development of a holistic perspective based on self-exploration about themselves. **L1**

Strengthening of self-reflection. **L2**

UNIT – V : GLOBAL ISSUES **12 Hrs**

Globalization: Globalization-MNCs-Technology-Cross culture issues- Environmental Ethics-Disasters- global pandemics-Computer Ethics and Net Etiquettes -Human and Employee Rights-Weapons Development -Ethics and Research-Intellectual Property Rights(IPR).

Learning Outcomes:

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

Understand various cross culture issues. **L1**

Identifying Employee Rights. **L2**

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 McGrawHill– 2003.**
4. **"Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana Maruthi Publications.**
5. **"Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications.**

Reference Books:

1. **"Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication.**
2. **"Professional Ethics and Human Values" by Prof.D.R.Kiran.**

Course Outcomes:

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

- Define terms like Natural Acceptance, Happiness and Prosperity. **L1**
- Know about appropriate technologies and management patterns Understand awareness of oneself, and ones surroundings (family, society, nature). **L2**
- Apply what they have learnt to their own self in different day-to-day settings in real life. **L3**
- Relate human values with human relationship and human society. **L4**
- Justify the need for universal human values and harmonious existence. **L5**

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COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-20 Civil Engineering)

Semester-3 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	CONCRETE TECHNOLOGY LABORATORY	0	0	3	1.5

Course Objective *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.*

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.

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*

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COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
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Semester-3 Syllabus

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

Course objectives:

OBJECTIVE: To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.

LIST OF EXERCISES:

(1) Survey of an area by chain survey (Closed traverse) & Plotting
(2) Chaining across obstacles
(3) Determination of distance between two inaccessible points with compass.
(4) Surveying of a given area by prismatic compass (Closed traverse) and plotting after adjustment.
(5) Radiation method, intersection methods by plane Table survey
(6) Two point and three point problems in plane table survey.
(7) Traversing by plane table survey
(8) Fly leveling (differential leveling)
(9) An exercise of L.S. and C.S. and plotting.
(10) Two exercises on contouring.
(11) Introduction to theodolite

Course Outcomes:

By performing the various experiments on field in this laboratory the student will be able to know the principles of surveying in chain surveying, compass surveying, plane table surveying, levelling.

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COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-20 Civil Engineering)

Semester-3 Syllabus

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

Course Objectives:

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

Course outcome

After completion of the course

1. 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.

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COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-20 Civil Engineering)

Semester-3 Syllabus

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

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.*

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.Kumara Swamy 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 Mc Graw Hill

COURSE OUTCOMES

1. The scope of this course is to introduce the concepts of building planning and drawing with emphasis on architectural planning.
2. 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.
3. Able to know the requirements of different rooms and characteristics of various types of residential buildings.
4. Able to know about building byelaws and regulations.
5. Ability to draw line sketch and planning and bi section of a building

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
II Year B.Tech. II-Sem (R20)
20ABS15 - NUMERICAL METHODS, PROBABILITY AND STATISTICS
(Common to CIVIL, ME, EEE & CSE)

L	T	P	C
3	0	0	3

Course Objectives:

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

UNIT – 1: 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:
At the end of this unit, the student will be able to

- find approximate roots of the an equation by using different numerical methods L2
- explain various discrete operators and find the relation among operators L2
- apply Newton forward and backward formulas for equal and unequal intervals L3

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

- find integration of a function by different numerical methods L3
- solve ordinary differential equations using different numerical schemes L3

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

- explains the basic concepts of probability theory and elementary theorems on probability. L2
- applies the knowledge of discrete random variable and continuous random variable and the respective probability distributions. L3

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 L2
- apply the concept of hypothesis testing for large samples L3

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 L3
- apply the concept of hypothesis testing for large samples and estimate the goodness of fit L3

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.
4. Advanced Engineering Mathematics, R K Jain and S R K Iyengar, Narosa Publishing House, New Delhi.

Reference Books:

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:

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

- apply different methods to find roots of the equations and find approximate the solutions of ordinary differential equations **L3**
- apply the Laplace transform for solving differential equations **L3**
- explain the concepts of probability and their applications **L3**
- apply discrete and continuous probability distributions in practical problems **L4**
- use the statistical inferential methods based on small and large sampling tests **L3**

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
B.Tech (R-20 Civil Engineering)

Semester-4 Syllabus

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

Course LearningObjectives:

The objective of this course is:

- To introduce the course: Engineering Geology to the Civil Engineering graduates.
- To enable the students, understand what minerals and rocks are and their formation and identification.
- To highlight significance/ importance/ role of Engineering Geology in construction of Civil Engineering structures
- To enable the student, realise its importance and applications of Engineering Geology in Civil Engineering constructions.

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 OUTCOMES :

Understand importance of geology in civil engineering

Understand how different rocks are formed and the minerals presents in rocks

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 OUTCOMES :

Understand different types of structures in geological formations

Understand geological classification of rocks and their structures and textures

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 OUTCOMES :

Obtain knowledge on ground water, earth quakes and land slides

Understand the effects due to land slides and earthquakes

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 Geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of competence of sites by grouting etc.

UNIT OUTCOMES :

Knowledge on geophysical studies

Understand the principles used for geophysical studies

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.

UNIT OUTCOMES :

Understand the need of geology in site selection

Understand the effects failures of structures

TEXT BOOKS:

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

2) Engineerring Geology by Vasudev Kanthi, Universities press, Hyderabad.

REFERENCES:

1. Engineerring geology by Prabin singh, Katson Pubilcations
2. Engineering geology by Duggal, TMH Publishers.
3. Engineering Geology by Subinoy Gangopadhyay, Oxford University press.
4. Principals of Engineering Geology by K.V.G.K. Gokhale – B.S publications
5. K. S. Valdiya, " Environmental Geology",, Tata Mc Graw Hill.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

- Identify and classify the geological minerals
- Measure the rock strengths of various rocks
- Classify and measure the earthquake prone areas to practice the hazard zonation
- Classify, monitor and measure the Landslides and subsidence
- Prepares, analyses and interpret the Engineering Geologic maps
- Analyses the ground conditions through geophysical surveys.
- Test the geological material and ground to check the suitability of civil engineering project construction

. • Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc.

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B.Tech (R-20 Civil Engineering)

Semester-4 Syllabus

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

Course Learning Objectives:

- To give preliminary concepts of assessment of bending moment and shear force in fixed beams and continuous beams due to various loading conditions.
- To impart concepts of Bending Moment and Shear force for beams with different boundary and loadingconditions
- The procedure for development of slope deflection equations and moment distribution method and to solve application to continuous beams with and without settlement ofsupports

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 OUTCOMES

- Understand Energy concepts
- Develop expression for strain energy due to axial load Bending moment and shear force
- Calculate deflections in simple beams and pin joined trusses
- Analyze simple structural elements using energy principles.

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 OUTCOMES

- Differentiate determinate and indeterminate structures
- Understand static and kinematic indeterminacies
- Solve truss problems

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 OUTCOMES

Unit Outcomes

- Categorize fixed and continuous beams and their performance
- Understand different loads on beams with different boundary conditions.
- Analyze the beams subjected to loads
- Study effect of sinking of supports of performance

UNIT – IV

SLOPE-DEFLECTION METHOD: Introduction-derivation of slope deflection equations- application to continuous beams with and without settlement of supports - Analysis of single bay portal frames without sway **UNIT OUTCOMES**

. • Develop slope deflection expressions

• Analyze structures with and without support sinking

• Analyze 2D frames using slope-deflection method.

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 .

UNIT OUTCOMES

• Develop moment distribution expressions

• Analyze structures with and without support sinking

• Analyze single storey portal frames

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 S Bhavikatti – 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.Prakasa rao - 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.P Perumal – Laxmi publications.

(7) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.

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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 Outcomes

- Understand Laminar Flow through plates
- Understand Turbulent flow and transition
- Apply energy and momentum principles to fluid flow situations
- Solve problems for forces in static and moving fluids

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 Outcomes

- Differentiate open and closed channel flows
- Understand different formulae on open channel flow
- Design open-channel flow systems.

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 Outcomes

- Understand the concepts of varying flow in pipes
- Measure discharge and velocity
- Understand gradually varied flow
- Solve introductory problems of forces and dynamics

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 Outcomes

- Understand hydrodynamic force of jets different vanes
- Calculate efficiency of jets
- Understand and design Pelton wheel, Francis and Kaplan turbine

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 .

Unit Outcomes

- Understand principles of centrifugal pumps
- Calculate losses and efficiencies of centrifugal pumps
- Design centrifugal pumps including multi stage pumps.

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.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AHS04 - MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to all Branches)

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 – I

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**

UNIT – IV

Types of Industrial Organization: Characteristic features of Industrial organization, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, State/Public Enterprises and their types.

Capital Budgeting: Introduction to capital, Meaning of capital budgeting, Need for capital budgeting – Capital budgeting decisions (Examples of capital budgeting) - Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR), IRR and Net Present Value Method (simple problems).

Learning Outcomes:

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

- Know the concept of capital budgeting and its importance in business. **L1**
- Contrast and compare different investment appraisal methods. **L2**

UNIT – V

Introduction to Financial Accounting: Introduction to Double-entry system, Journal, Ledger, Trial Balance- Final Accounts (with simple adjustments) - Limitations of Financial Statements.

Interpretation and analysis of Financial Statement: Ratio Analysis – Liquidity ratios, Profitability ratios and solvency ratios – Preparation of changes in working capital statement and fund flow statement.

Learning Outcomes:

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

- Know the concept, convention and significance of accounting. **L1**
- Apply the fundamental knowledge of accounting while posting the journal entries. **L2**

Text Books:

1. **J.V. Prabhakar Rao**: Managerial Economics and Financial Analysis, Maruthi Publications, 2011.
2. **Prof. C.Viswanatha Reddy:** 'Financial Accounting-1' Himalaya Publishing House, Newdelhi.

Reference Books:

1. **A R Aryasri** - Managerial Economics and Financial Analysis, TMH 2011.
2. **Suma damodaran**- Managerial Economics, **Oxford** 2011.
3. **S.A. Siddiqui & A.S. Siddiqui**, Managerial Economics and Financial Analysis, New Age International Publishers, 2011.
4. **N. Appa Rao. & P. Vijaya Kumar**: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi, 2011.

Course Outcomes:

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

- Be able to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives. **L1**
- Be able to perform and evaluate payback period and capitalized cost on one or more economic alternatives. **L2**
- Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives. **L3**
- Evaluate the capital budgeting techniques. **L4**
- Students can analyze how to invest their capital and maximize returns. **L5**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AHS05 - ENTERPRENUARSHIP AND INNOVATION MANAGEMENT

(Common to all Branches)

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:

1. Robin Lowe and Sue Marriott, Enterprise: Entrepreneurship and Innovation Concepts, Contexts and Commercialization.
2. John Bessant and Joe Tidd, Innovation and Entrepreneurship.

Reference Books:

1. Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, New Delhi, 1998.
2. Peter F. Drucker, Innovation and Entrepreneurship.
3. EDII "Faculty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development" Institute of India, Ahmadabad, 1986.
4. 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**

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Semester-4 Syllabus

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

Course LearningObjectives:

The objective of this courseis:

- To identify the Megascopic types of Ore minerals & Rock forming minerals.
- To identify the Megascopic types of Igneous, Sedimentary, Metamorphic rocks.
- To identify the topography of the site & material selection.

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.Satyanarayana Swamy, Engineering Geology Laboratory Manual , Dhanpat Rai Sons, New Delhi

Course Outcomes:

Upon the successful completion of this course, the students will be able to:

- Identify Megascopic minerals & their properties.
- Identify Megascopic rocks & their properties.
- Identify the site parameters such as contour, slope & aspect for topography.
- Know the occurrence of materials using the strike & dip problems.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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Semester-4 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	SURVEYING LAB-II	0	0	3	1.5

OBJECTIVE: To impart the practical knowledge in the field, it is essential to introduce in curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.

LIST OF EXERCISES:

1. Study of theodolite in detail – practice for measurement of horizontal and vertical angles.
2. Measurement of horizontal angles by method of repetition and reiteration.
3. Trigonometric Leveling – Heights and distance problem (Two Exercises).
4. Heights and distance using Principles of tachometric surveying (Two Exercises)
5. Curve setting – different methods. (Two Exercises)
6. Setting out works for buildings & pipe lines.
7. Determination of area using total station.
8. Traversing using total station.
9. Contouring using total station.
10. Determination of remote height using total station.
11. Distance, gradient, Diff. height between tow inaccessible points using total stations.

Course Outcomes :

By performing the various experiments in this laboratory the student will be able to know the principles of surveying in thedolite surveying and total station.

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Semester-4 Syllabus

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

COURSE OBJECTIVE:
To make the students understand the fluid flow concepts
To get familiarity with flow measuring devices.
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.

COURSE OUTCOMES

1. To calibrate the flow measuring devices.
2. To calculate loss coefficients for use in the pipe-flow analysis.
3. To prepare the characterstics for curves of the pumps and turbines.
4. To find the performance of francis, pelton wheel turbines.
5. To understand the efficiency of centrifugal, reciprocating pumps, and to calibrate venturimeter, orifice meter.

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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

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 Outcomes:

- Identify critical planes in two dimensional stress systems
- Estimate principals stresses
- Assess safety of structural elements under principal stresses

UNIT -II

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 Outcomes

- Analyze members subjected to torsion, combined torsion and bending moment
- Calculate power transmission through shafts
- Estimate energy absorption in springs.

