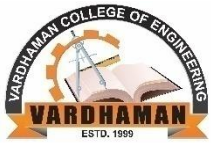

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD
Autonomous Institute, Affiliated to JNTUH
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BACHELOR OF TECHNOLOGY

CIVIL ENGINEERING

CURRICULUM AND SYLLABI (VCE R18)

UNDER CHOICE BASED CREDIT SYSTEM

B. Tech. - Regular Four Year Degree Program
(For batches admitted from the Academic Year 2018 - 2019)
&
B. Tech. - Lateral Entry Scheme
(For batches admitted from the Academic Year 2019 - 2020)

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

PROGRAM CURRICULUM STRUCTURE

B. TECH - CIVIL ENGINEERING

REGULATIONS: VCE-R18

I YEAR I SEMESTER									
Code	Title of Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4001	Linear Algebra and Ordinary Differential Equations	BS	3	1	0	4	30	70	100
A4005	Oscillations, Waves and Optics	BS	4	0	0	4	30	70	100
A4501	Programming for Problem Solving	ES	3	1	0	4	30	70	100
A4301	Engineering Graphics and Computer Aided Drafting	ES	0	0	3	1.5	30	70	100
A4006	Oscillations, Waves and Optics Laboratory	BS	0	0	2	1	30	70	100
A4502	Programming for Problem Solving Laboratory	ES	0	0	3	1.5	30	70	100
A4022	Engineering Exploration	ES	0	0	2	1	30	70	100
	TOTAL		**10**	**02**	**10**	**17**	**210**	**490**	**700**
I YEAR II SEMESTER									
Induction Program for One Week (Phase-II)									
Code	Title of the Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4002	Advanced Calculus	BS	3	1	0	4	30	70	100
A4007	Engineering Chemistry	BS	4	0	0	4	30	70	100
A4303	Engineering Mechanics	ES	3	1	0	4	30	70	100
A4009	Functional English	HS	3	0	0	3	30	70	100
A4302	Engineering Workshop	ES	0	0	3	1.5	30	70	100
A4008	Engineering Chemistry Laboratory	BS	0	0	2	1	30	70	100
A4304	Engineering Mechanics Laboratory	ES	0	0	3	1.5	30	70	100
A4010	English Language Communication Skills Laboratory	HS	0	0	2	1	30	70	100
A4021	Social Innovation	ES	0	0	2	1	30	70	100
	TOTAL		**13**	**2**	**12**	**21**	**270**	**630**	**900**

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD
PROGRAM CURRICULUM STRUCTURE
B. TECH - CIVIL ENGINEERING

REGULATIONS: VCE-R18

II YEAR I SEMESTER

Code	Title of Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4101	Building Planning and Drawing	PC	3	0	2	4	30	70	100
A4102	Fluid Mechanics	ES	3	1	0	4	30	70	100
A4103	Strength of Materials-I	ES	3	1	2	5	30	70	100
A4104	Surveying	PC	3	0	2	4	30	70	100
A4017	Quantitative Aptitude	BS	1	0	0	1	30	70	100
A4025	Managerial Economics and Financial Analysis	HS	3	0	0	3	30	70	100
A4014	Environmental Science	MC	2	0	0	0	-	100*	100*
	TOTAL		**18**	**02**	**06**	**21**	**180**	**420**	**600**

II YEAR II SEMESTER

Code	Title of the Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4019	Verbal Ability and Logical Reasoning	HS	1	0	0	1	30	70	100
A4012	Probability and Statistics	BS	3	0	0	3	30	70	100
A4105	Strength of Materials-II	PC	3	1	0	4	30	70	100
A4106	Concrete Technology	PC	3	0	2	4	30	70	100
A4107	Structural Analysis	PC	3	0	0	3	30	70	100
A4108	Hydraulics and Hydraulic Machines	PC	3	0	2	4	30	70	100
A4109	Advanced Surveying	PC	1	0	2	2	30	70	100
A4013	Gender Sensitization	MC	2	0	0	0	-	100*	100*
	TOTAL		**19**	**01**	**06**	**21**	**210**	**490**	**700**

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

PROGRAM CURRICULUM STRUCTURE

B. TECH - CIVIL ENGINEERING

REGULATIONS: VCE-R18

III YEAR I SEMESTER

Code	Title of Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4110	Geotechnical Engineering	PC	2	1	2	4	30	70	100
A4111	Design of Reinforced Concrete Structures	PC	3	1	0	4	30	70	100
A4112	Water Resource Engineering	PC	3	1	0	4	30	70	100
A4113	Engineering Geology	PC	3	0	2	4	30	70	100
	Professional Elective – I	PE	3	0	0	3	30	70	100
A4018	Engineering Design Thinking	ES	0	0	2	1	30	70	100
A4141	Internship – I	PW	0	0	4	2	100	-	100
A4016	Indian Constitution	MC	2	0	0	0	-	100*	100*
	TOTAL		**16**	**03**	**10**	**22**	**280**	**420**	**700**

III YEAR II SEMESTER

Code	Title of the Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4114	Environmental Engineering	PC	3	0	2	4	30	70	100
A4115	Design of Steel Structures	PC	3	1	0	4	30	70	100
A4116	Transportation Engineering	PC	3	1	2	5	30	70	100
	Professional Elective – II	PE	3	0	0	3	30	70	100
	Open Elective – I	OE	3	0	0	3	30	70	100
A4020	Product Realization	ES	0	0	2	1	30	70	100
A4142	Mini Project	PW	0	0	4	2	100	-	100
A4015	Essence of Indian Traditional Knowledge	MC	2	0	0	0	-	100*	100*
	TOTAL		**17**	**02**	**10**	**22**	**280**	**420**	**700**

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD
PROGRAM CURRICULUM STRUCTURE
B. TECH - CIVIL ENGINEERING

REGULATIONS: VCE-R18

IV YEAR I SEMESTER

Code	Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
A4117	Estimation and Costing	PC	2	0	2	3	30	70	100
A4118	Remote Sensing and GIS	PC	3	0	2	4	30	70	100
	Professional Elective – III	PE	3	0	0	3	30	70	100
	Open Elective – II	OE	3	0	0	3	30	70	100
A4143	Internship – II	PW	0	0	4	2	100	-	100
A4144	Project Work Phase – I	PW	0	0	8	4	100	-	100
	TOTAL		**11**	**0**	**16**	**19**	**320**	**280**	**600**

IV YEAR II SEMESTER

Code	Course	Category	Periods per Week			Credits	Assessment Tools Maximum Marks		
			L	T	P		CIE	SEE	Total
	Professional Elective – IV	PE	3	0	0	3	30	70	100
	Open Elective – III	OE	3	0	0	3	30	70	100
A4026	Management Science	HS	3	0	0	3	30	70	100
A4145	Project Work Phase – II	PW	0	0	16	8	100	100	200
	TOTAL		**09**	**0**	**16**	**17**	**190**	**310**	**500**

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

PROGRAM CURRICULUM STRUCTURE

B. TECH - CIVIL ENGINEERING

REGULATIONS: VCE-R18

Professional Elective – I		Professional Elective – II	
Code	**Course**	**Code**	**Course**
A4151	Advanced Structural Analysis	A4154	Advanced Geotechnical Engineering
A4152	Elements of Earthquake Engineering	A4155	Finite Element Methods
A4153	Air Pollution and Control	A4156	Pre stressed Concrete
Professional Elective – III		**Professional Elective – IV**	
Code	**Course**	**Code**	**Course**
A4157	Green Building and Sustainability	A4160	Rehabilitation and Retrofitting of Structure
A4158	Construction Management	A4161	Railway and Airway Engineering
A4159	Pavement Engineering	A4162	Environmental Management Systems

Open Electives

Code	Course	Code	Course
A4131	Project Planning and Management	A4531	Fundamentals of JAVA
A4132	Environmental Pollution and Management	A4532	Operation Research
A4133	Disaster Management	A4533	Fundamentals of DBMS
A4231	Transducers and Measurements	A4534	Fundamentals of Operating Systems
A4232	Solar Energy and Applications	A4631	Principles of Software Engineering
A4233	Energy Management and Audit	A4632	E-Commerce Trends
A4331	Basic Mechanical Engineering	A4633	Fundamental of Cyber Security
A4332	Introduction to 3D Printing	A4031	Numerical Techniques
A4333	Fundamentals of Robotics	A4032	Mathematical Programming
A4431	Fundamentals of IoT	A4033	Special Functions
A4432	Principles of Analog and Digital Communications	A4034	Entrepreneurship Development
A4433	Introduction to Signal Processing	A4035	Human Resource Management
		A4036	Logistics and Supply Chain Management

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

SYLABBI FOR I YEAR I SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH I SEMESTER

COURSE STRUCTURE

4001-LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: Solution of system of linear equations, Eigen values and Eigen vectors, Quadratic forms, Differential equations and their applications, Laplace transforms and its applications to ordinary differential equations. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4001.1 Solve system of linear equations using rank of a matrix.

A4001.2 Examine the nature of Quadratic form using Eigen values and Eigen vectors.

A4001.3. Solve the first and higher order linear ordinary differential equations.

A4001.4. Make use of ordinary differential equations to solve, Rate of growth/decay, Newton's law of cooling, Electrical circuits and Simple harmonic motion problems.

A4001.5. Apply Laplace transforms to solve ordinary differential equations.

3. Course Syllabus

THEORY OF MATRICES: Real, Complex matrices and their properties, Rank of a matrix by reducing to Echelon form and Normal form, Inverse of a matrix by Gauss-Jordan method, Consistency of system of linear equations using the rank of a matrix.

EIGEN VALUES, EIGEN VECTORS AND QUADRATIC FORMS: Linear dependence and independence of vectors, Linear transformation, Eigen values and Eigenvectors of a matrix, Properties of Eigen values and Eigen vectors of real and complex matrices, Cayley-Hamilton theorem (statement and verification), Inverse and powers of a matrix using Cayley-Hamilton theorem, Diagonalization of a matrix, Quadratic forms up to three variables: Rank, index, signature and nature of quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformation.

ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER: Differential equations of first order and first degree: Exact equations and equations reducible to exact form using integrating factors, Linear and Bernoulli's equations. Equations not of first degree: Equations solvable for p , Equations solvable for y Equations solvable for x and Clairaut's equation, Applications: Newton's law of cooling, Law of natural growth and decay.

HIGHER ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS: Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of the type $Q(x)=e^{ax}$, $\sin(ax+b)/\cos(ax+b)$, x^n, $e^{ax}V(x)$, $x^nV(x)$. Equations reducible to linear equations with constant coefficients: Cauchy's homogeneous linear equation, Legendre's linear equation, Method of variation of parameters, Applications: $L-C-R$ Circuits and Simple Harmonic Motion.

LAPLACE TRANSFORMS: Laplace transforms of elementary functions , First shifting theorem, Change of scale property, Multiplication by t^n , Division by t , Laplace transforms of derivatives and integrals, Laplace transform of unit step function, Second shifting theorem, Laplace transform of periodic function, Evaluation of some kind of integrals by Laplace transforms, Inverse Laplace transforms, Finding inverse Laplace transforms by different methods, Convolution theorem(without proof), Solving ordinary differential equations by Laplace transform method.