UNIT -III

Combined 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 Outcomes:

- To know about the effect of eccentricity effect in columns
- To know about the various theories of failures

UNIT -IV

Deflection of Beams:

Uniform bending – 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 Outcomes:**

- Understand types of loads acting on beams
- Compute slopes and deflections of beams with different boundary conditions
- Evaluate effect of different loads on propped cantilever beams

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.

Unit Outcomes

- Classify columns
- Understand Euler's theory on columns and assess crippling loads
- Analyze compression members using different theories
- Assess load carrying capacity using different formulae

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, Mc Graw 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 Pvt Ltd, 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.

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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 Outcomes :

Student will be able to

1. Understand basic characteristics of fluids
2. Understand Newton's Law of Viscosity
3. Understand concepts of fluid statics
.4. Demonstrate 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 Outcomes :

Student will be able to

Understand fundamentals of fluid kinematics

- Understands different types of fluid flows
- Derivation of Continuity equations of using 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 Outcomes :

Student will be able to

Demonstrate applications of Bernoulli's equations

- Experiment with different equipments under fluid flow
- Apply principles of fluid dynamics along with governing equations.

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 Outcomes :

Student will be able to

Estimate Energy losses in pipelines

- Determine flow characteristics through Pipes.

Unit-V

DIMENSIONAL ANALYSIS: Introduction, dimensions Dimensional homogeneity, Methods of dimensional analysis- Rayleigh's method Buckingham Pi theorem, model analysis, similitude-types of similarities. Dimensionless numbers. Model laws Partially submerged objects types of models, Scale effect

BOUNDARY LAYER THEORY & DRAG AND LIFT: Boundary layer - concepts. Prandtl's contribution, Characteristics of boundary layer along a thin flat plate laminar and turbulent Boundary layers, separation of BL. expression for drag and lift Lift and Drag Coefficients, pressure drag and friction drag, Streamlined and bluff bodies

Unit Outcomes :

Student will be able to

Under stand dimensional analysis

Under stand boundary layer theory and its charcterstics

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

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Semester-3 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	SURVEYING	2	1	--	3

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 Outcomes

- To impart basic concepts of surveying.
- To introduce the usage and applications of linear and angular measurements through chain, tape, compass and plane table.

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 Outcomes

- To impart basic principles in levelling and contouring.
- To calculate the areas of irregular boundaries and volumes of earth work quantities.

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 Outcomes

- To impart basic principles in Trigonometric levelling.
- To inculcate the knowledge of traversing.

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 Outcomes

- To impart basic principles in Tacheometric surveying.
- To inculcate the knowledge of simple horizontal circular curve setting.

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.

Unit Outcomes:

- To induce the knowledge of construction surveying.
- To inculcate the knowledge of advanced surveying instrument such as total station.

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.

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.

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Semester-3 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 INGREDIENTS :
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 Outcomes
- List different ingredients of concrete
- Conduct tests on materials
- Explain characteristics of water
- Understand conformity to IS Codes

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 Outcomes
- List various properties of fresh concrete
- Conduct experiments for determination of fresh concrete properties
- List various properties of hardened concrete
- Conduct experiments for determination of hardened concrete properties • Carryout Non Destructive tests on Concrete

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 Outcomes

- Understand curing methods and its importance
- Understand phenomenon of shrinkage and creep of concrete.
- Evaluate factors influencing creep and concrete

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 Outcomes

- Study properties of concrete mixes
- Design concrete mixes using different methods
- Estimate quantities for target strength of concretes

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)

Unit Outcomes

- Label different types of special concretes with the objectives
- Understand properties of special concretes.

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.

Course 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

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Semester-3 Syllabus

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

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.*

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.Kumara Swamy 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 Mc Graw Hill

COURSE OUTCOMES

1. The scope of this course is to introduce the concepts of building planning and drawing with emphasis on architectural planning.
2. 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.
3. Able to know the requirements of different rooms and characteristics of various types of residential buildings.
4. Able to know about building byelaws and regulations.
5. Ability to draw line sketch and planning and bi section of a building

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Semester-3 Syllabus

Subject Code	Title of the Subject	L	T	P	C
	CONCRETE TECHNOLOGY LABORATORY	0	0	3	1.5

Course Objective *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.*

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.

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*

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Semester-4 Syllabus

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

Course LearningObjectives:

The objective of this course is:

- To introduce the course: Engineering Geology to the Civil Engineering graduates.
- To enable the students, understand what minerals and rocks are and their formation and identification.
- To highlight significance/ importance/ role of Engineering Geology in construction of Civil Engineering structures
- To enable the student, realise its importance and applications of Engineering Geology in Civil Engineering constructions.

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 OUTCOMES :

Understand importance of geology in civil engineering

Understand how different rocks are formed and the minerals presents in rocks

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 OUTCOMES :

Understand different types of structures in geological formations

Understand geological classification of rocks and their structures and textures

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Semester-4 Syllabus

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

Course Learning Objectives:

- To give preliminary concepts of assessment of bending moment and shear force in fixed beams and continuous beams due to various loading conditions.
- To impart concepts of Bending Moment and Shear force for beams with different boundary and loadingconditions
- The procedure for development of slope deflection equations and moment distribution method and to solve application to continuous beams with and without settlement ofsupports

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 OUTCOMES

- Understand Energy concepts
- Develop expression for strain energy due to axial load Bending moment and shear force
- Calculate deflections in simple beams and pin joined trusses
- Analyze simple structural elements using energy principles.

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 OUTCOMES

- Differentiate determinate and indeterminate structures
- Understand static and kinematic indeterminacies
- Solve truss problems

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 OUTCOMES

Unit Outcomes

- Categorize fixed and continuous beams and their performance
- Understand different loads on beams with different boundary conditions.
- Analyze the beams subjected to loads
- Study effect of sinking of supports of performance

UNIT – IV

SLOPE-DEFLECTION METHOD: Introduction-derivation of slope deflection equations- application to continuous beams with and without settlement of supports - Analysis of single bay portal frames without sway **UNIT OUTCOMES**

. • Develop slope deflection expressions

• Analyze structures with and without support sinking

• Analyze 2D frames using slope-deflection method.

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 .

UNIT OUTCOMES

• Develop moment distribution expressions

• Analyze structures with and without support sinking

• Analyze single storey portal frames

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 S Bhavikatti – 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.Prakasa rao - 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.P Perumal – Laxmi publications.
(7) Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers.

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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 Outcomes

- Understand Laminar Flow through plates
- Understand Turbulent flow and transition
- Apply energy and momentum principles to fluid flow situations
- Solve problems for forces in static and moving fluids

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 Outcomes

- Differentiate open and closed channel flows
- Understand different formulae on open channel flow
- Design open-channel flow systems.

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 Outcomes

- Understand the concepts of varying flow in pipes
- Measure discharge and velocity
- Understand gradually varied flow
- Solve introductory problems of forces and dynamics

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 Outcomes

- Understand hydrodynamic force of jets different vanes
- Calculate efficiency of jets
- Understand and design Pelton wheel, Francis and Kaplan turbine

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 .

Unit Outcomes

- Understand principles of centrifugal pumps
- Calculate losses and efficiencies of centrifugal pumps
- Design centrifugal pumps including multi stage pumps.

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-20) CIVIL ENGINEERING)

SEMESTER -4

Subject code	Title of the Subject	L	T	P	C
	Estimation Costing & Valuation	**1**	**-**	**2**	**2**

Course Objectives:

- 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:

After completing this Unit, students 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 buildingssingle storied and multi-storied buildings-earthwork-foundations-Super structure-Fittings including sanitary and electrical fittings-paintings.

Learning Outcomes:

After completing this Unit, students 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:

After completing this Unit, students 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:

After completing this Unit, students 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:

After completing this Unit, students 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.

TEXTBOOKS:

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; Laxmi publications.

REFERENCES:

1. Estimating and Costing by G.S. Birdie, Dhanpat Rai Publishing Company (P) Ltd
2. A Text book of Estimating and Costing by D.D.Kohli, S.Chand Pubilishers.

Course Outcomes

On completion of the course, the students 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

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	Solve the environmental problems based fundamental concepts of Environmental Science.
CO2	Describe the structure and function of significant environmental systems
CO3	Differentiate Natural and Polluted environment and asses its impact different on the environmental components.
CO4	Apply the Pyramid of number, mass and Energy, Demonstrate 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												

BOS Chairman
Chemistry

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. Timber extraction, mining, dams 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, dams benefits and problems.

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

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

e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- 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.

Introduction, types, characteristic features, structure and function of the following ecosystem: -

a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, 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. Biodiversity at global, National and local levels. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-III:

Environmental Pollution:

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

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

UNIT-IV:

BOS Chairman

BOS chemistry

Social Issues and the Environment

From Unsustainable to Sustainable development. Urban problems related to energy.
Water conservation, rain water harvesting, watershed management.
Resettlement and rehabilitation of people; its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
Wasteland reclamation.
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. Human Rights. Value Education. HIV/AIDS. - 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 common plants, insects, birds.
- 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 edtion, 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.
4. Anubha Kaushik and C.P.Kaushik, Basics of Environment and Ecology, New Age International Publishers, 4th Edition, 2012.

BOS Chairman
Chemistry

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE51- DESIGN OF REINFORCED CEMENT CONCRETE STRUCTURES

L	T	P	C
3	0	0	3

Course Objectives:

- *Familiarize Students with different types of designphilosophies.*
- *Equip student with concepts of design of flexuralmembers.*
- *Understand Concepts of shear, bond andtorsion.*
- *Familiarize students with different types of compressions members and Design.*
- *Understand different types of footings and theirdesign.*

UNIT –I

Introduction: RCC design philosophy–Different methods of design

Working stress Design: working stress method, design constants; Design singly reinforced beams

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. Assumptions in limit state design-stress – block parameters-limiting moment of resistance- Limit state design of singly reinforced beams.

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

Design of Beams:T and L sections by limit state method,design of doubly reinforced beams 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.

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,Limit state design of serviceability for deflection, cracking and codal provision.

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.

TEXTBOOKS

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

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 – ArthusH.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:

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

- 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

20ACE52- GEOTECHNICAL ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVE:

The objective of this course is:

- 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:

After completion of this unit student will

- 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 lawpermeability – 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:-

After completion of this unit student will

- 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:-

After completion of this unit student will

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

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:-

After completion of this unit student will

- 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:-

After completion of this unit student will

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

TEXTBOOKS:

1. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers andDistributors, 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).

REFERENCES:

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.

OUTCOMES:

On completion of the course, the students 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

20ACE53- ENVIRONMENTAL ENGINEERING

L	T	P	C
3	0	0	3

Course objectives:

- *To make the students conversant with sources and its demand of water*
- *To understand the basic characteristics of water and its determination*
- *To expose the students to understand the design of water supply lines*
- *To provide adequate knowledge about the water treatment processes and its design*
- *To have adequate knowledge on safe disposal methods*

UNIT – I

Introduction: Necessity of protected water supply –Flow chart of public water supply system - Role of Environmental Engineer.

Water Demand and Water Quality: Population forecasts, design period – water demand, types of water demands – factors affecting – fluctuations – fire demand – Characteristics of water – Physical, Chemical & Biological and their testing – drinking water standards - Waterborne diseases - Comparison from quality and quantity and other considerations.

Water collection structures at source: intakes – infiltration galleries.

UNIT OUTCOMES

- Understand importance of water quality
- Explain water quality standards

UNIT-II

Water Treatment (Sedimentation, Filtration and Disinfection): Layout and general outline of water treatment units – sedimentation – principles – design factors – coagulation flocculation clarifier design – coagulants – feeding arrangements– Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation comparison of filters – disinfection – theory of chlorination, chlorine demand, other disinfection practices

LEARNING OUTCOMES:

After completion of this unit student will

- Design waste water treatment systems
- Categorize different water treatment procedures

UNIT-III

Water Distribution Network Analysis : Distribution systems – Requirements, Layout of Water distribution systems – Design procedures- Hardy Cross and equivalent pipe methods - service reservoirs – joints, valves such as sluice valves, air valves, scour valves and check valves water meters – laying and testing of pipe lines – pump house.

LEARNING OUTCOMES:

After completion of this unit student will

- Plan water supply systems in terms of transmission and distribution

UNIT IV

Waste Water Collection : House plumbing– inverted siphon – catch basins – flushing tanks– ejectors - Conservancy and water carriage systems – sewage and storm water estimation -fluctuations – types of sewers – Hydraulics of sewers and storm drains– design of sewers–shapes and materials.

Waste Water Characteristics: Characteristics of sewage – cycles of decay –decomposition of sewage. - B.O.D. – C.O.D. equations.

LEARNING OUTCOMES:

After completion of this unit student will

- Distinguish characteristics of domestic and storm water
- Assess quality of waste water parameters

UNIT – V

Waste Water Treatment : Layout and general outline of various units in a waste water treatment plant – primary treatment design of screens – grit chambers – skimming tanks – sedimentation tanks – principles of design – trickling filters – ultimate disposal of sewage – Construction and design of Oxidation ponds – sewage farming – dilution. Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying – septic tanks and Imhoff -Tanks working principles and design – soakpits.