4. Books and Materials

Text Books:

1. B S Grewal, *Higher Engineering Mathematics*, 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. B V Ramana, *Engineering Mathematics*, 23rd Reprint, Tata Mc Graw Hill Education Private Limited, New Delhi, 2015.

Reference Books:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, *A text book of Engineering Mathematics*, Laxmi Publications, 2010.
3. D. Poole, *Linear Algebra: A Modern Introduction*, 2nd Edition, Brooks/Cole, 2005.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH I SEMESTER

COURSE STRUCTURE

A4005 – OSCILLATIONS, WAVES AND OPTICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
4	0	0	56	0	0	4	30	70	100

1. Course Description

Course Overview

This course promotes an understanding of the nature and essence of physical principles and fosters implementation of the scientific approach in the analysis of real life situations. The student is encouraged to develop problem solving techniques and appreciate the influence of physics in everyday life. To achieve this one should have strong knowledge over simple harmonic motion, harmonic oscillators, transverse and longitudinal waves. Certainly this course is worthy to understand the principles of optics. This course also cover concepts related to wave optics and lasers.

Course Pre/co-requisites

This course has no specific pre/co-requisites.

2. Course Outcomes (COs)

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

A4005.1. Solve for the solutions and describe the behavior of a damped and driven harmonic oscillator.

A4005.2.Construct travelling and standing solutions to the wave equation.

A4005.3. Use the geometrical approximation, including Fermat's principle, the ray equation and paraxial matrix formalism for refractive and reflective surfaces.

A4005.4. Apply wave optics and diffraction theory to a range of problems.

A4005.5. Estimate the properties of various lasers and the propagation of laser beams.

3. Course Syllabus

of lasers **SIMPLE HARMONIC MOTION, DAMPED AND FORCED SIMPLE HARMONIC OSCILLATOR**: Mechanical and electrical simple harmonic oscillators, complex number notation and phasor representation of simple harmonic motion, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator, power absorbed by oscillator.

NON-DISPERSIVE TRANSVERSE AND LONGITUDINAL WAVES IN ONE DIMENSION AND INTRODUCTION TO DISPERSION: Transverse wave on a string, the wave equation on a string,

Harmonic waves, reflection and transmission of waves at a boundary, impedance matching, standing waves and their eigen frequencies, longitudinal waves and the wave equation for them, acoustics waves and speed of sound, standing sound waves. Waves with dispersion, water waves, superposition of waves and Fourier method, wave groups and group velocity.

THE PROPAGATION OF LIGHT AND GEOMETRIC OPTICS: Fermat's principle of stationary time and its applications e.g. in explaining mirage effect, laws of reflection and refraction, Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection, and evanescent wave.Introduction to Optical fibres, Acceptance angle, Numerical aperture, step and graded index fibre, losses in optical fibres.

WAVE OPTICS: Huygens' principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach-Zehnder interferometer.Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

LASERS: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO_2), solid-state lasers (ruby, Neodymium), semiconductor laser (homo-junction); Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications in science, engineering and medicine.

4. Books and Materials

Text Books:

1. H. J. Pain. *The Physics of Vibrations and Waves*, 6th edition, Wiley, India, 2006.
2. I. G. Main. *Vibrations and Waves in Physics,* Cambridge University Press, England, 2012.
3. N. Bajaj. *The physics of Waves and Oscillations*, 1st edition, McGraw Hill Education, India, 2017.
4. A.Ghatak. *Optics*, 5th edition, India: McGraw Hill Education, 2012.

Reference Books:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics,* Cengage Learning India Pvt. Ltd., New Delhi, 2014.
2. R. Fitzpatrick. *Oscillations and Waves: An Introduction*. CRC Press (Taylor &Francies Group), United States, 2017.
3. Trager and Frank. *Handbook of Lasers and Optics*. Springer, India, 2012.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH I SEMESTER

COURSE STRUCTURE

A4501 – PROGRAMMING FOR PROBLEM SOLVING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

The course is a Basic Engineering course for all computation aspiring students. It is designed to provide a comprehensive study of the C programming language that covers the fundamental principles of computer programming, with an emphasis on problem solving strategies using structured programming techniques. The syntax and constructs of data types, control statements, arrays, functions and pointers are elaborated. The derived data types like structures are discussed. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable and reusable code to solve mathematical, engineering and simple data processing problems.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4501.1. Select right identifiers, data types and operators for effective computation.
A4501.2. Write programs using control statements.
A4501.3. Write programs demonstrating use of arrays, strings and their applications.
A4501.4. Demonstrate the applications of function and recursion.
A4501.5. Write programs for simple real life problems using pointers and structures.

3. Course Syllabus

INTRODUCTION TO PROGRAMMING: Introduction to components of Computer Systems. Steps to solve logical and numerical problems. Representation of Algorithm, Flowchart and Pseudo code with examples. INTRODUCTION TO THE C LANGUAGE: program structure, identifiers, and data types, Formatting input/output, Syntax and Logical Errors in compilation, object and executable code.

OPERATORS, EXPRESSIONS AND CONTROL STATEMENTS: Arithmetic, Logical, Relational, Conditional, Assignment, Increment and Decrement operators. EXPRESSIONS**:** Arithmetic Expressions, Operator precedence and Associativity. DECISION MAKING AND LOOPING:Writing and evaluation of decision making, branching and looping.

ARRAYS, SORTING AND SEARCHING: Definition, Types of Arrays, declaration and Initialization of n-Dimensional Arrays and Character array, String manipulation. SEARCHING AND SORTING:Linear search, Bubble sort and Selection sort.

FUNCTIONS AND RECURSION: Functions, Parameter passing in functions through call by value, passing arrays to functions, storage classes. RECURSION:Recursion as a different way of solving problems. Example programs, such as finding factorial, Fibonacci series.

POINTERS AND STRUCTURES: Definition, Declaration, Pointer arithmetic, Pointer to Pointer, Pointer to an array (base pointer), Dynamic memory allocation, Command Line arguments, idea of call by reference in functions. STRUCTURES: Defining, Declaring and initialization of structures, nested structures, Array of Structures.

4. Books and Materials

Text Books:

1. B. A. Fouruzan and R. F. Gilberg, *C Programming & Data Structures,* 3rd Edition, CENGAGE, Learning, India, 2014.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, 2nd Edition, Prentice Hall of India,2015.
2. E. Balagurusamy, *Programming in ANSI C*, 7th Edition Tata McGraw-Hill,2017.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH I SEMESTER

COURSE STRUCTURE

A4301– ENGINEERING GRAPHICS AND COMPUTER AIDED DRAFTING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

Engineering drawing is said to be the language of engineers. It is the graphical representation of objects and their relationships based on certain basic principles and standard conventions. It can be regarded as a powerful tool to convey ideas. This course is included in all engineering curricula with the aim of training the students and making them graphically literate. This course covers orthographic projections for points, lines, planes and solids in different positions, the development of lateral surfaces and the isometric projections. The students are able to create simple solid models of various domain applications. This course is common for all disciplines where they don't undergo these courses except CE and ME students.

Course Pre/co-requisites

This course has no specific pre/co-requisites.

2. Course Outcomes (COs)

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

A5301.1. Construct various types of curves commonly used in engineering practice.
A5301.2. Distinguish between first, second, third and fourth angle projections of systems.
A5301.3. Estimate lateral surface of the sheet metal requirement for making regular solids.
A5301.4. Compare isometric and orthographic views of an object.
A5301.5. Select CAD tools for drafting regular solids.

3. Course Syllabus

INTRODUCTION TO ENGINEERING DRAWING: Introduction to engineering drawing: Principles of Engineering Graphics and their significance, usage of Drawing instruments, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epi-cycloid, Hypocycloid; Scales – Plain, Diagonal.

ORTHOGRAPHIC PROJECTIONS AND PROJECTIONS OF REGULAR SOLIDS:SPrinciples of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined to both Planes; Projections of Regular Solids: Prism, Cylinder, Pyramid, Cone-inclined to both planes.

SECTIONAL VIEWS AND DEVELOPMENT OF SURFACES OF RIGHT REGULAR SOLIDS: Sectional views of right regular solids: Prism, Cylinder, Pyramid, Cone-Development of surface of right regular solids: Prism, Cylinder, Pyramid, Cone.

ISOMETRIC PROJECTIONS: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa.

COMPUTER BASED DRAWINGOVERVIEW OF COMPUTER GRAPHICS: Overview of Computer Graphics, Customisation, Demonstration of a simple team design project: listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software; Customisation& CAD Drawing: consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles; Annotations, layering & other functions: applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings ; Demonstration of a simple team design project: Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids.

4. Laboratory Equipment/Software/Tools Required

1. PC installed with operating system (Windows)
2. Auto cad software**.**

5. Books and Materials

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., *Engineering Drawing,*Charotar Publishing House, 2014.
2. Basant Agrawal B. & Agrawal C. M., *Engineering Graphics,* TMH Publication, 2016.

Reference Books:

1. Narayana, K.L. & P Kannaiah, *Text book on Engineering Drawing*, Scitech Publishers, 2016.
2. K. Balaveera Reddy et al, *Computer Aided Engineering Drawing*, CBS Publications, 2017.
3. Shah, M.B. & Rana B.C., *Engineering Drawing and Computer Graphics*, Pearson Education,2008.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH I SEMESTER

COURSE STRUCTURE

A4006- OSCILLATIONS, WAVES AND OPTICS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

This laboratory course deals with understanding the fundamental physics concepts like frequency, oscillations, wave optics and lasers. This course helps to learn the methodology of investigating problems in physics and also provides to gain knowledge in different techniques and working principles related to waves and light propagation. This course also makes the students familiar with instrumental methods and various material properties. This basic knowledge will enable the scientific fervor to solve the societal issues.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4006.1. Evaluate the rigidity modulus and spring constant of the given materials to interpret the material properties.

A4006.2. Estimate the acceleration due to gravity (g) and frequency of AC power supply.

A4006.3. Determine the wavelength of a given light source and thickness of a wire by using interference mechanism.

A4006.4. Estimate the dispersive power and refractive index of various light sources.

A4006.5. Apply the principles of optics to evaluate the characteristics of lasers and optical fibres.

3. Course Syllabus

1. Rigidity modulus of the material of a given wire using Torsional Pendulum.
2. Spring constant by using coupled oscillator.
3. Frequency of an AC supply using Sonometer.
4. Acceleration due to gravity (g) by a compound pendulum.
5. Numerical aperture and acceptance angle of the given optical fibre.
6. Bending and transmission losses in a given optical fibre.
7. Dispersive Power of the material of a given prism using Mercury Light.
8. Refractive Index of the Material If a given Prism Using Sodium Light.
9. Wavelength of sodium light using Newton's Rings.