LEARNING OUTCOMES:

After completion of this unit student will

- Plan Sewage treatment and disposal methodologies
- Design waste water treatment systems leading to cleaning of rivers

TEXT BOOKS

1. Water supply and sanitary Engineering by G.S. Birdi, DhanpatRai&SonsPublishers.
2. Water supply and sanitary Engineering byS.A.Garg,
3. Elements of environmental engineering by K.N. Duggal, S. ChandPublishers.
4. Manual on Water supply and Treatment – CPHEEO,1999.
5. Punmia B.C, Ashok Jain &Arun Jain, Water Supply Engineering, Laxmi Publications,Pvt. Ltd., New Delhi,2004.

REFERENCS

1. Water and Waste Water Technology by Mark J Hammar and Mark J. HammarJr.
2. Water and Waste Water Technology bySteel
3. Water and Waste Water Engineering by Fair Geyer andOkun
4. Waste water treatment- concepts and design approach by G.L. Karia and R.A.Christian, Prentice Hall ofIndia
5. Waste water Engineering by Metcalf andEddy.
6. Unit operations in Environmental Engineering by R. Elangovan and M.K. Saseetharan, New age International
7. Environmental Engineering by georad.KielyTMHPubilications.
8. IntroductiontoEnvironmentalEngineeringbyMackenzie,DevisandDavid.A.Cornwell, TMH Publications, NewDelhi.

Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, AshokJain&Arun Jain, Laxmi Publications Pvt.Ltd,NewDelhi.

Course Outcomes:

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

- Understand about quality of water and purification process
- Design waste water treatment systems
- Select appropriate technique for treatment of waste water.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE54a- STRUCTURAL ANALYSIS – II

(Professional Elective-I)

L	T	P	C
3	0	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.

LEARNING OUTCOMES:

After completion of this unit student will

- Understand different types of arches
- Determination of horizontal thrust , normal thrust and radial shear for two hinged and there hinged arches

UNIT-II

APPROXIMATION METHODS OF ANALYSIS:-Analysis of single bay single storey portal frame including side sway–Substitute frame analysis by two cycle method - Portal method - cantilever method.

LEARNING OUTCOMES:

After completion of this unit student will

- Develop moment distribution expressions
- Analyze single storey portal frames with sway

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.

LEARNING OUTCOMES:

After completion of this unit student will

- Develop kanis method expressions
- Analyze the structures with and without settlement of supports

UNI T – IV

INTRODUCTION OF FLEXIBILITY AND STIFFNESS METHODS:-

Flexibility methods- Introduction- Application to continuous beams including support settlements. Stiffness methods- Introduction-application to continuous beams including support settlements.

LEARNING OUTCOMES:

After completion of this unit student will

- Analyze continous beams with and without settlement of supports

UNIT – V

PLASTIC ANALYSIS:

Introduction – Idealized stress – Strain diagram – shape factors for various sections – Moment curvature relationship – ultimate moment – Plastic hinge – lower and upper bound theorems – ultimate strength of fixed and continuous beams.

LEARNING OUTCOMES:

After completion of this unit student will

- Learn the importance of shape factors and analyze the shape factors for various shapes
- Learn the moment curvarture relation ship
- analyze the ultimate strength of beams

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

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE54b- REMOTE SENSING AND GIS

(Professional Elective-I)

L	T	P	C
3	0	0	3

Course Objectives:

- 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:

After completing this Unit, students 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:

After completing this Unit, students 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:

After completing this Unit, students 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: After completing this Unit, students 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:

After completing this Unit, students will be able to

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

Course outcomes

At the end of the 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.

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.

REFERENCES:

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

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE54c- CONSTRUCTION TECHNOLOGY & PROJECT MANAGEMENT

(Professional Elective-I)

L	T	P	C
3	0	0	3

Objective:

The objective of the course is to make the student to

- understand about fundamentals of construction management and techniques to be used to perform and complete the construction works Intime
- 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.

UNIT – I

FUNDAMENTALS OF CONSTRUCTION TECHNOLOGY:

Definitions and Discussion – Construction Activities – Construction Processes - Construction Works – Construction Estimating – Construction Schedule – Productivity and Mechanized Construction – Site Layout – Deployment of Construction Equipment – choice of construction technology

PREFABRICATION IN CONSTRUCTION– Need for prefabrication – Principles – Materials – Modular Coordination-Standardization. - Advantages and Disadvantages

Learning outcomes:

Students 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 – Groundwater Control methods – Trenchless (No-dig) Technology – Grading. 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- Dredging-types of dredging- its importance.

Learning outcomes:

Students 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 –decision -Project Life Cycle- - Role of decision in project management – Development of bar chart – Illustrative examples – Shortcomings of bar charts and remedial measures – Milestone charts.

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 fornetwork construction – Modes of network construction – Steps in development of network – Work breakdown structure –Hierarchies – Illustrative examples – Problems

Learning outcomes:

Students will be able to

- Understand and application of Network techniques in construction
- Application of Management tools like Bar Chart, Gant Chart, CPM and PERT
- Learn about Elements of network
- Analyze Steps in developing a network

UNIT - IV

PERT : 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

UNIT – V

CPM**NETWORK ANALYSIS** : 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.-Cost Time Optimization – Direct and Indirect project costs – Total costs – Cost Slopes – Crashing - Cost and Time Optimization.

Learning outcomes:

Students will be able to

- Understand the resource allocation and scheduling
- Analyzehow delay in activities effect the total estimated time of project

Course outcomes:

- 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.

TEXTBOOKS:

1. Construction project management by JhaPearsonpubilications,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.

REFERENCES:

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.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE57- ENVIRONMENTAL ENGINEERING LAB

L	T	P	C
0	0	3	1.5

Course Objective:

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 andTurbidity.
2. Determination ofConductivity.
3. Determination and Estimation of total solids, total volatile solids and total fixedsolids.
4. Determination and Estimation of Total dissolved solids and Total suspendedsolids.
5. Determination ofAlkalinity/Acidity.
6. Determination ofChlorides.
7. Determination ofiron.
8. Determination ofNitrogen.
9. Determination of totalPhosphorous.
10. Determination of Optimum coagulant dose – Jartest.
11. Determination of Chlorinedemand.
12. Determination of DissolvedOxygen.
13. Determination ofB.O.D
14. Determination ofC.O.D
15. Presumptive coliformtest.

NOTE: At least 8 of the above experiments are to be conducted.

LIST OF EQUIPMENT:

1) pH meter,
2) Turbiditymeter,
3) Conductivitymeter,
4) Hot airoven,
5) Mufflefurnace,
6) Dissolved Oxygenmeter,
7) U – V visible spectrophotometer,
8) RefluxApparatus,
9) Jar TestApparatus,
10) BOD incubator.
11) COD Extractionapparatus

Course Outcomes:

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

- Estimate various parameters of water
- Assess quality of waste water parameters

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.

References:

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE58- GEOTECHNICAL ENGINEERING LAB

(Professional Elective-I)

L	T	P	C
0	0	3	1.5

OBJECTIVE:

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'sLimits.
2. Field density-core cutter and sand replacementmethod
3. Grain sizeanalysis
4. Specific gravity of soils by Density Bottle method &Pycnometermethod
5. Permeability of soil, constant and variable headtest
6. Compactiontest
7. CBR test
8. Consolidationtest
9. Unconfined compressiontest
10. Tri-axial Compressiontest (Demo)
11. Direct sheartest.
12. Vane sheartest

NOTE: At least EIGHT of the above experiments are to be conducted.

Course Outcomes:

At the end of the course, the student must 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.

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.

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE50- BIM FUNDAMENTALS FOR CIVIL ENGINEERS

(Skill Oriented course-III)

L	T	P	C
1	0	2	2

COURSE OBJECTIVES:

The course should enable the students to:

- Provide familiarity with current BIM technologies.
- Understand the shift from 2D representation to 3D simulation.
- Synthesize, link and maintain continuity of existing and designed BIM information and other vitalinformation into the model.
- Explore new project delivery systems and technologies for integrated practice‘.

List of Experiments

1. Introduction to BIM & AUTODESK REVIT
2. Basic Drawing and editing tools
3. Setting Up Levels and Grids
4. Modelling Walls
5. Working With Doors and Windows
6. Working With Curtain Walls
7. Working With Views
8. Adding Components
9. Modelling Floors
10. Modelling Ceilings & Roofs
11. Modelling Stairs And Railing

Text Books:

Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston —BIM HANDBOOK‖, Wiley, 2 ndEdition, 2011

COURSE LEARNING OUTCOMES (COs):

At the end of the course, the student will have the ability to:

1. Understand the basics of BIM and Autodesk Revit.
2. Learn about various drawing and editing tools available in Revit architecture.
3. Draw the setting up levels and grids in building using Revit software.
4. Draw a different types of modeling walls in building using Revit software
5. Draw the doors and windows in building using Revit software.
6. Draw curtain walls in building using Revit software.
7. Work with different types of view in a building using Revit software.
8. To draw the adding components, modifying components & working with elements in building using Revit software.
9. Draw the modeling floors in a building using Revit software.
10. Model ceilings and roofs using Revit software.

Model stairs and railing using Revit software

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech. V-Sem (R20)

FUZZY SET THEORY, ARITHMETIC AND LOGIC

(Open Elective -I)

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.

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. **Possibility Theory:** Fuzzy Measures, Evidence Theory, Possibility Theory, Fuzzy Sets and Possibilty 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, Multi-valued 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:	
1. Fuzzy Sets and Fuzzy Logic, Geoge J. Klir and Bo Yuan	
Reference Books:	
1. Fuzzy Mathematical Models in Engineering and Management Science, A. Kaufmann and M.M. Gupta	
2. Fuzzy Logic, Timothy J. Ross	
3. Fuzzy Set Theory, H.J. Zimmermann	
4. 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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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF PHYSICS
III B.TECH – I SEMESTER-R20 (Open elective-Interdisciplinary) –OE-ID.1(THEORY)

FUNCTIONAL NANOMATERIALS FOR ENGINEERS
(Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- Be able to describe the terminology and basics of smart materials and smart systems
- Be able to understand the classification and applications of smart materials.
- Be able to understand the use of appropriate materials for energy applications.
- Be able to identify appropriate techniques for understanding the mechanisms of nanosensors
- Be able to explain the concepts of self-assembling monolayers and their applications

UNIT-I: INTRODUCTION TO FUNCTIONAL /SMART NANOMATERIALS **9 Hrs**

Introduction:-Nanomaterials and their importance (in brief), Functional/ Smart Nanomaterials, – (Hydrogels, Carbon nanotubes) and their Functionalization techniques, Properties of Smart materials (Sensing materials, Actuation materials, Self-detection, Self-corrective, self-healing, Shock Absorbers)- 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 functionalization of smart nanomaterials	**L1**
• **Explain** the need of functional/smart nanomaterials for advanced tecghnology	**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**

Introduction, Classification of smart materials (piezoelectric, electrostrictive, Magnetostrictive, Thermoresponsive and Electrochromic), Shape Memory Alloys and their working principle, Applications of smart materials in Aircrafts, Medicine, Robotics,Smart fabrics, Sporting goods and smart glass, Merits and de-merits 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**
• **Identify** the Merits and demerits of smart materials in engineering field	**L2**

Unit-III NANOSENSORS **9 Hrs**

Introduction, Principle of nanosensors, Types of nanosensors (Physicalnanosensors – *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 MONO LAYERS	**9Hrs**
Introduction, principles of self-assembly, monolayers, Characteristics of Self assembled monolayers (SAMs), Types of SAMs, Factors influencing Monolayer order, Methods of preparation of SAMs(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	**9Hrs**
Introduction, **Solar Cells** (Silicon Solar Cells, Thin film Solar Cells, Organic Solar Cells, Polymer solar cells) Working Principle, Efficiency estimation and advantages. **HydrogenFuel Cells** – Working Principle, Configuration, 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:

1. YaserDahman, Nanotechnology and Functional Materials for Engineers-, Elsevier, 2012
2. E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

Reference Books:

1. Gauenzi,P.,Smart Structures, Wiley, 2009.
2. 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**
• **Classify** the solar cells based on manufacturing material	**L4**
• `**Interpret** the efficiency and advantages in various solar cells	**L5**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech – III-I-Sem	L	T	P	C
	3	0	0	3

Chemistry of Energy Materials (OE.1)
(common to all branches)

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.
- Necessity 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-I: **Electrochemical Systems** — 9 Hrs

a) Introduction to Energy- Materials, Chemistry, Engineering and Technology.
b) Electrochemical Systems: Galvanic cell, standard electrode potential, application of EMF, Electrode mechanism, 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** — 7 Hrs

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:

- Classify the fuel cell(L2)
- 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)

UNIT-III: **Hydrogen Storage**	9 Hrs
Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF) zinc-(3-aminotriazolato)-oxalate; MOF-74 (Zn_2 -(2,5-dihydroxy-1,4-benzenedicarboxylate), Carbon structures (Carbon nano tubes, fullerenes), metal oxide porous structures, hydrogen storage by high pressure methods-liquefaction method	
Learning Outcomes: After completing the course, 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**	8 Hrs
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: After completing the course, 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: **Photochemical and Photo electrochemical Conversions**	7 Hrs
Photochemical cells and applications of photochemical reactions, photo electrochemical cell, advantages of photoelectro catalytic conversions.	
Learning Outcomes: • After completing the course, 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(2)	
Text Books:	
1. Bahl and Bahl and Tuli, Essentials of Physical Chemistry, S. Chand Publications, New Delhi, 28th Edition, 2020. 2. 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

20ACE55A- BASICS OF CIVIL ENGINEERING

(Open Elective-I)

L	T	P	C
3	0	0	3

Course Objectives:

- To study the basic concept of Civil Engineering and instruction buildings.
- To understand the concept of planning of buildings and drawing of single stored building.
- To study the Basic principles of surveying and instruments used.
- To study about the various materials used for the construction of Buildings.
- To understand the construction of Structural Elements in buildings.