10. Thickness of thin wire using Air Wedge method
11. Wavelength of a given source of Laser light using diffraction grating.
12. Angular divergence of the laser beam.

4. Laboratory Equipment/Software/Tools Required

1. Torsional pendulum set-up
2. Sonometer Set-up
3. Coupled oscillator set-up
4. Compound pendulum set-up
5. Regulated Power Supply (DC and AC)
6. Newton's Ring Set up
7. Spectrometer
8. Air Wedge Method set-up
9. Sodium & Mercury Vapour Lamp
10. Semiconductor Laser Source
11. Plane diffraction grating
12. Optical Fiber trainer kit
13. Meters - Ammeter, Voltmeter, Digital Multimeter

5. Books and Materials

Text Books:

1. GeetaSanon. *B.Sc. Practical Physics*. 1st edition, S. Chand and Company, India, 2007.
2. S. D. Gupta, N. Ghosh and A. Banerjee. *Wave Optics,* CRC Press (Taylor &Francies Group), United States, 2015.
3. M. Nelkon and J. M. Ogborn. *Advanced Level Practical Physics*. 4th edition, Heinemann Educational Publishers, London, 1985.

Reference Books:

1. M. Ghosh and D. Bhattacharya. *A Textbook of Oscillations, Waves and Acoustics*. 3rd edition, S. Chand Publisher, India, 2006.
2. D. Meschede. *Optics, Light and Lasers: The Practical Approach to Modern Aspects of Photonics and Laser Physics*. 2nd edition, Wiley-VCH, Germany, 2007.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH I SEMESTER

COURSE STRUCTURE

A4502 – PROGRAMMING FOR PROBLEM SOLVING LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1.Course Description

Course Overview

The course is a Basic Engineering course for all computation aspiring students. It is designed to provide a comprehensive study of the C programming language that covers the fundamental principles of computer programming, with an emphasis on problem solving strategies using structured programming techniques. The syntax and constructs of data types, control statements, arrays, functions and pointers are elaborated. The derived data types like structures are discussed. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable and reusable code to solve mathematical, engineering and simple data processing problems.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4502.1. Select right identifiers, data types and operators for effective computation.
A4502.2. Write programs using control statements.
A4502.3. Write programs demonstrating use of arrays, strings and their applications.
A4502.4. Demonstrate the applications of function and recursion.
A4502.5. Write programs for simple real life problems using pointers and structures.

3. Course Syllabus

Practice

Week-1: Programs using I/O statements and various operators.
Week-2: Programs using expression evaluation and precedence.
Week-3: Programs using decision making statements and branching statements.
Week-4: Programs using loop statements.
Week-5: Programs to demonstrate applications of n dimensional arrays.
Week-6: Programs to demonstrate searching and sorting.
Week-7: Programs to demonstrate use of string manipulation functions.

Week-8: Programs using user-defined functions.

Week-9: Programs to demonstrate parameter passing mechanism.

Week-10: Programs to demonstrate recursion

Week-11: Programs to demonstrate use of pointers.

Week-12: Programs to demonstrate command line arguments. Programs to demonstrate dynamic memory allocation.

Week-13: Programs to demonstrate applications of structures.

Week-14: Programs to demonstrate file operations.

1. Laboratory Equipment/Software/Tools Required

- A computer system with Linux/Ubuntu Operating System, C- Compiler

5. Books and Materials

Text Books:

1. B. A. Fouruzan and R. F. Gilberg, *C Programming & Data Structures*, 3rd Edition, CENGAGE, Learning, India, 2014.

Reference Books:

1. YashavantKanetkar, *Let Us C,* 15th Edition, BPB Publications, 2017

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH I SEMESTER

COURSE STRUCTURE

A4022-ENGINEERING EXPLORATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

This course starts with differentiating science and engineering, scientist and engineer, followed by describing engineering graduate attributes and what engineers "do". This course offers the fundamental principles, concepts of engineering, as well as the influences of engineering on society and also hands-on and experiential learning opportunities in specific areas of engineering. This course focuses on data collection and analysis, engineering problem-solving, mathematical modeling, contemporary tools (software and hardware), professional practice and expectations (e.g. Communication, teamwork, ethics) and the diversity of fields and majors within engineering. Topics to be covered in this course include: engineering design process in multidisciplinary domain, and unique platform to showcase any idea into functional prototype, project management skills, exploring engineering skills with ethical and sustainability perspective.

Course Pre/co-requisites

To design and develop a sustainable model to existing social problems by using a development platform (ARDUINO or equivalent).

2. Course Outcomes (COs)

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

A4022.1. Compare and contrast the contributions of different types of engineers in the development of a product, process or system.

A4022.2. Apply the common engineering design process to solve complex problems and arrive at viable solution.

A4022.3. Explore various contemporary software and hardware tools to provide solutions for the problems.

A4022.4. Apply skills needed for successful teamwork including the basics of project management and written and oral communication.

A4022.5. Identify the key elements of professional codes of ethics as well as the ethical and societal Issues related to the disciplines and their impact on society and the world.

3. Course Syllabus

Introduction to Engineering and Engineering Study: Difference between science and engineering, scientist and engineer needs and wants.
Various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer and Graduate Attributes.

Engineering Design Process, Multidisciplinary facet of design, Importance of analysis in engineering design, general analysis procedure.
Introduction to mechatronics system, generation of multiple solution, decision matrix, Concepts of reverse engineering.
Introduction to various platform based development (Arduino) programming and its essentials.
Introduction to sensors, transducers and actuators and its interfacing with arduino.

Engineering Ethics: Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers**.**
Identifying Ethical Dilemmas in different tasks of engineering, Applying Moral Theories and codes of conduct for resolution of Ethical Dilemmas.

Sustainability: Introduction to sustainability, Sustainability leadership, Life cycle assessment**.**

Project Management: Introduction, Significance of team work, Importance of communication in engineering profession.
Project management tools: Checklist, Timeline, Gantt Chart, Significance of documentation.

4. Books and Materials

Text Books:

1. PhilipKosky,RobertT.Balmer,WilliamD.Keat,GeorgeWise,ExploringEngineering:*AnIntroducti ontoEngineeringandDesign,AcademicPress*,3rdedition,2012.
2. ByronFrancis,Arduino:*TheCompleteBeginner'sGuide*,CreatespaceIndependentPublishers,2016.
3. M. Govindarajan, S. Natarajan & V. S. Senthil Kumar, *Engineering Ethics,* 1st Edition, Phi Learning, 2009.

Reference Books:

1. Neerparaj Rai, *Arduino Projects for Engineers*, 1st edition, BPB Publications, 2016.
2. Simon Monk, Programming Arduino:*Getting Started with Sketches,*2nd Edition, McGraw-Hill Education, 2016.
3. W. Richard Bowen, *Engineering Ethics* –Outline of an aspirational approach, Springer London.

SYLABBI FOR I YEAR II SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH II SEMESTER

COURSE STRUCTURE

A4002-ADVANCED CALCULUS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: Evaluation of improper integrals, functions of single, several variables and their applications, Multiple integrals, Vector differential and integral calculus, Fourier series and Fourier transforms. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

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

A4002.1. Evaluate improper integrals and examine the extremum of a function of several variables.

A4002.2. Make use of multiple integrals to find the area and volume of a solid.

A4002.3. Determine scalar potential function for irrotational force fields.

A4002.4.Evaluate line, surface and volume integrals using vector integral theorems.

A4002.5. Develop Fourier series and Fourier transforms of a function.

3. Course Syllabus

CALCULUS: Evaluation of improper integrals: Beta and Gamma functions and their properties, Rolle's Theorem, Lagrange's mean value theorem and Cauchy's mean value theorem, Taylor's and Maclaurin's series. Functions of several variables: Limit, continuity and partial derivatives of functions of two variables (not to be examined), Jacobians, Functional dependence, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.

MULTIPLE INTEGRALS: Double integrals, Change of order of integration, Change of variables, Area enclosed by plane curves, Triple integrals, Change of variables, Area, volume, mass and centre of gravity (constant and variable densities).

VECTOR DIFFERENTIATION: Scalar and vector point functions, Gradient, Directional derivative, Tangent plane and normal line to the surface, Divergence, Curl and their related properties, Scalar potential function, Laplacian operator, Vector identities.

VECTOR INTEGRATION: Line integral, work done, Surface integrals, Volume integrals. Vector integral theorems: Green's theorem in a plane, Stoke's theorem and Gauss divergence theorem (without proof) and related problems, Irrotational fields.

FOURIER SERIES AND FOURIER TRANSFORMS: Euler's formulae, Dirichlet's conditions, Fourier series for functions having period $2l$, Fourier series for even and odd functions, Half range Fourier sine and cosine series. Fourier integral theorem (without proof), Fourier sine and cosine integrals, Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier transforms.

4. Books and Materials

Text Books:

1. B.S. Grewal, *Higher Engineering Mathematics*, 43rdEdition, Khanna Publishers, New Delhi, 2014.
2. B.V. Ramana, *Higher Engineering Mathematics*, 23rdReprint, Tata Mc-Graw Hill Education Private Limited, New Delhi, 2015.

REFERENCE BOOKs:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, *A text book of Engineering Mathematics*, Laxmi Publications, 2010.
3. G.B. Thomas and R.L. Finney, *Calculus and Analytic Geometry*, 9thEdition, Pearson Education, 2002.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH II SEMESTER

COURSE STRUCTURE

A4007- ENGINEERING CHEMISTRY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
4	0	0	42	0	0	4	30	70	100

1.Course Description

Course Overview

This course emphasizes a strong base in physical chemistry and organic chemistry to spread over an orientation towards the materials and drug synthesis. This course also focuses on the general applications of chemical principles to the analysis and evaluation of engineering problems such as Water and its treatment, batteries and fuel cells.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2.Course Outcomes (COs)

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

A4007.1. Apply knowledge of three - dimensional arrangements of atoms, molecules and their effects on chemical reactions.

A4007.2.Identify differences and similarities of the Batteries.

A4007.3. Evaluate the behaviour and interactions between matter and energy at both the atomic and molecular levels.

A4007.4. Make use of different methods for softening hardness of water.

A4007.5. Apply major chemical reactions in the synthesis of various drugs.

3.Course Syllabus

Theory

ATOMIC AND MOLECULAR STRUCTURE: Introduction, Concept of atomic and molecular orbitals, Molecular orbital theory, and Molecular orbital energy level diagrams of diatomic molecules - O_2 and N_2.Crystal field theory – crystal field splitting in Octahedral, Tetrahedral and Square planar complexes.

STEREOCHEMISTRY OF CARBON COMPOUNDS: Isomerism**:** Definition and their classification: Constitutional isomers: Definition, examples of chain, functional and positional isomers. Stereoisomers: Definition, examples of enantiomers and diastereomers. Optical activity: Definition, chiral centres. Chiral molecules: Definition and criteria - asymmetric and dissymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and dissymmetric molecules (trans-1, 2-

dichlorocyclopropane). R, S nomenclature, Cahn-Ingold-Prelog rules. Geometrical isomerism of alkenes– cis, trans and E, Z configuration.