UNIT-I:

Introduction to Civil Engineering Building planning : Introduction to types of buildings as per NBC; Selection of site for buildings. Components of a residential building and their functions. Introduction to industrial buildings – office / factory / software development office / power house /electronic equipment service centre

UNIT-II:

Site plan, Orientation of a building, Open space requirements, Position of doorsand windows, Size of rooms; Preparation of a scaled sketch of the plan of asingle storeyed residential building in a given site plan. Introduction to the various building area terms - Computation of plinth area/ built up area, Floor area / carpet area - for a simple single storeyed building; Setting out of a building.

UNIT-III

Surveying - Principles and objectives of surveying; Horizontal measurements – instruments used – tape, types of tapes; Ranging(direct ranging only) Theodolite and Total station-Principles

UNIT-IV:

Building materials

Bricks, cement blocks - Properties and specifications.

Cement – OPC, properties, grades; other types of cement and its uses (inbrief).

Cement mortar – constituents, preparation.

Concrete – PCC and RCC – grades.

Steel - Use of steel in building construction, types and market forms.

UNIT-V:

Building construction – Foundations; Bearing capacity of soil (definitiononly); Functions of foundations, Types - shallow and deep (sketches only).

Brick masonry – header and stretcher bond, English bonds – Elevation and plan (one brick thick walls only).

Roofs – functions, types, roofing materials (brief discussion only).

Floors – functions, types; flooring materials (brief discussion only).

Decorative finishes – Plastering – Purpose, procedure.

Paints and Painting – Purpose, types, preparation of surfaces for painting (brief discussion only).

Text Books:

- Rangwala, S. C., Essentials of Civil Engineering, Charotar Publishing House
- Rangwala, S. C. and Dalal, K. B., Engineering Materials, Charotar Publishing house
- Rangwala, S. C. and Dalal, K. B., Building Construction, Charotar Publishing house
- Dr. K. R. Arora, "Surveying Volume-1", Standard book house, New Delhi, 13th Edition, 2012. 2. S. K.
- Duggal, "SurveyingVolume-2", Tata McGraw-Hill Education Private Limited, India,New Delhi, 3rd Edition, 2009.

Course Outcomes:

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

- To learn the types of buildings and components of building.
- To get the knowledge of planning of single stored buildings.
- To understand Basic concepts of surveying and Basic uses of instruments in surveying.
- To know the materials used for the construction of Buildings.
- To get the knowledge about the construction methods of Buildings.

Annexure-I *R20*

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

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

20AME55a-3D PRINTING

(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 of additive manufacturing / rapid prototyping and its applications in various fields.
- Impart reverse engineering techniques.
- Explain different processes available in additive manufacturing.
- Bring awareness on mechanical properties of materials and geometric issues related to additive manufacturing applications.

UNIT – I: Introduction to 3D PRINTING Systems: **10 Hrs**

History and Development of 3D printing, Need of 3D Printing, Difference between 3D Printing and CNC, Classification of 3D Printing Processes: Based on Layering Techniques, Raw Materials and Energy Sources, 3D Printing Process Chain, Benefits and Applications of 3D Printing, Representation of 3D model in STL format, RP data formats: SLC, CLI, RPI, LEAF, IGES, CT, STEP, HP/GL.

Learning Outcomes:

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

- Identify the applications for additive manufacturing processes. **L3**
- Explain the process of additive manufacturing. **L2**
- Represent a 3D model in STL format and other RP data formats to store and retrieve the geometric data of the object. **L3**

UNIT – II: CAD & Reverse Engineering: **8 Hrs**

Basic Concept, Digitization techniques, Model Reconstruction, Data Processing for Additive Manufacturing Technology: CAD model preparation, Part Orientation and support generation, Model Slicing, Tool path Generation, Software's for Additive Manufacturing Technology: MIMICS, MAGICS. Reverse Engineering (RE) –Meaning, Use, RE – The Generic Process, Phase of RE Scanning, Contact Scanners, Noncontact Scanners, Point Processing, Application Geometric Model, Development.

Learning Outcomes:

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

- Apply various digitalization techniques. **L3**
- Explain the concept of reverse engineering and scanning tools. **L2**

UNIT – III: Solid and Liquid Based AM Systems: **8 Hrs**

Laminated Object Manufacturing (LOM): Principle, Process, Materials, Advantages, Limitations, Applications.

Solid Ground Curing (SGC): Principle, Process, Materials, Advantages, Limitations, Applications.

Fusion Deposition Modeling (FDM): Principle, Process, Materials, Advantages, Limitations, Applications.

Stereo lithography Apparatus (SLA): Principle, Process, Materials, Advantages, Limitations and 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. **L3**

UNIT – IV: Powder Based AM Systems: **8 Hrs**

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.

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**
- Apply SLS, LENS and EBM 3D printing methods. **L3**

UNIT – V: Other Additive Manufacturing Systems: **8 Hrs**

Three Dimensional Printing (3DP): Principle, Process, Advantages, Limitations and Applications. Ballistic 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 principles and limitation of 3D printing using BPM and SDM. **L2**
- Use BPM and SDM 3D printing methods. **L3**

Text Books:

1. Ian Gibson, David W. Rosen, Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 1/e Springer, 2010.
2. Chua C.K., Leong K.F. and Lim C.S., Rapid Prototyping: Principles and Applications, 2/e World Scientific Publishers, 2003.
3. Liou W. Liou, Frank W., Liou, Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development, CRC Press, 2007.

Reference Books:

1. Pham D.T. and Dimov S.S., Rapid Manufacturing; The Technologies and Application of RPT and Rapid Tooling, Springer, London 2001.
2. Gebhardt A., Rapid prototyping, Hanser Gardener Publications, 2003.
3. Hilton P.D. and Jacobs P.F., Rapid Tooling: Technologies and Industrial Applications, CRC Press, 2005.
4. Rafiq Noorani, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons, 2006.

Course Outcomes:

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

- Demonstrate various additive manufacturing and rapid prototyping techniques applications. **L4**
- Describe different additive manufacturing processes. **L3**
- Apply methods in rapid prototyping. **L2**
- Use powder based AM system. **L3**
- Model 3D printing using SDM and BPM methods. **L6**

Online Learning Resources:

- https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
- https://slideplayer.com/slide/6927137/
- https://www.mdpi.com/2073-4360/12/6/1334
- https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-%20FDM.pdf
- https://lecturenotes.in/subject/197
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- https://www.youtube.com/watch?v=NkC8TNts4B4

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Mechanical Engineering Department,
JNTUA College of Engineering,

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME55b-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: Introduction to Smart Materials: **10 Hrs**

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 intelligence is. **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: **8 Hrs**

High bandwidth - Low strain generating (HBLS) Smart Materials:

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**
- Discus Galfenol and Metglas materials. **L6**

UNIT – III: Low bandwidth - High strain generating (LBHS) materials: **8 Hrs**

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. **L2**
- Identify the influence of stress on characteristic temperatures in SMA and EAP. **L3**
- Explain the concept of vibration control through shape memory alloys. **L2**
- Discus design considerations of shape memory alloy. **L6**

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UNIT – IV: Smart actuator: **8 Hrs**

Smart actuators:

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**
- Discus the concepts of actuators based on HBLS and LBHS. **L6**

UNIT – V: Smart sensors: **8 Hrs**

Smart sensors:

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**
- discus EPA based and SMA based sensors. **L6**
- Explain optical based sensing system. **L2**

Text Books:

1. M.V. Gandhi, B.D. Thompson" Smart Materials and Structures" Springer Science & Business Media, 31.
2. A.V. Srinivasan, Smart Structures; Analysis and Design, Cambridge University Press, Cambridge; New York, 2001
3. K.Uchino, Kluwer, Piezoelectric Actuators and ultrasonic Motors Academic Publishers, Boston, 1997.

Reference Books:

1. Brian Culshaw, Smart Structures and Materials, Artech House, Boston,2000.
2. Gauenzi, P., Smart Structures, Wiley, 2009.
3. Cady, W. G., Piezoelectricity, Dover Publication.
4. A.J. Moulson and J.M-Herbert, Electro ceramics: Materials, Properties/ / Wiley/ 2/e.

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 piezeoelectric materials. **L2**
- Identify the influence of stress on characteristic temperatures in SMA and EAP. **L3**
- Explain techniques of self sensing MEMS sensors. **L2**

Online Learning Resources:

- https://nptel.ac.in/courses/112104251
- http://wwwcourses.sens.buffalo.edu/mae538/LecNotes.html
- http://ssdl.iitd.ac.in/vssdl/smart.pdf
- https://www.stem.org.uk/resources/elibrary/resource/33044/smart-materials-1

Head
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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC55a- FUNDAMENTALS OF ELECTRONICS AND COMMUNICATION ENGINEERING

(Open Elective-I)

L–T – P - C
3 – 0 – 0 – 3

Course Objectives:

- 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 the 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 the unit, the student will be able to:

- To learn the real time applications of semiconductor devices.(L1)
- To understand the basic concepts of operational amplifier and their applications.(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 the 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 the 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 the 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",DhanpatRai& 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 students 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)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC55b- TRANSDUCERS AND SENSORS

(Open Elective-I)

L – T – P - C
3 – 0 – 0 – 3

Course Objectives:

- 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 the 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 the 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 the 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 the 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 the 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", DhanpatRai& 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 students 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

20ACS55A- Fundamentals of Internet of Things

(Open Elective-I)

L	T	P	C
3	0	0	3

Course objectives:

- To understand the fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To apply the concept of Internet of Things in the real world scenario.

UNIT I : Fundamentals of IoT

Introduction – Characteristics-Physical Design – IoT Protocols – Logical Design – Enabling technologies – IoT Levels – Six Levels of IoT - Domain Specific IoTs.

Learning Outcome:

At the end of this unit, students will able to

- Describe the IoT devices physical design and able to design IoT devices in various levels of IoT L1
- Explain the technologies enabling related to industry. L2

UNIT II: IOT and M2M

Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCONF, YANG- NETCONF, YANG, SNMP, NETOPEER.

Learning Outcome:

At the end of this unit, students will able to

- Describe the Software defined networks and Network function virtualization with respect to the IoT systems. L2
- Explain the NETCONF protocol with YANG modeling language. L2

UNIT III: IoT Design Methodology

IoT Systems Management – IoT Design Methodology – Specifications Integration and Application Development.

Learning Outcome:

At the end of this unit, students will able to

- Describe the IoT devices complete design methodology with all spectifications. L2
- Explain the system Integration and application development and deployment.L3 L3

UNIT IV: Sensors and Connectivity

Sensors- Types of sensor nodes, Internet communications, IP addresses, MAC Address, TCP and UDP Ports, Application layer protocols

Learning Outcome:

At the end of this unit, students will able to

- Describe various sensors usage with respect to the IoT systems and differentiation between IP address and MAC address L3
- Explain the benefits of application layer protocols. L4

UNIT V: IOT Industry Applications

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plant wide Ethernet Model (CPwE) – Power Utility Industry – Grid Blocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

Learning Outcome:

At the end of this unit, students will able to

- Describe the industry oriented IoT devices and its applications. L4

TEXT BOOKS:

2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A Hands-on Approach", Universities Press, 2015.
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

REFERENCES:

4. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014.
5. Marco Schwartz, "Internet of Things with the Arduino Yun", Pack Publishing, 2014.
6. *Simon Monk, "Programming the Raspberry Pi: Getting Started with Python"*, McGraw-Hill, *2013.*
7. CharalamposDoukas,"Building Internet of Things With the Arduino", Second Edition, 2012.
8. Dr.John Bates, "Thingalytics: Smart Big Data Analytics for the Internet of Things", Software AG Publisher, 2015.

Course Outcomes:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models. L2
- Appraise the role of IoT protocols for efficient network communication. L3
- Illustrate different sensor technologies for sensing real world entities and identify the

B.Tech III Year I Semester
JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ACS55B-E-Marketing
(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
I. Understand the legal and ethical issues in e-marketing.

II. Analyze online marketing and supply chain management.

III. Provides extensive theoretical and practical knowledge of online marketing.

IV. Develop marketing skills required for a continuously growing international business environment.

UNIT – I: E-BUSINESS OVERVIEW :
Traditional commerce vs. e-commerce, e-commerce and e-business categories of e-commerce development and growth of e-commerce advantages and disadvantages of e-commerce international nature of e-commerce..
Learning Outcomes:
At the end of this unit, the student will be able to
To realize basics of E-Marketing. **L1**

To introduce different E-Business Models . **L2**

UNIT – II: E-BUSINESS INFRASTRUCTURE :

E Commerce architectural framework, the internet and www-internet protocols, internet, intranet and extranets, internet connection options, security issues in e commerce environment, encryption techniques payment systems types of payments legal, ethical and tax issues in e-commerce.
Learning Outcomes:
At the end of this unit, the student will be able to
To understand the E-Marketing Plan. **L2**

To know about Online Expression . **L3**

UNIT – III: ONLINE MARKETING AND SUPPLY CHAIN MANAGEMENT
Online marketing, business models of e marketing, online advertisement, advertisement methods and strategies online retailing e-auctions.Supply chain management-procurement process and the supply chain types of procurement, multi-tier supply chains and trends in supply chain management.
Learning Outcomes:
At the end of this unit, the student will be able to
To know about the Data Drive Strategy . **L6**

Gain knowledge on Consumer Behavior Online **L3**

UNIT – IV: ONLINE SERVICES :

Online financial services, online banking and brokerage, online insurance services, online real estate services, travel services online, hospitality services online, recruitment services online, publishing services online entertainment, e-learning.

Learning Outcomes:

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

To know about Pricing Strategies L4

To know about Channel Management and Power. L6

UNIT – V: MOBILE COMMERCE :

Definition of mobile commerce, mobile commerce framework, growth of mobile commerce benefits and limitations of mobile commerce mobile network infrastructure, information distribution for mobile networks multimedia content, publishing, mobile payment models, mobile commerce applications.

Learning Outcomes:

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

To know how Browsing Behavior Model L4

To know about Ten rules for CRM Success. L2

Text Books:

1. Gary P. Schneider, "Ecommerce-Strategy, Technology and Implementation", Cengage Learning, India Edition

2. Kenneth C. Laudon, Carol GuercioTraver, "E-commerce–Business", Technology, Pearson, Low Price Edition.

3. Bharat Bhasker, "Electronic Commerce Framework, Technologies and Applications", 3rdn Edition.Tata McGraw, Hill.

Reference Books:

1. Efraim Turban, Tae Lee, David King and H. Micheal Chung, "Electronic Commerce, Managerial Perspective", Pearson Education Asia.

2. CSV Murthy, "E-commerce-Concepts, Models and Strategies", HPH.

3. . J. Christopher Westland and Theodore H K Clark, "Global Electronic Commerce ,Theory and Case Studies", Oxford Universities Press.

Course Outcomes:

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

- Analyse the confluence of marketing, operations, and human resources in real-time delivery. L3
- Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks. L3
- Investigate and evaluate issues in adapting to globalised markets that are constantly changing and increasingly networked. L5
- Investigate and evaluate issues in adapting to globalised markets that are constantly changing and increasingly networked. L2
- Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities. L3

B.Tech III Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20ACS55C-Computer Architecture and Organization

(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 impart basic concepts of computer architecture and organization.
- To explain key skills of constructing cost-effective computer systems.
- To familiarize the basic CPU organization.
- To help students in understanding various memory devices.

UNIT – I: STRUCTURE OF COMPUTERS:

Computer types, Functional units, Basic operational concepts, VonNeumann Architecture, Bus Structures, Software, Performance, Multiprocessors and Multicomputer, Data representation, Fixed and Floating point, Error detection and correction codes.

COMPUTER ARITHMETIC: Addition and Subtraction, Multiplication and Division algorithms, Floating-point Arithmetic Operations, Decimal arithmetic operations.

Learning Outcomes:

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

To realize basics of computer structure. L1

To know about the arithmetic operations. L2

UNIT – II: BASIC COMPUTER ORGANIZATION AND DESIGN:

Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Memory-Reference Instructions, Input-Output and interrupt. Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs RISC.

Learning Outcomes:

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

To understand the organization of computer. L2

To know about design of the computer. L3

UNIT – III:REGISTER TRANSFER AND MICRO-OPERATIONS

REGISTER TRANSFER AND MICRO-OPERATIONS: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logic shift unit.

MICRO-PROGRAMMED CONTROL: Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit.

Learning Outcomes:
At the end of this unit, the student will be able to
To know about the registers and its operations. **L6**

Gain knowledge on Micro operations. **L3**

UNIT – IV:MEMORY SYSTEM

MEMORY SYSTEM: Memory Hierarchy, Semiconductor Memories, RAM(Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory, Paging, Secondary Storage, RAID.

Learning Outcomes:
At the end of this unit, the student will be able to
To know about Semiconductor Memories **L4**

To know about the Cache Memory **L6**

UNIT – V: INPUT OUTPUT

INPUT OUTPUT: I/O interface, Programmed IO, Memory Mapped IO, Interrupt Driven IO, DMA.
MULTIPROCESSORS: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache Coherence.

Learning Outcomes:
At the end of this unit, the student will be able to
To know about the Input/Output operations **L4**

To know about the multiprocessors. **L2**

Text Books:

1. M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India.

Reference Books:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.

2.William Stallings (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersy

3.Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, Pearson Education Inc,

4.John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGrawHill

Course Outcomes:

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

- Identify various components of computer and their interconnection. **L3**
- Identify basic components and design of the CPU: the ALU and control unit. **L3**
- Compare and select various Memory devices as per requirement. **L5**
- Compare various types of IO mapping techniques. **L2**
- Critique the performance issues of cache memory and virtual memory. **L3**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE61- DESIGN OF STEEL STRUCTURES

L	T	P	C
2	1	0	3

Course Objectives:

- 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

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

Understand bolted and welded connections

1. Estimate strength of welds
2. 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.

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 and Laterally un-restrained beams - 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 Laterally restrained and understand laterally un-restrained beams.

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

3. Understand behavior of simple and compound beams
4. Visualize importance of curtailment of flange plates
5. Design and detail of steel beams under different conditions adopting IS Code.

UNIT-V:

Design of Column base , slab base and Gusset base-Grillage foundation..

Learning Outcomes:

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

6. Identify different components of plate girder
7. Design and detail of components of plate girder confirming to IS Code
8. Understand the functioning of gantry girder for different types of loads

Note: The students should prepare the following plates.

Plate 1 Detailing of simple beams

Plate 2 Detailing of Compound beams including curtailment of flangeplates. 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.

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. Weight age for Part – A is 40% and Part- B is 60%.

Codes/Tables: IS Codes:

1) IS -800 – 2007
2) IS – 875 – PartIII
3) SteelTables.
4) Railway Design Standards Code. and steel tables to be permitted into the examinationhall.

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,TataMc.Graw-Hill, NewDelhi.

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

20ACE62- HIGHWAY ENGINEERING

L	T	P	C
3	0	0	3

Course Objectives:

- 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.

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, Rightof 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–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.

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 by 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 –Joints in C.C Pavements and Types.

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- KhannaPublications.
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.

Department of Civil Engineering R20

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE63- HYDROLOGY AND IRRIGATION ENGINEERING

L	T	P	C
3	0	0	3

Course Objectives:

- Engineering Hydrology and its applications like Runoff estimation
- Irrigation Engineering – Water utilization for Crop growth

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;Evapotranspirtion.

UNIT-II:

HYDROGRAPH ANALYSIS AND RUN-OFF: 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.

Run off- Factors affecting run- off, Computation of run-off; Design Flood; Estimation of maximum rate of run-off; separation of base flow

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.

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

Text Books:

1. Irrigation and water power engineering by Punmia&Lal
2. Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna Publishers

Reference Books:

1. Engineering Hydrology by K.Subramanya
2. Engineering Hydrology by Jayarami Reddy
3. Irrigation and Water Resources & Water Power by P.N.Modi

Course Outcomes:

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

- To gain & apply the knowledge of water recourses for Civil Engineering.
- To obtained the knowledge of water cycle and its components.
- To apply & analysis of Hydrograph for hydrological data.
- To gain knowledge basic requirements of irrigation and irrigations channels.
- To apply the knowledge of silt theories for canals.
- To understands the knowledge of well hydraulics.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

MANAGEMENT SCIENCE

(Common to all Branches)

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 – 1

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 Organisation - 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

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

BUSINESS ENVIRONMENT
(Common to all Branches)

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 – 1: 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**
• Explain 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

20ACE66- DESIGN STUDIO LAB

L	T	P	C
0	0	3	1.5

Course Objectives:

- To introduce fundamentals of computer aided, Design and drawing in Civil Engineering.
- To enable the students Communicate designs graphically

SOFTWARE:

1. STAAD PRO or Equivalent

EXCERCISIES:

1. 2-D Frame Analysis andDesign
2. Steel Tabular Truss Analysis andDesign
3. 3-D Frame Analysis andDesign
4. Retaining Wall Analysis andDesign
5. Simple tower Analysis andDesign
6. One Way Slab Analysis &Design
7. Two Way Slab Analysis &Design
8. Column Analysis &Design

TEXT BOOK:

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

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE67- HIGHWAY ENGINEERING LAB

L	T	P	C
0	0	3	1.5

Course Objectives:

- 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 onAggregates

1. Aggregate Crushing ValueTest
2. Los Angeles Abrasion Test
3. Aggregate Impact ValueTest
4. Aggregate shape Test (Flakiness &Elongation)
5. Specific Gravity of AggregateTest
6. Water Absorption of AggregateTest
7. SoundnessTest

II. Tests onBitumen

1. PenetrationTest
2. DuctilityTest
3. Softening PointTest
4. Specific GravityTest
5. ViscosityTest
6. Flash and Fire PointTest

III. Demo on BituminousMixes

1. Marshall Stability Test(Demo)

Course Outcomes:

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

- By performing the various tests in this laboratory the student will be able to know the physicalCharacteristics of aggregates and bitumen

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

SOFT SKILLS

(Common to all branches)

L	T	P	C
1	0	2	2

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 Development vs. 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'ts 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 ***Cornerstone Developing 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

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

L	T	P	C
3	0	0	0

Constitution of India

Course Objectives:

1. To enable the student to understand the importance of constitution.
2. To understand philosophy of fundamental rights and duties.
3. To understand the structure of executive, legislature and judiciary.
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

Democratic forms of Constitution, Union Government and its Administration Structure of the Indian Union: 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

Federalism, Political relations, Financial relations of 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, Supreme Court, High Court.

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. Subash Kashyap, 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 and Politics 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.

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE71A- HYDRAULIC STRUCTURES AND WATER POWER ENGINEERING

(Professional Elective-III)

L	T	P	C
3	0	0	3

Course Objectives:

- *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.

UNIT-II:

CROSS DRAINAGE WORKS: Introduction; types of cross drainage works; selection of suitable type of cross drainage work; classification of aqueducts and siphon aqueducts.

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.

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

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.

Text Books:

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

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 channelsystems
- Design head and cross regulatorstructures
- Identify various types of reservoir and their designaspects
- By the Establishes the understanding of cross drainage works and itsdesign
- Design different types of dams
- Design gravity dam and earthendam
- Design the canalsystems

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE71B- AIR POLLUTION AND CONTROL

(Professional Elective-III)

L	T	P	C
3	0	0	3

Course Objectives:

- 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:

THERMODYNAMIC OF AIR POLLUTION:

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 No_x and So_x 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
2. Air Pollution and Control by K.V.S.G.Murali Krishna
3. Enivronmental meteorology by S.Padmanabhammurthy

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

20ACE71C- ADVANCED STRUCTURAL DESIGN

(Professional Elective-III)

L	T	P	C
3	0	0	3

Course Objectives:

- *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 the flat slab

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

9. 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

10. To know the applications of cantilever and counter forte retaining walls.
11. To perform the stability analysis of the retaining walls
12. 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:

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. 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

20ACE72A- PRESTRESSED CONCRETE

(Professional Elective-IV)

L	T	P	C
3	0	0	3

Course Objectives:

- 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 prestressingpre-tensioning 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 frictional losses

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:

IntroductionDifferent 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 uncracked members 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, John Wiley &Sons.
2. Pre stressed concrete: A Fundamental Approach byE.G.Nawy 5^{th} edition , Pearson Publications

Course Outcomes:

At the end of this Course 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.

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE72B- DESIGN AND DRAWING OF IRRIGATION STRUCTURES

(Professional Elective-IV)

L	T	P	C
3	0	0	3

Course Objectives:

- Sloping glacis weir.
- Tank sluice with tower head
- Surplus weir.
- Trapezoidal notch fall.
- Canal regulator.

Design and drawing of the following irrigation structures.

1. Surplus weir.
2. Tank sluice with tower head
3. Trapezoidal Notch fall
4. Canal regulator.
5. Sloping glacis weir

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.

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

20ACE72C- GROUND IMPROVEMENT TECHNIQUES

(Professional Elective-IV)

L	T	P	C
3	0	0	3

Course Objectives:

- 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 at depth.

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 0reinforced 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:

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

Reference Books:

1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional,BocaTaton, Florida,USA.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley andSons,
3. New York, USA.
4. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy,USA

Course Outcomes:

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

- 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

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE73A- RAILWAYS, AIRPORT AND HARBOUR ENGINEERING

(Professional Elective-V)

L	T	P	C
3	0	0	3

Course Objectives:

- Introduce different transportation systems and their importance and their role in development
- Understand standards and norms of National and International organisations 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 – Rail Fastenings.

Learning Outcomes:

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

13. Obtain Knowledge regarding different components of an railway track and its materials

14. 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 – Types of signals.

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. Functions of Taxiways –Geometric

Elements of Taxi ways and Standard Specifications – Runway and TaxiwayLighting.

Learning Outcomes:

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

15. Design runway in a aerodrome

16. 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 And Sons, 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, ScitechPubilishers.