ELECTROCHEMISTRY AND BATTERIES: Electrochemical cells -Types, cell notation, cell reaction and cell emf - concentration cells – Electrode and Electrolyte concentration cells, numerical problems. Electrochemical series and its applications. Electrode potential, standard electrode potential, types of electrodes –Hydrogen, Calomel and Quinhydrone electrode. Batteries**:** Primary battery (Zinc- Carbon Battery) and Secondary battery (lead acid and lithium ion battery) - Applications. Fuel cells**:** Concept of Fuel-Cells. Hydrogen –Oxygen fuel cell – advantages and applications.

ORGANIC REACTIONS, DRUG MOLECULES AND SPECTROSCOPY: Introduction, Types of organic reactions, reactions involving substitution (S_N^1, S_N^2), addition of H_2, X_2 andHX to C-C double bond – Markownikoff and Anti-Markownikoff rule, elimination (E1 and E2), reduction: Hydrogenation by H_2 by Nickel and Pd/C (any two examples for each). Drugs: Introduction and classification. Structure, preparation and uses of commonly used drug molecules- paracetamol, aspirin and ibuprofen. Spectroscopy: Introduction. Principle, selection rules and applications ofVibrational, rotational and electronic spectroscopy.

WATER TECHNOLOGY: Introduction, Hardness of water, causes of hardness and types of hardness: temporary and permanent – expression and units of hardness. Numerical problems. Potable water and its specifications. Treatment of water for drinking-filtration, sedimentation, chlorination and ozonization. Boiler troubles**:** Causes and effects. Sludges, scales and caustic embrittlement. Internal treatment of boiler feed water – Calgon conditioning, Phosphate conditioning, Colloidal conditioning – Softening of water by ion- exchange process. Desalination of water – Reverse osmosis.

4.Books and Materials

Text Books:

1. Jain & Jain. *Engineering Chemistry:* Dhanapathrai Publications., 2015.
2. PrsantaRath, B. Rama Devi, Ch. Venkata Ramana Reddy &SubhenduChakroborty, *Engineering Chemistry:* Cengage Publications., 2018.
3. B. H. Mahan, Rollie. J. Meyers. *University chemistry*: Pearson publications, 4th edition, 2009.
4. C. N. Banwell. *Fundamentals of Molecular Spectroscopy:* McGraw Hill Education India, 4th edition, 2016.
5. GL David Krupadanam, Vijaya Prasad, Varaprasad Rao K. *Drugs: Universities Press (India) Limited.*

Reference Books:

1. B. L. Tembe, Kamaluddin and M. S. Krishnan. *Engineering Chemistry (NPTEL Web-book)*
2. Peter Atkins, Julio de Paula's *Physical Chemistry*, Oxford University Press, Tenth Edition, 2014.
3. D. Nasipuri, *Stereochemistry of Organic Compounds – Principles and Applications*, 3rd Edition, New Age International (P) Limited.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH II SEMESTER

COURSE STRUCTURE

A4303 – ENGINEERING MECHANICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

Engineering Mechanics is the branch of science for analyzing force systems that acts upon the bodies at either at rest or in motion. The knowledge of mechanics helps us in designing the various parts of machine elements. The course content is designed in such a way that the balancing of various mechanical systems could be achieved by the calculations of centre of gravity and moment of inertia. The effects of friction and the consequences of frictional forces on the mating parts will be analyzed to design various systems with negligible effort loss.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes:

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

A4303.1.Apply the laws of mechanics to evaluate the resultant force.

A4303.2. Solve the problems using equations of equilibrium through free body diagram.

A4303.3.Analyzethe frictional forces to maintain the equilibrium of system.

A4303.4.Identify the centroid and centre of gravity of a body by using principle of moments And calculate area moment of inertia and mass moment of inertia of a body.

A4303.5. Utilize the basic concepts of kinematics and kinetics to solve the problem.

3. Course Syllabus

INTRODUCTION TO ENGINEERING MECHANICS: Introduction to Engineering Mechanics – Basic Concepts. Resultants of Force System: Parallelogram law –Forces and components- Resultant of coplanar Concurrent Forces – Components of forces in Space – Moment of Force – principle of moments – Coplanar Applications – Couples – Resultant of any Force System. Equilibrium of Force Systems: Free Body Diagrams, Equations of Equilibrium – Equilibrium of planar Systems.

FRICTION: Types of Friction – Limiting Friction – Laws of Friction – Angle of repose- Equilibrium of body lying on rough inclined plane – Ladder friction – Wedge friction- screw jack.

CENTROID AND CENTRE OF GRAVITY: Centroid and Centre of Gravity, Centroid of simple figures from first principle, centroid of composite sections, Pappus theorems.Centre of Gravity and its implications, centre of gravity of composite sections.

MOMENT OF INERTIA: Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections.

Mass moment inertia of circular plate, Cylinder, Cone, Sphere, mass moment of inertia of composite bodies.

DYNAMICS OF PARTICLES: Displacements, Velocity and acceleration, their relationship – Rectilinear motion – Curvilinear motion -Newton's laws of motion – Work Energy Equation–Conservation of energy, Impulse and Momentum principle-direct central collisions-coefficient of restitution.

4. Books and Materials

Text Books:

1. Fedinand L. Singer 1998., *Engineering Mechanics*- Harper – Collins Publishers- NewDelhi.
2. A. K. Tayal2012.,*Engineering Mechanics*- Umesh Publications- NewDelhi.

Reference Books:

1. Timoshenko & Young 2013.,*Engineering Mechanics,* Mc Graw Hill-India.
2. K. L Kumar 2009.,*Engineering Mechanics*- Tata Mc Graw Hill- NewDelhi.
3. Irving. H. Shames 2004.,*Engineering Mechanics*- Prentice-Hall-India.
4. S. S. Bhavikatti- J. G. Rajasekharappa 2014.,*Engineering Mechanics*- New Age International-India.S Chand & Co. Ltd, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH II SEMESTER

COURSE STRUCTURE

A4009-FUNCTIONAL ENGLISH

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic and communicative competencies of Engineering students. In English classes, the focus should be on the development of competence in the areas of grammar and vocabulary and skills development in terms of reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts/poems silently leading to reading comprehension. Reading comprehension passages are given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind. For instance, newspaper articles, advertisements, promotional material etc could be deployed as supplementary material to enhance their communication skills. The focus of the syllabus is on language acquisition and skill development.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4009.1. Demonstrate an understanding of the significance of humanity, love and service to mankind.

A4009.2. Utilize appropriate vocabulary in the given contexts.

A4009.3. Build competence in grammar.

A4009.4. Develop effective academic reading skills.

A4009.5. Develop effective academic writing skills.

3. Course Syllabus

Vocabulary: Word Formation – Prefixes – Suffixes – Guessing the meanings of the words using prefixes and suffixes- Standard Abbreviations.

Grammar: Articles.

Reading: Presidential Address by APJ Abdul Kalam: Techniques for effective comprehension - Skimming and Scanning-Types of texts – Summarizing.
Writing: Sentences – Paragraphs – Cohesion – Coherence – Logical, Lexical and Grammatical Devices – Punctuation – Types of Paragraphs: Description – Definition – Classification.

Vocabulary: Synonyms – Antonyms.
Grammar: Prepositions.
Reading: The Road Not Taken (Robert Frost): Reading using different strategies: Types of Reading – Extensive and Intensive-Do's and Dont's of reading
Writing: Letter Writing – Formats, Styles, Parts – Letters of Requisition, Letters of Inquiry, Letters of Apology.

Vocabulary: Homonyms, Homophones, Homographs, Foreign Words - Redundancies – Clichés
Grammar – Changing words from one form to another – Concord – Tenses: Present, Past and Future Active and Passive Voice.

Vocabulary: Idiomatic Expressions - One Word Substitutes.
Grammar: Noun-Pronoun Agreement – Misplaced Modifiers.
Reading: Good Manners (J C Hill): Practice in reading different types of texts efficiently - Predicting the Content – Understanding the gist - Note Making- Understanding Coherence- Sequencing Sentences.
Writing: Information Transfer: Bar Charts – Flow Charts – Tree Diagrams**.**

Reading: *Exercises for practice.
Writing: Essay writing: Introduction – Conclusion- Précis Writing: Introduction – Steps to Effective Précis writing – Guidelines.
*Reading material from Text books and Reference books.

4. Books and Materials

Text Books:

1. *Fluency in English – A Course book for Engineering Students* (by Board of Editors: Orient BlackSwan Pvt. Ltd, Hyderabad, 2016.
2. Raman, Meenakshi , Sharma, Sangeeta, *Technical Communication- Principles and Practice,* 3rd Edition, Oxford University Press, New Delhi. Print, 2015.

Reference Books:

1. Green, David *Contemporary English Grammar –Structures and Composition,* MacMillan India, 2014.
2. Rizvi, M. Ashraf, *Effective Technical Communication,* Tata Mc Graw –Hill, 1995.
3. Michael Swan, *Practical English Usage,* 3rd Edition, Oxford University Press, 1995.
4. Wood F. T, *Remedial English Grammar for Foreign Students,* Macmillan, 2007.
5. Zinsser William, *On Writing Well,* Harper Resource Book, 2001.
6. Liz Hamp- Lyons, Ben Heasley, *Study writing,* Cambridge University Press, 2006.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH II SEMESTER

COURSE STRUCTURE
A4302-ENGINEERING WORKSHOP

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Description

Course Overview

The course is intended to familiarize students to all workshops including civil, mechanical, and electricalandelectronicsengineering.Ineachoftheseworkshops,thestudentsareexposedtobasic understandingofcomponents,equipment,tradesandmethods.Civilengineeringworkshopfocuseson surveyinginstrumentsandtypesofbuildingmaterialsanditsidentification.Mechanicalengineering workshop focuses on fitting and carpentry trades, Tin-Smithy, foundry and plumbing. Electronic workshop focuses on basic electronic components, measuring equipment and Multisim software. Electricalworkshopfocusesonbasicelectricalwiringandinstallations.

Course Pre/co-requisites

The course aims to facilitate the students with the basic familiarization to all engineering streams and basic knowledge over civil, electrical, mechanical and electronics.

2. Course Outcomes (COs)

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

A4302.1. Identify various surveying tools and choose building materials according to field conditions.

A4302.2. Analyze the basic circuit connections, maintenance and troubleshooting of house hold equipments.

A4302.3. Make use of various electrical and electronic components to constructsimplecircuits andmeasurevariousphysicalquantities.

A4302.4. Explain basic components used in different trades.

A4302.5. Identify the associated tools used in different trades.

3.Course Syllabus

PART – A (TRADES FOR LECTURES & VIDEOS)

Note: Minimum one Hour Lecture on each Trade, to be discussed by any class room teaching technique in following trades.

Manufacturing Methods:

1. Casting, Forming, Joining, Machining, Advanced Manufacturing Methods

2. CNC machining , Additive Manufacturing
3. Fitting Operation & Power Tools , Carpentry , Plastic Molding , Glass Cutting, Metal Casting
4. Welding (Arc Welding & Gas Welding), Brazing, Sheet Metal Forming.

PART-B (TRADES FOR PRACTICE)

1. Fitting Trade: a. L -Fitting Joint b. V- Fitting Joint c. Square - Fitting Joint d. Semicircular - Fitting Joint.
2. Carpentry Trade: a. Lap Joint (Two Experiments) b. Bridle Joint (Two Experiments)
3. House wiring Trade: a. House Wiring (5 Experiments)
4. Welding Trade: a. Arc Welding (Two Experiments) b. Gas Welding (Two Experiments)
5. Foundry Trade: a. Single Piece Pattern b. Multiple Piece Pattern
6. Tin Smithy Trade: a. Open Scoop b. Funnel c. Rectangular Tray d. Square & Cylindrical Pipes
7. Black Smithy Trade: a. Round to Square and Vice Versa b. S - Hook c. O - Ring.

Note: Minimum one experiment from each Trade with total of 12 Experiments.

4. Books and Materials

Text Books::

1. B. L. Juneja, *Workshop Practice*, 1st Edition,Cengage Learning India Private Limited, New Delhi, 2015.
2. H.S. Bawa, *Workshop Practice*, 3rd Edition, Mc Graw Hill Education, New Delhi, 2017.
3. S.K.Garg, *Workshop Technology (Manufacturing process)* 4thEdition, Laxmi Publications (P) Ltd., New Delhi, 2017.

Reference Books::

1. K.Venkata Reddy,*Workshop Manual*, 6th Edition Reprint, BSP Publications, Hyderabad, 2018.
2. S Gowri& T Jeyapoovan*, Engineering Practices Lab Manual*, 5th Edition, Vikas Publishing House Private Limited, New Delhi, 2017.
3. Singh, Rajender*, Introduction to Basic Manufacturing Process & Workshop Technology*, 2nd Edition, New Age International (P) Ltd. New Delhi, 2014.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH II SEMESTER

COURSE STRUCTURE
A4008-ENGINEERING CHEMISTRY LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

This course emphasizes a strong background to carryout chemical analysis. The objective of engineering chemistry laboratory is to understand various instrumental techniques, physical properties of organic liquids, separation techniques, and organic synthesis to inculcate the knowledge of engineering chemistry discipline. The experiments on water treatment are proved to be vital in engineering applications on industrial level.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4008.1. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions and redox potentials.

A4008.2. Apply various titrations for the estimation of strengths of solutions and hardness of water.

A4008.3. Identify different samples from a mixture by using various separation techniques.

A4008.4. Estimate rate constants of reactions from concentration of reactants/products as a function of time.

A4008.5. Evaluate the percentage of yield of chemical substances by organic synthesis.

3. Course Syllabus

1. Estimation of strength of hydrochloric acid by conductometric titration.
2. Estimation of strength of hydrochloric acid by potentiometric titration.
3. Estimation of Iron in Mohr's salt by potentiometric titration.
4. Estimation of hardness of water by complexometry using EDTA
5. Determination of chloride content in water by Argentometry.
6. Determination of viscosity of a given fluid by Ostwald's viscometer.
7. Determination of surface tension of a given liquid by using Stalagmometer
8. Synthesis of Aspirin and Paracetamol.
9. Thin layer chromatography calculation of R_f values. Eg. ortho and para nitro phenols.
10. Verification of Freundlich adsorption isotherm of acetic acid on Charcoal.

11. Determination of partition coefficient of acetic acid between butanol and water.
12. Determination of the rate constant of acid catalyzed hydrolysis of methylacetate.

4. Laboratory Equipment/Software/Tools Required

1. Digital Conductometer
2. Digital Potentiometer
3. Electrical Water Heater
4. Wall Mount Distillation Plant
5. Analytical/Digital Weighing Balance
6. Ostawald's Viscometer
7. Stalagnometer
8. Stop watch
9. Thermometer
10. RB Flask condenser
11. TLC Plates (silica coated)
12. TLC Chambers
13. Magnetic Stirrer
14. Iodine Blowers

5. Books and Materials

Text Books:

NIL

Reference Books:

1. S.S.Dara, *Experiments and Calculations in Engineering Chemistry,* S-Chand Publications, Revised edition., 2008.
2. Dr.M.P.SMurali Krishna and M.Gopala Krishna, *Chemistry Lab Manual*, VGS Publications.
3. Dr.A.Ravi Krishnan, Dr.T.SyedaJeelaniBasri, and Mrs.M.B.Lakshmi, *Engineering Chemistry Laboratory Manual.*

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH II SEMESTER

COURSE STRUCTURE

A4304 – ENGINEERING MECHANICS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	3	0	0	42	1.5	30	70	100

1. Course Overview:

Course Overview

The Engineering Mechanics Laboratory is well equipped with various instruments as per syllabus. Engineering Mechanics Lab is primarily dedicated to make the student to understand some basic concepts through experiment.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4304.1. Examine basic laws of Mechanics by using experiment setup.

A4304.2. Determine the co-efficient of friction between wood and various surface.

A4304.3. Apply the basic concepts of mechanics to find the Mechanical Advantage, velocity ratio and mechanical efficiency.

A4304.4. Calculate moment of Inertia of an irregular body using Computation method.

A4304.5. Analyze the different force systems by using graphical method.

3. Course Syllabus

Exp. No.1. To verify the law of Force Polygon with the help of force polygon apparatus.

Exp. No.2. To verify the law of Moments using Parallel Force apparatus. (simply supported type)

Exp.No.3. To determine the co-efficient of friction between wood and various surface (like Leather, Wood, Aluminum) on an inclined plane.

Exp. No.4. To determine the mechanical advantage, Velocity ratio and efficiency of a screw jack.

Exp.No.5. To determine the mechanical advantage, Velocity ratio and Mechanical efficiency of the Wheel and Axle.

Exp. No.6. To determine the Mechanical Advantage, Velocity Ratio of worm and Worm Wheel.

Exp. No.7. To verify the law of moments using Bell crank lever.

Exp. No.8. To determine the centre of Gravity by graphical Method.

Exp. No.9. Verification of Lami's Theorem.

Exp. No.10. To Determine the resultant of Coplanar force system by graphical Method.

Exp. No.11. To Determine the resultant of concurrent force system by graphical Method.

Exp. No.12. To determine the Moment of Inertia of Flywheel.

Exp. No.13. To determine the co-efficient of friction for different materials.

Exp. No.14. To determine the natural frequency, radius of gyration and mass moment of inertia of the given rectangular rod experimentally.

Exp. No.15. To determine the radius of gyration and the moment of Inertia of a given circular plate.

Exp. No.16. To find the forces in the members of Jib Crane.

4. Books and Materials

Text Books:

1. Timoshenko and Young2017., *Engineering Mechanics*-Mc-Graw Hill-India.
2. F. P. Beer and E. R. Johnston 2017., *Vector Mechanics for Engineers,* Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill.
3. R.K.Rajput 2001, *A text book of applied mechanics*,3rd Ed, Laxmi publications, New Delhi.
4. A.K. Sharma 2009,*Engineering Mechanics Practical*,Laxmi publications, New Delhi.

Reference Books:

1. R. C. Hibbler2017*., Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.*
2. Irving H. Shames 2017., *Engineering Mechanics,* 4th Edition, Prentice Hall.
3. Reddy Vijaykumar K. and K. Suresh Kumar,2016., *Singer's Engineering Mechanics.*
4. N.H. Dubey, 2013*., Engineering Mechanics-Statics and Dynamics*, Mc-Graw Hill-India.
5. Shanes and Rao, 2006., *Engineering Mechanics*, Pearson Education.
6. Tayal A.K. 2010., *Engineering Mechanics*, Umesh Publications.

I B.TECH II SEMESTER

COURSE STRUCTURE

A4010-ENGLISH LANGUAGE COMMUNICATION SKILLS LABORATORY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

The basic idea behind offering English as a practical subject at the undergraduate level is to acquaint the students with a language that enjoys currently as a lingua franca of the globe. In the ELCS lab the students are trained in Communicative English Skills: phonetics, word accent and intonation, making effective oral presentations – both extempore and prepared, role- play, telephonic skills, asking for and giving directions, etc. The lab encourages students to work in a group, engage in peer-reviews and inculcate team spirit through various exercises related to listening to native speakers' accent and participating in speaking activities.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4010.1. Improve his/her pronunciation.

A4010.2. Take part in role-plays and perform effectively in real-life situations.

A4010.3. Choose appropriate words and phrases to make effective telephonic conversations.

A4010.4. Minimize stage fear and make effective presentations.

A4010.5. Build sustained conversations.

3. Course Syllabus

a. **Computer Assisted Language Learning (CALL) Lab**

b. **Interactive Communication Skills (ICS) Lab**

Module – 1:

ALL: Introduction to Phonetics - Speech Sounds – Vowels and Consonants

ICS: Ice-Breaking activity and JAM session.

Module – 2:

CALL: Past Tense Marker and Plural Marker – Syllable Structure – Consonant Clusters - Minimal Pairs

Module – 3:

ICS: Situational Dialogues – Role-Play – Expressions in Various Situations: Greetings: Self-

introduction and Introducing others – Apologies – Requests – Complaints – Congratulating – Expressing sympathy/ condolences.

Module – 4:

CALL: Basic Rules of Word Accent – Stress Shift – Weak Forms and Strong Forms.

Module – 5:

ICS: Asking for and Giving Directions – Giving Instructions – Seeking Clarifications – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Module– 6:

CALL: Neutralization of Mother Tongue Influence-Common Indian Variants in Pronunciation – Differences between British and American pronunciation.

Module – 7:

CALL: Intonation Patterns-Types of Tones - Sentence Stress.

Module – 8:

ICS: Social and Professional Etiquette - Telephone Etiquette.

Module – 9:

ICS: Oral Presentation Skills (short presentations) - Making a Presentation-Prepared – Extempore.

Module – 10:

ICS: Listening-Types of Listening-Steps to effective Listening –Business Listening Comprehension exercises.

4. Laboratory Equipment/Software/Tools Required

1. Computers with internet
2. K VAN Solutions Software
3. Headphones
4. Audio Visual Equipment

5. Books and Materials

Text Books:

NIL

Reference Books:

1. Mohanraj, J., *Let Us Hear Them Speak,* Sage Texts. Print, New Delhi, 2015.
2. Hancock, M., *English Pronunciation in Use* Intermediate, Cambridge University Press. Print, Cambridge, 2009.
3. Sanjay Kumar and PushpLata, *Communication Skills,* Oxford University Press, 2011.
4. *Exercises in Spoken English,* Parts I-III CIEFL, Oxford University Press, Hyderabad.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

I B.TECH II SEMESTER

COURSE STRUCTURE

A4021- SOCIAL INNOVATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

Social Innovation is an open ended course to develop social connectedness in engineering students through social awareness and social consciousness. This can be done through live field exposure along with faculty led conceptual presentations, real case reviews; self-study assignments, literature and field survey. Through this course, the students are expected to use their engineering knowledge to provide innovative solutions to existing social problems. This course also develops critical thinking ability among the students.