Course Outcomes:

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

- Gain knowledge regarding various specifications and standards set by organisations and official bodies.
- Differentiate the working of various transport systems and their working in different scenarios
- Understanding the functions of various components in Rail, Air, Water transport systems and their importance.
- Capable of carrying out surveys needed to be done while constructing Railways Airports and seaports
- Have a in depth knowledge on curve sections super elevations and many other design elements
- Explain the working of various design elements used in different Transport systems
- Calculate entities like maximum permissible loads on rails ,degree of curves, permissible speeds on various gauges etc
- Prepare master plans for Airports, harbour site considering natural phenomenon and different harbour railway airport elements

Department of Civil Engineering R20

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE73B- BRIDGE ENGINEERING

(Professional Elective-V)

L	T	P	C
3	0	0	3

Course Objectives:

- 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

17. Understand different types of I.R.C loads on the bridges.
18. 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 procedure of 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

19. Know the forces acting on the plate girder bridge
20. 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:

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

21. Know the forces acting on the piers and abutments and their stability analysis

22. 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

Note: Relevant IRC & Railway Bridge Codes are to be permitted in the examination hall

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE73C- FOUNDATION ENGINEERING

(Professional Elective-V)

L	T	P	C
3	0	0	3

Course Objectives:

- 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

23. To learn about soil sampling (undisturbed and disturbed)

24. 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

25. To learn about various types of foundations

26. 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

27. To understand the behaviour of the piles under different loading conditions.

28. To design the load carrying capacity of piles.

29. To understand the behaviour of well foundations.

Text Books:

1. Geotechnical Engineering by C.Venkataramaiah, New AgePubilications.
2. Soil Mechanics and Foundation Engineering by Arora, Standard Publishers andDistributors, Delhi
3. Soil Mechanics and Foundations by – by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., NewDelhi

Reference Books:

1. Das, B.M.,-(1999)Principles of Foundation Engineering–6^{th} edition (Indianedition) Thomson Engineering
2. Foundation Engineering by Varghese,P.C., Prentice Hall of India., NewDelhi.
3. Foundation Engineering by V.N.S.Murthy, CRC Press, NewDelhi.
4. Bowles, J.E., (1988) Foundation Analysis and Design – 4 thEdition, McGraw-HillPublishingcompany,Newyork
5. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.GrawhillPublishersNew Delhi.

Course Outcomes:

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

- To enable the student to analyse shallow and deep foundations when subjected to various types of loadings
- To enable the student to analyse slopes, retaining walls and well foundations

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE70- REMOTE SENSING & GIS LAB

(Skill Oriented Course-V)

L	T	P	C
1	0	2	2

LIST OF EXPERIMENTS:

1. Familiarization with GIS Software, Data Input
2. Geo Referencing and Projections
3. Digitization of Map/ Top sheet
4. Creation of Thematic Maps
5. Base Map Preparation
6. Data Conversion – Vector to Raster, Raster to Vector
7. Adding Attribute Data – Querying On Attribute Data
8. Vector Analysis
9. Raster Analysis
10. Map Composition
11. Developing Digital Elevation Model
12. Simple Applications of GIS in Water Resources Engineering & Transportation Engineering

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech. VI /VII-Sem (R20)

NUMERICAL TECHNIQUES

(Open Elective -II)

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 to System of Nonlinear Equations and Spline Functions: **9 Hrs**

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.

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: Initial and Boundary value problems:

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 Laplace's equation and Poisson's equation:

Laplace's equation and Poisson's equation – Finite difference approximations to derivatives – solution of Laplace's equation and Poisson's equation: Jacobi's method – Gauss-Seidel method – Successive over

relaxation method – ADI method.

Learning Outcomes:

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

• Solve Laplace's equation using finite difference technique.	L3
• Solve Poisson's equation through iterative methods.	L4

UNIT – V: One dimensional Heat equation & Wave equation:

Heat equation in one dimension: Finite difference approximations-Bender-Schmidt recurrence formula-Crank-Nicolson formula ; Iterative methods for the solution of equations - Gauss-Seidel iteration formula and One dimensional Wave equation.

Learning Outcomes:

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

• Apply numerical methods for solving one dimensional heat equation.	L3
• Apply numerical methods for solving one dimensional wave equation.	L4

Text Books:

1. 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 Laplace's equation.	**L3**
• Emphasizes the numerical solutions of one dimensional heat and wave equations .	**L4**
• Analyze the problems in engineering and technology using various techniques of Numerical methods.`	**L5**

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF PHYSICS
III B.TECH – II SEMESTER-R20 (Open elective-Interdisciplinary) –OE-ID.1(THEORY

MATERIALS CHARACTERIZATION TECHNIQUES
(Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

- The latest analysis techniques and material structure and property correlation
- The most advanced imaging instruments for investigating the modern materials at the highest topographic resolution
- The commonly used analytical tools for characterizing modern materials at highest sensitivity
- The latest advancement in spectroscopy for getting structural and elemental analysis of Materials

UNIT – 1: Structure analysis by Powder X-Ray Diffraction **9 Hrs**

Introduction, Bragg's law of diffraction, Intensity of Diffracted beams –factors affecting Diffraction Intensities - structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherrer equation, Small angle X-ray scattering (SAXS) (in brief).

Learning Outcomes:

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

• **Understand** the diffraction phenomenon in crystals	**L1**
• **Identify** the factors affecting diffraction pattern intensities	**L2**
• **Explain** the polycrystalline nature of the material	**L3**
• **Analyze** the crystal structure and crystallite size by various methods	**L4**
• **Illustrate** the Small angle X-ray scattering (SAXS)	**L2**

UNIT – II: Microscopy technique -1 –Scanning Electron Microscopy (SEM) **9 Hrs**

Introduction, Principle, Construction and working principle of Scanning Electron Microscope, Specimen preparation, Different types of modes used (Secondary Electron and Back scattered Electron), Energy Dispersive X-ray Analyzer (to provide elemental identification and quantitative compositional information), Advantages and limitations of SEM.

Learning Outcomes:

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

• **Explain** the basic concepts and working principle of Scanning Electron Microscope	**L1**
• **Classify** the different types of Scanning Electron Microscope modes used	**L2**
• **Identifies** the specimen preparation for Scanning Electron Microscope	**L2**
• **Analyze** the morphology of the sample by using Scanning Electron Microscope	**L4**
• **Understand** the advantages and limitations of Scanning Electron Microscope	**L2**

UNIT – III: Microscopy Technique -2 - Transmission Electron Microscopy (TEM) **9Hrs**

Principle, Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy,Difference between SEM and TEM, Advantages and Limitations of Transmission Electron Microscopy.

Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Explain** the basic principle and working principle of Transmission Electron Microscope	**L1**
• **Classify** the different types of Transmission Electron Microscope modes used	**L2**
• **Identifies** the specimen preparation for Transmission Electron Microscope	**L2**
• **Analyze** the morphology and crystal structure of the sample by using Transmission Electron Microscope	**L2**
• **Understand** the advantages and limitations of Transmission Electron Microscope	**L3**
UNIT – IV: Spectroscopy techniques	**9 Hrs**
Principle, Experimental arrangement, Analysis and Advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy – quantitative analysis of elements and organic compounds, energy band gap determination – wood and Tauc and KubelkaMunk functions (ii) Raman Spectroscopy – Molecular analysis using vibrational modes (iv) X-ray photoelectron spectroscopy (XPS) for surface materials characterization and chemical analysis.	
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 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**
• **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 BanwellandElaine 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**
• Ilustates the various characterization techniques for materials characterization.	**L3**
• **Apply** suitability in Engineering Applications	**L4**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech – IV-I-Sem	L	T	P	C
	3	0	0	3

Polymers and their applications (OE.2)
(common to all branches)

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-I: **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.Molecularweight concepts: determination bynumber, 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**	8 Hrs

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	8 Hrs

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:

After completing the course, the student will be able to:

- Describe the properties and applications of polymers(L2)
- Interpret the properties of cellulose, lignin, starch, rosin, latex (L2)
- Discuss the special plastics of PES, PAES, PEEK (L3)
- Explain modified cellulosics(L2)

UNIT-IV: Hydrogels of Polymer networks and Drug delivery	8 Hrs

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 regulation, absorption and disposition, routes of administration and dosage forms. Advanced drug delivery systems and controlled release.

Learning Outcomes:

After completing the course, 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: **Advanced Polymers for engineering applications**	7Hrs

Importance of advance polymers examples-polymers in sensors,conducting and synthetic metals, photonics, thermoplastics. Applications of Biodegradable polymers, Bio-PET, BIO-PEP, Polylactides

Learning Outcomes:

After completing the course, the student will be able to:

- Demonstrate conducting polymers (L3)
- Explain Biodegradable polymers (L2)
- Discuss applications of Biodegradable polymers, Bio-PET, BIO-PEP, Polylactides (L3)

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).
- Explain biodegradable polymers(L2)
- Discuss applications of Biodegradable polymers (L3)

B.Tech III Year II Sem & IV Year I Sem

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE65A- ENVIRONMENTAL IMPACT ASSESSMENT

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- This course is aimed at exposing the student to the concept of environmental impact assessment and methodologies used for the same.
- The student will also be imparted the knowledge about the various laws related to EIA and also methods of EIA audit.

UNIT-I:

INTRODUCTION:-

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

UNIT-II:

EIA METHODOLOGIES:-

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis.

UNIT-III

IMPACT OF DEVELOPMENTAL ACTIVITIES AND LAND USE:-

Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

UNIT-IV:

ASSEMENT OF IMPACT ON VEGETATION AND WILDLIFE :

Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

ENVIRONEMNTAL AUDIT :

Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocel, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

UNIT-V:

ENVIRONEMENTAL ACTS (PROTECTION AND PREVENTION)

Post Audit activities, The Environmental protection Act, The water preventation Act, The Air (Prevention & Control of pollution Act.), Wild life Act.Case studies and preparation of Environmental Impact assessment statement for various Industries.

Text Books:

- Environmental Impact Assessment Methodologies, byY. Anjaneyulu, B.S. Publication, Sultan Bazar,Hyderabad.
- Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice HallPublishers

Reference Books:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katari& Sons Publication., NewDelhi.
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi

Course Outcomes:

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

1. Understand the concept of Environmental impact
2. Understand the methodologies related to EIA
3. Appreciate various laws related to environmental protection
4. Prepare the environmental impact assessment statement and to evaluateit.

Annexure-II *R20*

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

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:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy efficient electric motors by John.C.Andreas, Marcel Dekker Inc Ltd-2nd edition,1995.

Reference Books:

1. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
2. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1stedition, 1998.
3. Energy management hand book by W.C.Turner, John wiley and sons.
4. Energy management and conservation –k v Sharma and pvenkata seshaiah-I K International Publishing House pvt.ltd, 2011.
5. 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**
- Determination of the economic analysis **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME65a-PROGRAMMING OF ROBOTS AND 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 – I: 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: **8 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. **L1**

UNIT – III: Robot Programming: **8 Hrs**

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 **L1**
- Explain the requirements and features of programming **L2**

UNIT – IV: Control of Manipulators **8 Hrs**

Open-loop 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. **L3**
- Use the force control strategies to determine the forces in robot. **L2**
- 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 — McGraw Hill, 1986.
2. R K Mittal and I J Nagrath, Robotics and control, Illustrated Edition, Tata McGraw Hill India 2003.
3. S.R.DEB

Reference Books:

1. Saeed B. Niku, Introduction to Robotics – Analysis, System, Applications, 2/e, John Wiley & Sons, 2010.
2. H. Asada and J.J.E. Slotine, Robot Analysis and Control, 1/e, Wiley- Inter science, 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**

Online Learning Resources:

- https://nptel.ac.in/courses/112105249
- https://onlinecourses.nptel.ac.in/noc20_de11/preview
- https://nptel.ac.in/courses/112104308
- https://nptel.ac.in/courses/112104288
- https://nptel.ac.in/courses/112101099
- https://www.iare.ac.in/sites/default/files/lecture_notes/ROBOTICS_LECURE_NOTES.pdf

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B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME65b-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 – I: Introduction **10 Hrs**

Introduction to energy resources: 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 & Storage **8 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 **8 Hrs**

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**
- Discus the principles of Bio-conversion. **L6**
- Explain combustion characterises 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**
- Discus OTEC and principles utilization. **L6**
- Explain mini-hydel power plants and their economics. **L2**

UNIT – V: Direct Energy Conversion **8 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, 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. Tiwari and Ghosal, Renewable energy resources, Narosa Publishing House-2004.
2. G.D. Rai, Non-Conventional Energy Sources, Khanna Publications-1988.

Reference Books:

1. Twidell & Weir, Renewable Energy Sources, Routledge; 3/e, 2015.
2. Sukhatme S.P., Nayak.J.P, 'Solar Energy – Principle of Thermal Storage and collection", Tata McGraw Hill, 2008.
3. Sathyajith Mathew, Wind Energy Fundamentals, Resource Analysis and Economics, Springer Publications, 2006.
4. Wei Tong, Wind Power Generation and Wind Turbine Design, WIT Press, 2010.
5. Wind Power, Revised Edition: Renewable Energy for Home, Farm, and Business, Paul Gipe, Chelsea Green Publishing, 2004.
6. S.S. Rao, B.B. Parulekar, Energy Technology (Non Conventional, Renewable and Conventional), Khanna publications, 1994.

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**

Online Learning Resources:

- https://nptel.ac.in/courses/103103206
- https://nptel.ac.in/courses/108108078
- https://onlinecourses.nptel.ac.in/noc21_ph33/preview
- https://nptel.ac.in/courses/121106014
- https://mrcet.com/downloads/digital_notes/EEE/31082020/IV-I%20SOLAR%20&%20WIND%20ELECTRICAL%20SYSTEMS%20DIGITAL%20NOTES%201.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1428910296.pdf

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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC65a- INTRODUCTION TO MICROCONTROLLER AND APPLICATIONS

(Open Elective-II)

L–T – P - C
3 – 0 – 0 – 3

Course Objective:

- To understand the basic concepts and architecture of 8051.
- To learn various instructions and addressing modes used in 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.
- To know the basic architecture and interfacing of ARM microcontroller.