Course Pre/co-requisites

To create innovative solutions/ approaches to existing social problems by using basic engineering knowledge.

1. Course Outcomes (COs)

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

A4021.1. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions and redox potentials.

A4021.2. Apply various titrations for the estimation of strengths of solutions and hardness of water.

A4021.3. Identify different samples from a mixture by using various separation techniques.

A4021.4. Estimate rate constants of reactions from concentration of reactants/products as a function of time.

A4021.5. Evaluate the percentage of yield of chemical substances by organic synthesis.

3. Course Syllabus

Introduction to Social Innovation: Core definitions, core elements and common features of social innovation, a typology of social innovation, Awakening social consciousness.

Create Mindsets: Seven mindsets– Empathy, Optimism, Iteration, Creative confidence, Making it, Embracing ambiguity, Learning from failures.

Wicked Problems: Distinguish between simple, complicated and complex problems; describe the characteristics of wicked problems, breakdown a given problem by unpacking its complexity..

Critical Thinking for Social Innovation: Definition, engineering thinking and learning, distinguish between creativity and innovation.

Models for Creative Thinking: Appreciative Inquiry (AI), Asset Based Community Development (ABCD) and Concept of Bricolage.
Process of Social Innovation: Community study, develop questionnaire, identifying the causes of a particular problem.

Process of Social Innovation: Identify needs, record your learning's.
Process of Social Innovation: Generate ideas, select promising ideas, prototyping and testing.

Social Innovation across Four Sectors - The non-profit sector, public sector, the private sector, the informal sector, links between and cross sectors.
Stages of Innovation: Social organizations and enterprises, social movements, social software and open source methods, common patterns of success and failure.

4. Laboratory Equipment/Software/Tools Required

1. Computer Systems

5. Books and Materials

Text Books:

1. Robin Murray, Julie Caulier - Grice, Geoff Mulgan, "The open book of social innovation: Ways to Design, Develop and Grow Social Innovation", The Young Foundation, 2010.
2. Julie Caulier-Grice, Anna Davies, Robert Patrick & Will Norman, The Young Foundation (2012) Social Innovation Overview: A deliverable of the project: "The theoretical, empirical and policy foundations for building social innovation in Europe" (TEPSIE), European Commission–7th Framework Programme, Brussels: European Commission, DG Research.

Reference Books:

1. Geoff Mulgan, "Social Innovation: What it is, Why it matters and How it can be accelerated", The Young Foundation, 2007.
2. Asset Based Community Development (ABCD) Model –http://www.nurturedevelopment.org/asset-based-community-development/.
3. Diana Whitney & Amanda Trosten-Bloom, "The Power of Appreciative inquiry – A Practical Guide to Positive Change", 2nd Edition, Berrett-Koehler Publishers, Inc, 2010.

SYLLABI FOR II YEAR I SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH I SEMESTER

COURSE STRUCTURE

A4101 – BUILDING PLANNING AND DRAWING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

This is the fundamental course in Civil Engineering. This course helps students understand terminology, materials used and various standard dimensions of a building.This course covers the study of building bye laws which plays vital role in planning of a building. Also deals with the planning of various buildings such as hospital, educational, commercial, residential and public buildings etc. This course also covers the drawing of various sign conventions, doors, windows, ventilators, trusses and section, plan and elevation of the buildings. This is an integrated course having theory and practical components that integrates theory with actual plan drawing. This course forms basis for advance courses like Construction Project Management

Course Pre/co-requisites

The course has no specific pre-requisite and co-requisite

2. Course Outcomes (COs)

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

A4101.1. Use the Building Bye laws and Principles of Planning to develop a building plan.
A4101.2. Inspect the plan for residential and other public buildings according to local body norms.
A4101.3. Plan, schedule and monitor the project for efficient allocation of resource in projects.
A4101.4. Develop and choose parts of building for maximum ventilation and lighting for efficient power utilization and health of inmates.
A4101.5. Model Plan, elevation and section for flat buildings for given land area.

3. Course Syllabus

Theory

BUILDING BYELAWS AND REGULATIONS: Introduction, Terminology, Objectives of building byelaws, Floor area ratio (FAR) and Floor space Index (FSI), Principles underlying building byelaws, classification of bye buildings.

OPEN SPACE REQUIREMENTS, built up area limitations, Height of Buildings, Wall thickness, lighting and ventilation requirement

RESIDENTIAL BUILDINGS: Minimum standards for various parts of buildings, requirements of different rooms and their grouping, characteristics of various types of residential buildings.

PUBLIC BUILDINGS: Planning of Educational institutions, hospitals, dispensaries, Office buildings, banks, industrial buildings, hotels and motels, buildings for recreation.
PLANNING OF CONSTRUCTION PROJECTS: scheduling and monitoring Bar chart, CPM and PERT Network planning, Computation of times and floats their significance

Practice

1. **SITE LAYOUT:** marking of frontage and open spaces around building, minimum plinth height and height of building.
2. **SIGN CONVENTIONS & SYMBOLS:** 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.
3. English bond odd & even courses for one, one and half and two brick walls in thickness at the junction of a corner.
4. Flemish bond odd & even courses for one, one and half and two brick walls in thickness at the junction of a corner.
5. **DOORS & WINDOWS:**Paneled and glazed door, glazed windows – paneled Windows.
6. **VENTILATORS AND ROOFS:** fixed ventilator, Couple roof and Collar roof, King Post truss and Queen post truss.
7. **STAIR CASE:**Straight stair case with two flights
8. **ROOM LAYOUTS:**Living , dining , kitchen, bed room, bath and water closet layouts
9. **BUILDINGS:** Given line diagram with specification to draw plan, section and elevation of a building
10. **OFFICE BUILDING:** Given line diagram with specification to draw plan, section and elevation of a office building
11. **TWO STOREY RESIDENTIAL BUILDING:** Given line diagram with specification to draw plan, section and elevation of a office building

4. Books and Materials

Text Books:

1. Dr. N. Kumara swamy & A. Kameswara Rao, *Building Planning and Drawing*,9th Edition 2019 (Revised & Enlarged), Charotar Publishing House Pvt Ltd, New Delhi, India.
2. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain ,*Building Construction*,Eleventh 2019,Laxmi Publications (P) ltd., New Delhi, India.

Reference Books:

1. R.L. Peurifoyetal, *Construction Planning, Equipment and methods*, Tata Mc. Graw Hill Publications, New Delhi, India
2. SP 7 : 2016 National Building Code of India 2016
3. Municipal Administration and Urban Development Department – Telangana Building Rules, 2012
4. P. C. Varghese ,*Building materials*, Prentice Hall of India private Ltd, New Delhi, India.
5. S. K. Duggal ,*Building materials,* Second Edition, New Age International Publishers, New Delhi, India

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH I SEMESTER

COURSE STRUCTURE

A4102 – FLUID MECHANICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description COURSE STRUCTURE

Course Overview

Fluid mechanics is the fundamental course of civil engineering, which deals with fluid mechanical principles and applications with mathematical descriptions. The course is useful in understanding providing solutions to many scientific and technological problems including chemical and industrial processes of mechanical systems. The course covers fluid statics (fluids at rest), fluid kinematics (fluids in motion) and fluid dynamics (effect of forces on fluid motion). After completion of the course, the students will understand the principles of Fluid Mechanics and will be able to apply, analyze and evaluate fluid mechanical systems.

Course Pre/co-requisites

The course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4102.1 Classify the various types of fluids and their applications

A4102.2 Apply the theories of fluid statics and dynamics to solve problems in a fluid flow

A4102.3 Analyze the boundary layer effect on the fluid flow

A4102.4 Explain the properties of fluids based on the laws of fluid.

A4102.5 Categorize various pipe networks on the basis of distribution systems.

3. Course Syllabus

Properties of Fluids: Introduction of fluids, Physical properties of fluids-mass density, weight density, specific gravity, specific volume, viscosity, surface tension, vapour pressure, cavitation and their influences on fluid motion, Classification of fluids: Newtonian and Non-Newtonian fluids, Newton's law of Viscosity and applications.

Hydrostatic Forces: Total pressure and centre of pressure, Hydrostatic forces on submerged planes - Horizontal, Vertical, inclined and curved surfaces, Principle of Buoyancy-metacentric height, conditions of Equilibrium.

Pressure Measurement: fluid pressure at a point, Pascal's law, Hydrostatic law, atmospheric, gauge and vacuum pressure. Measurement of Pressure- simple Manometers, differential Manometers.

Fluid Kinematics: Introduction, Methods of Describing fluid motion - Eulerian and Lagrangian Approach, Stream line, path line, streak lines and stream tube. Classification of flows: Steady-unsteady, uniform-non uniform, laminar-turbulent, rotational - Irrotational flows. Equation of continuity for one, two, three dimensional flows, velocity and acceleration functions, Stream Function and Velocity Potential Functions, Flow Net Analysis.

Fluid Dynamics: Surface and body forces - Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, applications of Bernoulli's equation - Pitot tube, Venturi-meter and orifice meter, Momentum equation and its application - forces on pipe bend.
Notches and Weirs: Classification of Notches and Weirs, Discharge over rectangular, triangular and trapezoidal and Stepped notches, Velocity of Approach concept, Discharge over a Broad crested, Cipolletti, Narrow crested, Ogee weirs.

Boundary Layer Theory: Introduction, Definitions, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, drag force on a Flat Plate due to Boundary Layer-laminar and turbulent Boundary layers, separation of Boundary Layer, Methods of preventing the separation of Boundary Layer, flow around submerged objects - Drag and Lift- Magnus effect.

Flow Through Pipes: Introduction, Reynolds's experiment - Characteristics of Laminar & Turbulent flows. Loss of Energy in Pipes-Major, Minor losses, losses - pipes in series- pipes in parallel - Total energy line and hydraulic gradient line. Equivalent pipe concept, flow through branched pipes, water hammer in pipes

4. Books and Materials

Text Books:

1. Dr.R.K. Bansal, *Fluid Mechanics and Hydraulic Machines*, Laxmi Publications (p).Ltd,New Delhi, 10th Edition, 2018.

Reference Books:

1. Modi and Seth, *Fluid Mechanics*, Standard book house, 2012.
2. S.K.Som&G.Biswas, *Introduction to Fluid Machines*, Tata McGraw-Hill publishers Pvt. Ltd, 2013.
3. K.Subramanya, *Fluid Mechanics and Hydraulic Machines*", McGraw Hill Education, 1st Edition, 2019.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH I SEMESTER

COURSE STRUCTURE

A4103 – STRENGTH OF MATERIALS-I

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	2	42	14	28	5	30	70	100

1. Course Description

Course Overview

Strength of material is a fundamental course in Civil Engineering. This course primarily deals with the internal resistance mechanism of structures when it subjected to external loading. This course will begin by covering simple stress-strain relationship. Then it covers the shear force and bending moment diagrams for different support condition and different loading conditions. Then it moves on to flexural stress, shear stress, and deflection of the materials. This course forms a basis for the study of advanced subjects like structural analysis, design of reinforced concrete structures and design of steel structures.

Course Pre/co-requisites

A4303-Engineering Mechanics

2. Course Outcomes (COs)

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

A4103.1. Interpret the engineering properties of the materials

A4103.2. Identify shear force and bending moment in a member for different support conditions

A4103.3. Apply theory of simple bending on various sections.

A4103.4. Analyse slope and deflection of beams using classical and analytical methods.

A4103.5. Estimate the principle stresses using graphical method.

3. Course Syllabus

Theory

Simple stresses and strains: Stress -strain diagram for mild steel, working stress, poison's ratio and elastic moduli and the relationship between them, bars of varying section composite bars temperature stresses. Strain energy: resilience, applications.

Concept of shear force and bending moment: SFD and BMD for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L, uniformly varying loads, Point of contra flexure Relation between S.F., B.M and rate of loading at a section of a beam.

Theory of simple bending: Determination of bending stresses section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections Design of simple beam sections.

Derivation of formula Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T, angle sections.

Determination of slope and deflection: Calculation of cantilever and simply supported beams subjected to various loads. Double integration and Macaulay's methods. Mohr's theorems, moment area method application to simple cases including overhanging beams.

Principal stresses and strains:two perpendicular normal stresses accompanied by a state of simple shear, Mohr's circle of stresses- principle stresses and strains- analytical and graphical solutions

Practice

1. Tension test (Stress-strain curve for mild steel)
2. Compression test on wood or concrete
3. Bending test on simple support beam
4. Bending test on (Steel / Wood) Cantilever beam
5. Verification of Maxwell's Reciprocal theorem on beams
6. Continuous beam - deflection test
7. Hardness test
8. Impact test
9. Shear test
10. Use of strain gauges

4. Laboratory Equipment/Software/Tools Required

1. Universal testing machine
2. Compression testing machine
3. Dial gauges and fixing stands
4. Brinell hardness testing machine
5. Impact testing machine
6. Shear testing machine
7. Strain gauges

5. Books and Materials

Text Books:

1. Bansal R. K, *Strength of Materials*, Laxmi Publications, 2010.

Reference Books:

1. Beer, F.P., Johuston, Jr., E.R., Dewolf, J.T. and Mazureu, D.E., *Mechanics of Materials*, 5th Edition, McGraw Hill, 2009.
2. Timoshenko, S.P. and Young, D.H., *Elements of Strength of Materials*, 5th Edition, (In MKS Units), East-West Press Pvt. Ltd., 2009.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH I SEMESTER

COURSE STRUCTURE
A4104 – SURVEYING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

This course offers to undergraduate students to understand the fundamentals of surveying measurement and levelling. This includes an overview of field techniques, instrumentation, measurement of horizontal distance, area, sources and types of errors and their corrections. This course also includes preparation of contour maps, plans by utilizing the available data of field.

Course Pre/co-requisites

The course has no specific pre-requisite and co-requisite.

2. Course Outcomes (COs)

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

A4104.1. Classify surveying based on topographical conditions
A4104.2. Utilize instruments at required levels of surveying
A4104.3. Inspect methodological errors and corrections while performing surveying
A4104.4. Apply different methods of contouring.

3. Course Syllabus

Theory

Introduction: Introduction to Surveying – objectives – classification – principles of surveying.
Chain surveying: Introduction to Chain surveying – Instruments for chaining – obstacles in chaining – Traversing – plotting – errors, corrections in chaining – problems.

Compass surveying: Introduction to compass surveying – Types of compasses – Designation of bearings – Calculation of included angles from bearings – Traversing – Local attraction – Errors and corrections – problems**.**

Plane table surveying: Introduction to plane table surveying – Accessories of plane table – Methods of plane tabling – Errors – problems.

Levelling: Introduction to Leveling – Types of leveling – Bench mark – Temporary and permanent adjustments – Reduction and arithmetic checks - Height of instrument method – Rise and fall method – Fly leveling – longitudinal leveling – Cross-sectional leveling – plotting – Errors.

Contouring: Introduction to contouring – methods of contouring – characteristics and uses – Interpolation of contours.

Practice

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 by plane Table survey
6. Intersection methods by plane Table survey
7. Fly leveling (differential leveling)
8. An exercise of Longitudinal profile
9. An exercise of cross sectional profile.
10. Two exercises on contouring.

4. Laboratory Equipment/Software/Tools Required

1. 20m chains/30m chains
2. Tapes
3. Ranging Rods
4. Arrows
5. Cross staff
6. Prismatic compass
7. Auto level
8. Levelling staff

5. Books and Materials

Text Books:

1. Dr. B.C. Punmia, Er. Ashok K. Jain and Dr.Arun K. Jain., *Surveying Vol-1*, Sixteenth Edition, Laxmi Publications (P) Ltd., 2005.

Reference Books:

1. N. N. Basak., *Surveying and Leveling Vol-1*, Second edition, McGraw Hill., 2014.
2. S. K. Duggal., *Surveying Vol-1*, Fourth edition, McGraw Hill., 2013.
3. S. S. Bhavikatti., *Surveying and Levelling Vol-1*, I. K. International Publishing House Pvt. Ltd., 2008.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH I SEMESTER

COURSE STRUCTURE
A4017 – QUANTITATIVE APTITUDE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	0	28	0	0	1	30	70	100

1. Course Description

Course Overview

This course provides the basic skills required in solving the problems of Aptitude required by various companies for Campus Recruitment and competitive tests. The contents of course include solving problems on different concepts such as – Permutations and Combinations, Averages, Percentages and Logarithms etc.

Course Pre/co-requisites

To equip learners with the knowledge and skills required to get placed in reputed companies and appear for competitive exams.

2. Course Outcomes (COs)

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

A4017.1. Interpret data using graphs and charts.

A4017.2. Apply the concepts of ratios, proportions and percentages to solve problems.

A4017.3. Solve problems on Logarithms, permutations, combinations, clocks, and calendars.

3. Course Syllabus

Ratio and Proportion: Ratio, Proportion, Variations, Problems on Ages

Average, Mixtures and Alligation: Averages, Weighted average, Difference between mixture and alligation, Problems on Mixtures and allegation

Percentages, Simple Interest (SI) and Compound Interest(CI): Fundamentals of Percentage, Percentage change, SI and CI, Relation between SI and CI.

Data Interpretation: Introduction, Tabulation, Bar Graph, Pie Charts, Line Graphs, Combined Graphs.

Profit and Loss, Partnerships: Basic terminology in profit and loss, Types of partnership, Problems related to partnership

Logarithms: Fundamental formulae of logarithms and problems, finding number of terms on expanding a given number.

Permutations and Combinations: Fundamentals counting principle, Definition of Permutation, Seating arrangement, Problems related to alphabets, Rank of the word, Problems related to numbers, Circular permutation, Combination.

Clocks: Introduction, Finding angle between hands of clock, Gain or loss of time
Calendar: Calendars method- 1, Calendars method -2

4. Books and Materials

Text Books:

1. R.S Aggarwal , *Quantitative Aptitude for competitive examinations*, 2017 edition, S.Chand.

Reference Books:

1. Abhijit Guha, *Quantitative Aptitude for competitive examinations*, 6th Edition, McGraw Hill Education.
2. Dinesh Khattar, *The Pearson guide to Quantitative Aptitude for Competitive Examinations*, 3rd Edition, Pearson Education.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH I SEMESTER

COURSE STRUCTURE

A4025– Managerial Economics and Financial Analysis

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course addresses the concepts, principles and techniques of Managerial Economics and Financial Analysis. It covers the fundamentals of Managerial Economics and its various aspects. Apart from Capital budgeting and its techniques, financial analysis gives clear idea about concepts and conventions of accounting, accounting procedures like journal, ledger, trial balance, final accounts and interpretation of financial statements through ratios.

Course Pre/co-requisites

A4025 – NIL

2. Course Outcomes (COs)

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

A4025.1. Explain the concepts of Managerial Economics and Financial Accounting.
A4025.2.Analyze interrelationship among various economic variables and it's impact.
A4025.3.Classify the market structure to decide the fixation of suitable price.
A4025.4.Analyze financial statements to assess financial health of business.
A4025.5.Apply capital budgeting techniques to select best investment opportunity.

3. Course Syllabus

INTRODUCTION TO MANAGERIAL ECONOMICS & DEMAND: Managerial Economics - Meaning, Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand - Meaning, Types, Demand Determinants, Law of Demand and its assumptions & exceptions.

ELASTICITY OF DEMAND & DEMAND FORECASTING: Elasticity of Demand - Meaning, Types, Measurement and Significance. Demand Forecasting - Meaning, Need, Methods of demand forecasting.

PRODUCTION ANALYSIS: Production – Meaning, Production function, Production function with one variable input, Iso-quants and Iso-costs, MRTS, Least Cost Combination of Inputs, Law of returns to scale.

COST & BREAK EVEN ANALYSIS: Cost- Meaning, Cost Concepts - Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Marginal cost, Sunk cost. Break-even Analysis (BEA)- Determination of Break-Even Point (simple problems) - Significance and limitations of BEA.

INTRODUCTION TO MARKETS: Market – Meaning, structure, Types of competition - Features of Perfect competition, Monopoly, Monopolistic Competition and Oligopoly - Price-Output Determination in case of Perfect Competition, Monopoly.

PRICING: Objectives and Pricing policies - Methods of Pricing -Cost plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.

INTRODUCTION TO FINANCIAL ACCOUNTING: Accounting Principles - Concepts, Conventions - Double-Entry Book Keeping - Journal, Ledger, Trial Balance.

PREPARATION OF FINANCIAL STATEMENTS: Final Account problems with simple adjustments.

FINANCIAL ANALYSIS THROUGH RATIOS: Ratio Analysis – Meaning, importance - Types: Liquidity Ratios, Solvency Ratios, Turnover Ratios and Profitability ratios. (Simple problems).

CAPITAL BUDGETING: Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting - Payback Method, Accounting Rate of Return (ARR), Net Present Value Method, Profitability Index, Internal rate of return (simple problems).

4. Books and Materials

Text Books:

1. A.R. Aryasri (2011), *Managerial Economics and Financial Analysis*, TMH, India.

Reference Books:

1. Varshney&Maheswari (2003), *Managerial Economics*, Sultan Chand.
2. Ambrish Gupta (2011), *Financial Accounting for Management: An Analytical Perspective*, 4th Edition, Pearson Education, New Delhi.
3. Richard Lipsey and Alec Chrystal (2012), Economics, Oxford University Press.
4. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition,Thomson.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH I SEMESTER

COURSE STRUCTURE

A4014 – ENVIRONMENTAL SCIENCE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	0	0	100	100

1. Course Description

Course Overview

Through this course students engage with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world. The course requires that students identify and analyze natural and human-made environmental problems, evaluate the relative risks associated with these problems, and examine alternative solutions for resolving or preventing them. It is essentially a multidisciplinary approach that brings about an appreciation of our natural world and human impact on its integrity. Its components include biology, geology, chemistry, physics, engineering, sociology, health, anthropology, economics, statistics, computers and philosophy.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

A4014.1. Identify the important components of environment

A4014.2. Identify global environmental problems and come out with best possible solutions.