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 the 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. **I/O:** Bit addresses for I/O and RAM, I/O programming, I/O bit manipulation programming.

Learning Outcomes:

At the end of the 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

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 the 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 IV

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 the 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)

UNIT V

ARM Cortex-M Microcontrollers: A Memory-centric System Model. Basics of Chip Design. The Arm Cortex-M Processor Architecture. Interconnects. The Advanced Microcontroller Bus Architecture (AMBA). Interfacing with the External World. Peripherals. Memory System. FPGA SoC Architecture.

Learning Outcomes:

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

- Learn about the ARM based processor and its architecture.(L3)
- Interface ARM controllers for practical applications.(L3)

TEXT BOOKS

1. Muhammed Ali Mazidi, Janice GillispieMazidi andRolin 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
3. Fundamentals of System-on-Chip Design on Arm Cortex-M Microcontrollers Paperback – 2 Aug. 2021by Rene Beuchat , Andrea Guerrieri , SahandKashani.

Course outcomes:

At the end of this course, the students 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)
- Program 8051 Timers and implement serial communication for a given application.(L6)
- Interface memory, I/O devices and use Interrupts.(L4).
- Learn the basic architecture and interfacing of ARM microcontroller(L3).

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC65b- PRINCIPLES OF DIGITAL SIGNAL PROCESSING

(Open Elective-II)

L–T – P - C
3 – 0 – 0 – 3

Course Objectives:

- To understand the frequency domain analysis of discrete time signals.
- To learn the properties of discrete fourierseries and fourier transforms.
- To design & analyze IIR digital filters from analog filters.
- To know various structures used in implementation of FIR digital filters.
- To grasp the importance and applications of Multirate Digital signal processing.

UNIT I

Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, LTI system Properties. Solution of Linear constant coefficient difference equations, frequency domain representation of discrete time signals and systems. Review of Z-transforms.

Learning Outcomes:

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

- Analyze and process signals in the discrete domain.(L4)
- Determine time domain representations and frequency domain analysis of discrete-time signals and systems (L3)

UNIT II

Discrete Fourier Series and Fourier Transforms: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

Learning Outcomes:

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

- Understand the pproperties of discrete fourier series.(L2)
- Describe DFT using FFT algorithms.(L1)

UNIT III

Design of IIR Digital Filters and Realizations: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

Learning Outcomes:

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

- Design IIR digital filters from analog filters.(L6)
- Construct IIR digital filters with different realization techniques.(L6)

UNIT IV

Design of FIR Digital Filters and Realizations: Characteristics of FIR Digital Filters, frequency response. Design of FIR digital filters using window techniques and frequency sampling technique, comparison of IIR & FIR filters, basic structures of FIR systems.

Learning Outcomes:

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

- Design FIR digital filters using window techniques.(L6)
- Construct the basic structures of FIR systems.(L6)

UNIT V

DSP Applications: Introduction to programmable DSPs, Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor; Adaptive filters: Introduction, Basic principles of Forward Linear Predictive filter and applications such as system identification, echo cancellation, equalization of channels, and beam forming using block diagram representation study only.

Learning Outcomes:

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

- Apply Interpolation and Decimation with help of sampling and filtering.(L3)
- Understand the principle and applications of Forward Linear Predictive filter.(L2)

Text Books:

1. John G. Proakis andDimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithmsand Applications", Pearson Education, 2007.
2. A.V.Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing",PHI.
3. B.Venkataramani and M. Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications", TATA McGraw Hill, 2002.

References:

1. Andreas Antoniou, "Digital Signal Processing", TATA McGraw Hill, 2006
2. MH Hayes, "Digital Signal Processing", Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling and Sandra L. Harris, "Fundamentals of Digital Signal Processing using Matlab", Thomson, 2007.

Course outcomes:

At the end of this course, the students will be able to

- Articulate the frequency domain analysis of discrete time signals.(L3)
- Understand the properties of discrete fourierseries and fourier transforms.(L2)
- Design& analyze IIR digital filters from analog filters.(L6)
- Design various structures used in implementation of FIR digital filters.(L6)
- Summarize the importance and applications of Multirate Digital signal processing.(L2)

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACS65A- MACHINE LEARNING APPLICATIONS

(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-I: INTRODUCTION

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

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

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

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**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACS65B- OBJECT ORIENTED PROGRAMMING

(Open Elective-II)

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-I: 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 datastructures. **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. "Programming with Java" T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan Pearson Edition.
2. "Core Java", Nageswar Rao, Wiley Publishers.
3. "Thinking in Java", Bruce Eckel, Pearson Education.
4. "A Programmers Guide to Java SCJP", Third Edition, Mughal, Rasmussen, Pearson.
5. "Head First Java", Kathy Sierra, Bert Bates, O'Reilly
6. "SCJP – Sun Certified Programmer for Java Study guide" – Kathy Sierra, Bert Bates, McGrawHill
7. "Java in Nutshell", David Flanagan, O'Reilly
8. "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

- Gain knowledge of client-side scripting, validation of forms and AJAX programming **L3**
- Understand server-side scripting with PHP language **L4**
- Understand what XML is and how to parse and use XML Data with Java **L5**
- To introduce Server-side programming with Java Servlets and JSP **L6**

B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACS65C- WEB DESIGN

(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives:

- 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-I: WEB DESIGN - HTML MARKUP FOR STRUCTURE

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

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

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

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:

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

- Recognize the method of using layered approach for design . **L2**
- Explain the functionality of each layer of a computer network. **L3**
- Apply the knowledge of layered approach for the design of computer network software. **L4**
- Analyze the performance of protocols of a computer network. **L4**
- Recommend the protocols for different applications. **L5**
- Propose new protocols for a computer networks. **L6**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech. VII-Sem (R20)

MATHEMATICAL MODELING

(Open Elective -III)

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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JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA
DEPARTMENT OF PHYSICS
IV B.TECH – I SEMESTER-R20 (Open elective-Interdisciplinary) –OE-ID.1(THEORY

SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS

(Common to all branches)

L	T	P	C
3	0	0	3

Course Objectives:

1. To understand basics of sensors, actuators and their operating principles.
2. To educate the students on different types of microfabrication techniques for designing and developing sensors.
3. To explain working of various types of electrochemical sensors and actuators.
4. To provide an understanding on characteristic parameters to evaluate sensor performance.

UNIT – 1: Introduction to Sensors and Actuators — **9 Hrs**

Content of the Unit – I

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Materials used and their fabrication process: Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

Learning Outcomes:

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

• **Classify** different types of Sensors and their characteristics	**L2**
• **Explain** about different fabrication process of Sensors	**L1**
• **Illustrate** Dry and wet etching	**L2**

UNIT – II: Temperature and Mechanical Sensors — **9 Hrs**

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Resistance temperature sensors, Silicon resistive sensors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors,strain gauges, Pressure sensors: semiconductor, piezoresistive, capacitive, Variable reluctance pressure (VRP) sensors.

Learning Outcomes:

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

• **Summarize** various types of Temperature sensors	**L2**
• **Explain** basic working principle of different types mechanical sensors	**L1**
• **Summarize** various types of Mechanical sensors	**L2**
• **Explain** the working principle of different types mechanical sensors	**L1**

UNIT – III: Optical, Acoustic and Chemical Sensors — **9 Hrs**

Content of the Unit – III

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo-resistors based sensors, Photomultipliers, Infrared sensors: thermal, PIR, thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones.

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Explain** the working and principle of various optical sensors	**L1**
• **Explain** the working principle of different Acoustic sensors	**L1**
• **Explain** the working and principle of various chemical sensors	**L1**
UNIT – IV: Magnetic, Electromagnetic and Radiation Sensors	**9 Hrs**
Inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magneto-strictive sensors, **Radiation Sensors**: Principle and working of Ionization detectors, Scintillation detectors, Geiger-Mueller counters, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Explain** the working principle of different magnetic and electromagnetic sensors	**L1**
• **Explain** the working principle of different radiation sensors	**L1**
• **Identifies** the applications Electronic sensors in various fields	**L1**
• **Identify** the various optical, solid state system components	**L1**
UNIT – V: Actuators Types, Principle, Magnetic, Electromagnetic actuators	**9 Hrs**
Introduction, Functional diagram of actuators, Types of actuators and their basic principle of working: Hydraulic, Pneumatic, Mechanical, Electrical, Magnetic, Electromagnetic, piezo-electric and piezo-resistive actuators, Simple applications of Actuators. Motors as actuators (linear, rotational, stepping motors),Magneto-strictive actuators, Voice coil actuators (speakers and speaker-like actuators).	
Learning Outcomes:	
At the end of this unit, the student will be able to	
• **Illustrates** the different types of Actuators	**L2**
• **Explains** the basic principle of working of Actuators	**L1**
• **Identifies** the applications of Actuators sensors	**L1**
Text Books:	
1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015	
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999	
Reference Books:	
1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003	
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999	
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.	
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.	
5. Principles of Industrial Instrumentation By D. Patranabhis	
Course Outcomes:	
At the end of this Course the student will be able to	
➢ to identify the needs of sensors and actuators	**L1**
➢ to understand working principles of various sensors and actuators	**L2**
➢ to identify different type of sensors and actuators used in real life applications	**L1**
➢ to explore common methods for converting a physical parameter into an electrical quantity	**L3**
➢ to summaries use of sensors and actuators for different applications	**L2**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

B.Tech – IV-I-Sem	L	T	P	C
	3	0	0	3

Chemistry of Nanomaterials and applications (OE.3)
(common to all branches)

Course Objectives:

- To understand synthetic principles of Nanomaterials by various methods
- Characterize the synthetic nanomaterials by various instrumental methods
- To enumerate the applications of nanomaterials in engineering
- Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

UNIT-I: **Introduction to nanoscience**	7 Hrs

Introduction,importance of nanomaterials, nanoscience in nature, classification of nanostructured materials, properties and scope of nanoscience and applicationsof nanotechnology.

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

- Classify the nanostructure materials(L2)
- Describe scope of nano science and technology(L2)
- Explain different synthetic methods of nano materials(L2)
- Identify the synthetic methods of nanomaterial which is suitable for preparation of particular material(L3)

UNIT-II: **Synthesis of nanomaterials**	8Hrs

Bottom-Up approach:- Sol-gel synthesis, microemulsions 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, electrodeposition 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 of nanomaterials	7 Hrs

Techniques for characterization:Dynamic light scattering for particle size determination, Diffraction technique, electron microscopy techniques, BET method for surface area analysis.

Learning Outcomes:
After completing the course, 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:

After completing the course, 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**	7Hrs

Engineering, medicine. aerospace applications of nanomaterials. Technologies based on nano materials.

Learning Outcomes:

After completing the course, 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 IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACE75A- DISASTER MANAGEMENT AND MITIGATION

(OPEN ELECTIVE-III)

L	T	P	C
3	0	0	3

Course Objectives:

- The objectives of this are to give the basic knowledge of Environmental Hazards and disasters. The syllabus includes the basics of Endogenous and Exogenous hazard's and gives a suitable picture on the different types ofhazardas.

UNIT-I:

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

UNIT-II:

Classification of hazards & Disasters: Natural hazards and Disasters - Man Made hazards & Disasters - Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards

UNIT-III

Endogenous Hazards - Volcanic Eruption – Earthquakes – Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - - Human adjustment, perception & mitigation of earthquake.

UNIT-IV:

Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters Infrequent events: Cyclones – Lightning – Hailstorms Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes, distribution human adjustment, perception & mitigation)Cumulative atmospheric hazards/ disasters : - Floods- Droughts- Cold waves- Heat waves. Floods:- Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation).Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Palnetary Hazards/ Disasters- Man induced Hazards /Disasters- Physical hazards/ Disasters-Soil Erosion Soil Erosion:-- Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion. Chemical hazards/ disasters:-- Release of toxic chemicals, nuclear explosion- Sedimentation processes. Sedimentation processes:- Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation-Biological hazards/ disasters:- Population Explosion.

UNIT-V:

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage(preparedness)-HVRA Atlas
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

Text Books:

1. Disaster Management by Rajib Shah, Universities Press, India,2003
2. Disaster Mitigation: Experiences And Reflections by PardeepSahni
3. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning
4. National Disaster Management Authority-Guidelines

Reference Books:

1. Kates,B.I& White, G.F The Environment as Hazards, oxford, New York, 1978
2. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000
3. H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003
4. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo,1994
5. Dr.Satender,Disaster Management in Hills, Concept Publishing Co., New Delhi, 2003

Course Outcomes:

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

- Understand the nature, cause and effects of disasters
- Comprehend the importance of Disaster Management and the need of awareness
- Acquire knowledge on disaster preparedness, recovery remedial measures and personal precautions

Annexure-III *R20*

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

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

20AME75a-INTRODUCTION TO COMPOSITE MATERIALS

(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

- 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: **10 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 **8 Hrs**

Polymers - Polymer matrix materials – PMC processes - hand layup processes – spray up processes – resin transfer moulding – Pultrusion – Filament winding – Auto clave - Injection moulding – sheet moulding compound – properties and applications of PMCs.

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: **8 Hrs**

Metals - types of metal matrix composites – Metallic Matrices. Processing of MMC – Liquid state processes – solid state processes – In-situ processes. Properties and applications of MMCs.

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**

UNIT – IV: Ceramic matrix composites: **8 Hrs**

Ceramic matrix materials – properties – processing of CMCs –Sintering - Hot pressing – Infiltration – Lanxide process – In-situ chemical reaction techniques – solgel polymer pyrolsis –SHS - Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Properties and Applications of CCMs.

Learning Outcomes:

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

- Summarize the various types of ceramic matrix materials. **L2**
- Explain the sintering, hot pressing, infiltration and lanxide process. **L3**
- Contrast between cold and hot isostatic pressing. **L2**
- Examine the properties and applications of CCMs. **L2**

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UNIT – V: Advances & Applications of composites: **8 Hrs**

Advantages and Limitations of carbon matrix composites – chemical vapour deposition of carbon on carbon fibre perform. Properties and applications of Carbon-carbon composites. Composites for aerospace applications. Bio degradability - introduction to bio composites, classification, processing and, applications of bio composites - Mechanical, Biomedical, automobile Engineering.

Learning Outcomes:

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

- Explain the advantages and disadvantages of carbon matrix. **L2**
- Identify composites for aerospace applications. **L3**
- Apply chemical vapour deposition of carbon on carbon fibre perform. **L3**
- Select the carbon - carbon composites. **L1**
- Classify various bio- degradable composites. **L3**

Text Books:

1. Chawla K.K, Composite materials, 2/e, Springer – Verlag, 1998.
2. Mathews F.L. and Rawlings R.D., Chapman and Hall, Composite Materials: Engineering and Science, 1/e, England, 1994.

Reference Books:

1. H K Shivanand, B V Babu Kiran, Composite Materials, ASIAN BOOKS, 2011.
2. A.B. Strong , Fundamentals of Composite Manufacturing, SME Publications, 1989.
3. S.C. Sharma, Composite materials, Narosa Publications, 2000.
4. Maureen Mitton, Hand Book of Bio plastics & Bio composites for Engineering applications, John Wiley publications, 2011.

Course Outcomes:

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

- Identify the practical applications of composites. **L3**
- Identify the polymer matrix composites. **L3**
- Classify of bio- degradable composites. **L2**
- Outline the various types of ceramic matrix materials. **L2**

Online Learning Resources:

- https://nptel.ac.in/courses/112104229
- https://nptel.ac.in/courses/112104168
- https://nptel.ac.in/courses/101104010
- https://nptel.ac.in/courses/105108124
- https://nptel.ac.in/courses/112104221

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B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AME75b-CUSTOMER RELATIONSHIP MANAGEMENT

(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

- 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 – I: CRM concepts **10 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 : **8 Hrs**

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 **8 Hrs**

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). - Case studies.

Learning Outcomes:

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

- Explain the concept of CRM links in e-Business. **L1**
- 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 **8 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**

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- 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 **8 Hrs**

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 Relationship 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 Relationship Management.
3. V. Kumar & Werner J., Customer Relationship 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**
- Discuss 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**

Online Learning Resources:

- https://nptel.ac.in/courses/110105145
- https://onlinecourses.swayam2.ac.in/imb19_mg10/preview
- https://www.classcentral.com/course/swayam-customer-relationship-management-13977
- https://www.edx.org/course/customer-relationship-management

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC75a- FUNDAMENTALSTO IMAGE PROCESSING

(Open Elective-III)

L–T – P - C
3 – 0 – 0 – 3

Course Objectives:

- 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 – neighbourhood, 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 the 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 the 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 the 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 HaarTransform.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 the 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 the 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.

REFERENCES:

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 students 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)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

20AEC75b- BASICS OF VLSI DESIGN

(Open Elective-III)

L–T – P - C
3 – 0 – 0 – 3

Course Objectives:

- 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 the unit, the student will be able to:

- Understand different steps involved in the fabrication of ICs and electrical properties of MOSdevices.(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 the 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 the 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, grey to binary code converter.

Learning Outcomes:

At the end of the 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 the 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)

TEXTBOOKS:

1. Kamran Eshraghian. Douglas, A. Pucknell and SholehEshraghian, "Essentials of LSI Circuits and Systems", Prentice Hall of India Private Limited, 2005 Edition.
2. Neil H.E.WESTE, David HarrisandAyan Banerjee, "CMOS VLSI Design A Circuits and systems perspective", Pearson Education, 2006 Third Edition

REFERENCES:

1. Richa Jain and Amrita Rai, "Principles of VLSI and CMOS Integrated Circuits", S.Chandand Company Limited. First edition.2012.
2. Wayne Wolf, "Modern VLSI Design", Pearson Education, 3rd Edition.

Course Outcomes:

At the end of this course, the students 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)

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACS75A- APPLICATIONAS OF AI

(Open Elective-III)

L	T	P	C
3	0	0	3

Course Objectives:

- Define Artificial Intelligence and establish the cultural background for study Understand various learning algorithms
- Explore the searching and optimization techniques for problem solving
- Provide basic knowledge on Natural Language Processing and Robotics

UNIT – I: Introduction

What is AI, Foundations of AI, History of AI, The State of Art. Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Learning Outcomes:

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

- Recognize the importance of Artificial Intelligence **L1**
- Identify how intelligent agent is related to its environment **L2**

UNIT – II: Solving Problems by searching:

Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

Learning Outcomes:

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

- Explain how an agent can formulate an appropriate view of the problem it faces. **L2**
- Solve the problems by systematically generating new states **L2**

UNIT – III: Reinforcement Learning:

Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning; Policy Search, applications of RL 10 Page Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction..

Learning Outcomes:

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

- Examine how an agent can learn from success and failure, reward and punishment. **L5**
- Develop programs that make queries to a database, extract information from texts, and retrieve relevant documents from a collection using Natural Language Processing. **L6**

UNIT-IV: Natural Language for Communication

Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

Learning Outcomes:

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

- Develop programs that translate from one language to another, or recognize spoken words. **L6**
- Explain the techniques that provide robust object recognition in restricted context. **L2**

UNIT – V: Robotics:

Introduction, Robot Hardware, Robotic Perception, Planning to move, planning uncertain movements, Moving, Robotic software architectures, application domains Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right

direction, What if AI does succeed.

Learning Outcomes:

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

- Explain the role of Robot in various applications.
- List the main philosophical issues in AI.

Text Books:

1. Stuart J.Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

Reference Books:

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

Course Outcomes:

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

- Apply searching techniques for solving a problem **L3**
- Design Intelligent Agents **L6**
- Develop Natural Language Interface for Machines **L6**
- Design mini robots **L6**
- Summarize past, present and future of Artificial Intelligence **L5**

B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACS75B- 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 – I:

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:

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:

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:

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:

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**

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACEH01- SOLID AND HAZARDOUS WASTE MANAGEMENT

(Honors Degree)

L	T	P	C
3	1	0	4

Course Objectives:

- To provide comprehensive overview of solid, biomedical and hazardous waste management.
- To provide knowledge on solid waste management design aspects.
- To learn about the different methods of solid waste management.

UNIT-I:

Solid waste – sources and engineering classification, characterization, generation and quantification. Transport - collection systems, collection equipment, transfer stations, collection route optimization.

UNIT-II:

Treatment methods - various methods of refuse processing, recovery, recycle and reuse, composting – aerobic and anaerobic, incineration, pyrolysis and energy recovery,

UNIT-III

Disposal methods – Impacts of open dumping, site selection, sanitary land filling – design criteria and design examples, leachate and gas collection systems, leachate treatment.

UNIT-IV:

Biomedical Waste management – sources, treatment and disposal Hazardous Waste Management-Introduction, Sources, Classification, Physico-chemical, Chemical and Biological Treatment of hazardous waste, regulations.

UNIT-V:

Thermal treatment - Incineration and pyrolysis. Soil contamination and site remediation – bioremediation processes, monitoring of disposal sites.

Text Books:

1. Solid Waste Management -Bhide A.D. ,Indian National Scientific Documentation Centre, New Delhi, Edition 1983.
2. Solid Waste – Techobanoglous George; Kreith, Frank-McGraw Hill Publication, New Delhi 2002.
3. Environmental Studies – Manjunath D.L.- Pearson Education Publication, New Delhi.
4. Solid Waste Management- K. Sasikumar – PHI learning, New Delhi,2009.
5. Environmental Pollution – Khopkar S.M. –New Age International limited, Delhi 2007.
6. Environmental Studies – Basak Anindita - Pearson Publication, New Delhi 2009.
7. Environmental Pollution Control Engineering – Rao C.S. – New Age International 2006, New Delhi.

Course Outcomes:

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

- solid waste remedial measures and their importance.
- Undertake projects related to solid waste management.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACEH02- REPAIR & REHABILITATION OF STRUCTURES

(Honors Degree)

L	T	P	C
3	1	0	4

Course Objectives:

- 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 ofDesiccation.-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.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACEH03- EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(Honors Degree)

L	T	P	C
3	1	0	4

Course Objectives:

- 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

Codes/Tables:

IS Codes: IS:1893, IS:4326 and IS:13920 to be permitted into the examination

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

20ACEH04- ADVANCED FOUNDATION ENGINEERING

(Honors Degree)

L	T	P	C
3	1	0	4

Course Objectives:

- 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 ExpressionsAndSolution 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"sTheory And Siva ReddyAnalysis.

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, PearsonPubilications3.GeotechnicalEngg. – 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.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::PULIVENDULA

PAVEMENT MAINTENANCE AND MANAGEMENT

(Honors Degree)

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Course Objectives:

- Being able to recognize and use current common pavement design procedures.
- Understanding common design and construction features important to the performance of both asphalt and concrete pavements.
- The ability to design and recognize specification and construction activities that can improve the performance of pavements.
- Evaluating the condition of pavements through surface condition surveys, smoothness, friction, load/deflection and other evaluation techniques.
- Understanding the basic components of pavement management systems and how they can be used to optimize funding expenditures.
- Communicating and promoting good road design and construction practices.

UNIT-I:

Pavement management system: Components of PMS and their activities; Major steps in implementing PMS; Inputs; Design, Construction and Maintenance; Rehabilitation and Feedback systems; Examples of HDM and RTIM packages; Highway financing; Fund generation; Evaluating alternate strategies and Decision criteria ; Pavement Maintenance Management Components of Maintenance Management and Related Activities – Network and Project Level Analysis; Prioritization Techniques and Formulation of Maintenance Strategies.

UNIT-II:

Pavement Inventories, Quality Control and Evaluation: Serviceability Concepts ;Visual Rating;Pavement Serviceability Index; Roughness Measurements ;Distress Modes – Cracking Rutting Etc; Pavement Deflection – Different Methods and BBD, Skid Resistance, Roughness, Safety – Aspects; Inventory System. Causes of Deterioration, Traffic and Environmental Factors, Pavement Performance Modeling Approaches and Methods of Maintaining WBM, Bitumen and Cement Concrete Roads, Quality Assurance; Quality Control – ISO 9000, Sampling Techniques – Tolerances and Controls related to Profile and Compaction

UNIT-III

Construction of Base,Subbase, Shoulders and Drain Roadway and Drain Excavation, Excavation and Blasting, Embankment Construction, Construction of Gravel Base, Cement Stabilised SubBases, WBM Bases, Wet Mix Construction; Crushed Cement Bases, Shoulder Construction; Drainage Surface, Turfing Sand Drains; Sand Wicks; Rope Drains, Geo- Textile Drainage; Preloading Techniques

UNIT-IV:

Bituminous Construction and Maintenance:Preparation and Laying of Tack Coat; Bituminous Macadam,Penetration Macadam, Built up Spray Grout, Open Graded Premix, Mix Seal, Semi-Dense Asphalt Concrete-Interface Treatments and Overlay Construction, IRC Specifications,

UNIT-V:

Cement Concrete pavement Construction and Maintenance:Cement Concrete Pavement Analysis – Construction of Cement Roads, Manual and Mechanical Methods, Joints in Concrete and Reinforced Concrete Pavement and Overlay Construction.

Reference Books:

1. Haas and Hudson , W. R. Pavement management systems –McGraw Hill publications
2. Sargious, M. A. – Pavements and surfacing for highways and airports – Applied Science Publishers ltd
3. Bridge and Pavement maintenance- Transportation Research Record no.800, TRB

4. Shahin M. Y, 1994- Pavement management for airports, roads and parking lots
5. Bent Thagesan, 1996- Highway and Traffic engineering for developing countries
6. MORTH – Specifications

Course Outcomes:

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

- Select appropriate earth moving and compaction equipment depending upon the Requirement
- Prepare quality assurance and quality control plans in an attempt to construct Better Performing pavements
- Evaluate the pavements based on the functional and structural characteristics
- Understand constructions of non bituminous & bituminous & cement concrete Pavements for flexible & rigid pavements.

S.No	Title	Web link	Offering Institution	Duration
1.	Modern Construction Materials	https://onlinecourses.nptel.ac.in/noc22_ce13/preview	IIT Madras	12
2.	Design of Masonry Structures	https://nptel.ac.in/courses/105106197	IIT Madras	12
3.	Integrated Waste Management for a Smart City	https://nptel.ac.in/courses/105105160	IIT Kharagpur	12
4.	Earthquake Geology: A tool for Seismic Hazard Assessment	https://nptel.ac.in/courses/105104200	IIT Kanpur	12
5.	Structural Geology	https://nptel.ac.in/courses/105104191	IIT Kanpur	12
6	Optimization methods for Civil Engineering	https://nptel.ac.in/courses/105103210	IIT Guwahati	12
7	Rock Mechanics and tunnelling	https://nptel.ac.in/courses/105105212	IIT Kharagpur	