A4014.3. Apply environmental laws for the protection of forest and wildlife

A4014.4. Apply the knowledge of Environmental ethics to maintain harmonious relation between nature and human being.

A4014.5. Illustrate the major environmental effects of exploiting natural resources.

3. Course Syllabus

INTRODUCTION: Definition, The Multidisciplinary nature of environmental studies, importance of environmental education, need for public awareness.

ECOSYSTEMS: Ecosystem Definition. Classification of ecosystems. Structure of an ecosystem: Producers, Consumers and Decomposers. Function of ecosystems: Food chains, food webs and Energy flow in an ecosystem. Ecological pyramids: Pyramid of number, Pyramid of biomass and Pyramid of energy. Ecological succession.

BIOGEOCHEMICAL CYCLES: Definition, Carbon cycle, Hydrologic cycle and Nitrogen cycle.

NATURAL RESOURCES

CLASSIFICATION OF RESOURCES: Renewable and Non-renewable resources.

NATURAL RESOURCES AND ASSOCIATED PROBLEMS:

FOREST RESOURCES: Use and over – exploitation, deforestation, Timber extraction, Mining, dams and other effects on forest and tribal people.
WATER RESOURCES: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems.
MINERAL RESOURCES: Use and exploitation, environmental effects of extracting and using mineral resources.
FOOD RESOURCES: World food problems, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
ENERGY RESOURCES: Growing energy needs, renewable energy resources-solar energy, wind energy, geothermal energy. Bio fuels- definition, Gobar gas production and biodiesel production by trans esterification.
LAND RESOURCES: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

BIODIVERSITY AND ITS CONSERVATION :
Introduction and definition. Genetic diversity, species diversity and ecosystem diversity. Values of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values. Threats to biodiversity: Habitat loss, Poaching of wildlife, Man-wildlife conflicts. In-situ conservation of biodiversity. Ex-situ conservation of biodiversity. Endangered and endemic species of India. Hot-spots of biodiversity. India as a mega diversity nation.

ENVIRONMENTAL POLLUTION:
Definition, causes, effects and control measures of : Air Pollution, Water pollution, Marine pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear pollution. Eutrophication, bio-magnification. Solid waste management: Causes, effects and methods of solid waste disposal. E-waste. Role of an individual in prevention of pollution. Disaster management: Floods, Earthquakes and Cyclones. Pollution case studies.
GLOBAL ENVIRONMENTAL PROBLEMS AND GLOBAL EFFORTS: Global warming, Acid rain, Ozone layer depletion. Kyoto protocol1997, Carbon credits, clean development mechanism.

SOCIAL ISSUES AND THE ENVIRONMENT: Concept of sustainable development. Threats to sustainability: Population explosion, Crazy consumerism, Over exploitation of resources. Environmental economics: Strategies of environmental economics. Green Building definition, green building materials, energy considerations in green buildings, water requirement in green buildings, health considerations in green buildings. Role of information Technology in Environment and human health. Water conservation, Rainwater harvesting, watershed management, A brief study about Environmental performance Index(EPI), mission Kakatiya, water man of India Dr. Rajendra singh and Anna hazare watershed management development programme. Environmental ethics. A brief study about Bishnoi tribe environmental conservation, Khejarli massacre.

ENVIRONMENTAL POLICIES AND LEGISLATIONS: Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act.

4. Books and Materials

Text Books:

1. Textbook of *Environmental Studies for Undergraduate Courses* by ErachBharucha for University Grants Commission.
2. *Environmental Studies* by R.J. Ranjit Daniels, JagdishKrishnaswamy,first edition,Wiley India (P)Ltd., New Delhi. ISBN 9788126519439.
3. *Environmental Studies* by Anubha Kaushik, C.P. Kaushik, 4th edition, New age international publishers, New Delhi.
4. *Environmental studies* by Benny joseph, Third edition, McGraw Hill Education (India) Private Limited, Chennai.

Reference Books:

1. *Environmental science* by Daniel B.Botkin & Edwards A.Keller, 8th edition, International student version, Wiley India (P) Ltd., New Delhi. ISBN 9788126534142.
2. *Environmental Science*: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
3. *Ecology And Environment* by P.D.Sharma, 2005 reprint edition, Rastogi Publications, Meerut, Uttar Pradesh. ISBN 8191339050.

SYLLABI FOR II YEAR II SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH II SEMESTER

COURSE STRUCTURE

A4019-VERBAL ABILITY AND LOGICAL REASONING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	0	14	0	0	1	30	70	100

1. Course Description

Course Overview

This course provides the basic skills of verbal and logical reasoning as required by companies for Campus Recruitment and also for other Competitive exams. The contents of this course includes different techniques of solving problems on Coding and Decoding, Seating Arrangements, Syllogisms, Blood Relations, Visual reasoning and brief account on basic grammar such as Error detection, Modifiers, Articles etc .

Course Pre/co-requisites

To equip learners with the knowledge and skills required to get placed in reputed companies and other competitive exams.

2. Course Outcomes (COs)

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

A4019.1. Identify efficient and appropriate methods to solve logical reasoning problems.

A4019.2. Choose the techniques to solve puzzles on analytical reasoning.

A4019.3. Apply the grammar rules for effective sentence formation.

3. Course Syllabus

Coding and Decoding: Coding and Decoding, Arrow Method, Chinese coding, Series, Analogy, Odd man out.

Articles and Tenses: Introduction, usage of articles, Omission of Articles, Types of tenses, Forms and Usage of tenses.

Direction Sense: Introduction, Distance method, Facing Method and Shadow Method.

Blood Relations: Introduction, Direct, Puzzle and Coded models.

Voices and Forms of Speech: Introduction, conversion of active and passive voice, conversions of direct and indirect speech.

Data Arrangements: Linear Arrangement, Circular Arrangement, Multiple Arrangements.

Syllogisms: Introduction, Tick-Cross method, Inferential Technique, Venn-Diagram method.

Visual Reasoning: Patterns, Folded Images, Cubes and Analytical Reasoning.

Sentence Correction: Subject-Verb Agreement, Pronoun Antecedent, Parallelism, Verb-Time Sequence Error, Determiners and Modifiers.

4. Books and Materials

Text Books:

1. R.S. Aggarwal, Vikas Aggarwal, *Quick Learning Objective General English,* S.Chand, 2003.
2. *R*.S. Aggarwal, *A Modern Approach to Logical Reasoning*, Revised Edition, S Chand & Co Ltd.

Reference Books:

1. Edgar Thorpe, *Test of Reasoning for all competitive examinations*, 6th Edition, McGraw Hill Education, 2017.
2. Arun Sharma, *How to Prepare for Logical Reasoning for CAT and other Management Examination*s, 4th edition, McGraw Hill Education, 2017.
3. SimboNuga, *English Grammar and Verbal Reasoning – The Toolkit for Success*, Trafford Publishing, 2013.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH II SEMESTER

COURSE STRUCTURE

A4012 – PROBABILITY AND STATISTICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	1	0	28	14	0	3	30	70	100

1. Course Description

Course Overview

This course provides a solid undergraduate foundation in both probability theory and mathematical statistics and at the same time provides an indication of the relevance and importance of the theory in solving practical problems in the field of multidisciplinary engineering applications. The mathematical skills sustained from this course form a suitable base to analytical and theoretical concepts encountered in engineering profession.

Course Pre/co-requisites

The course has no specific prerequisite and co-requisite

2. Course Outcomes (COs)

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

A4012.1. Solve basic concepts of probability and perform probability theoretical distributions
A4012.2. Identify the types of random variables and various distributions
A4012.3. Make use of probability distributions to analyze and solve a given problem
A4012.4. Build practical understanding of various concepts of statistics
A4012.5. Inspect scientific hypothesis and theories

3. Course Syllabus

Probability: Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Bayes' Theorem.

Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence, Joint Probability Distributions. Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables.

Discrete and Continuous Distributions: Moment generating function, moments and properties. Discrete distributions: Binomial distribution, Poisson Distribution, Continuous Distribution: Uniform distribution, Normal distribution, Evaluation of all statistical constants of above mentioned distributions through moments, MGF.

Estimation and Testing of Hypothesis for Large samples: Point estimation, Maximum error estimate, Interval Estimation, Introduction to Hypothesis, Type I and Type II error, Level of significance, one tailed and two tailed test, Test concerning one mean and one proportion, Two means and two Proportions.

Testing of Hypothesis for Small samples: Test for single mean, difference of means and paired t-test, Test for ratio of variances (F-test), Chi-square test for goodness of fit and independence of attributes.

4. Books and Materials

Text Book(s)

1. Ronald E. Walpole,Raymond H. Myers,Sharon L. Myers,Keying Ye.,*Probability & Statistics for Engineers & Scientists,* 9th Edition,Pearson Publication, 2012.
2. S.C. Gupta and V. K. Kapoor**,** *Fundamentals of Mathematical statistics*, Tenth Revised Edition, S Chand & Sons, New Delhi, 2000.

Reference Book(s)

1. T.T. Soong,*Fundamentals of Probability and Statistics for Engineers**,**John Wiley & Sons, Ltd, 2004*
2. Sheldon M Ross, *Probability and Statistics for Engineers and Scientists*, 4th Edition, Academic Press**,** 2009.
3. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH II SEMESTER

COURSE STRUCTURE

A4105 – STRENGTH OF MATERIALS-II

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

This course is the extension of the course Strength of Materials I. The basics learnt in the previous course are extended to more complex geometry and loading conditions. This course is intended to introduce the basic principles for the design of power transmission of shafts, springs, columns and struts, beams curved in plan, beam-columns, dams, chimneys, retaining walls, unsymmetrical beams, thin and thick cylinders. This course imparts adequate knowledge to continue the design and research activity in structural analysis.

Course Pre/co-requisites

- A5103-Strength of Materials-I

2. Course Outcomes (COs)

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

A4105.1. Identify the parameters that characterize structural behavior and describe their role.

A4105.2. Apply classical theories and failures to compute different types of response in the structural elements.

A4105.3. Solve the problems of various structural members subjected to different loading systems.

A4105.4. Analyze structural members subjected to different loading conditions to compute design parameters.

A4105.5. Determine the stresses developed in members and shear centre for different sections.

3. Course Syllabus

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\theta/L$, Assumptions made in the theory of pure torsion, Torsional moment of resistance, Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

Springs: Introduction, Types of springs, deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

Columns and Struts: Introduction, Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns, assumptions,

Derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column, slenderness ratio, Euler's critical stress, Limitations of Euler's theory, Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Straight line formula – Prof. Perry's formula.

Beam Columns: Laterally loaded struts – subjected to uniformly distributed and concentrated loads Maximum B.M. and stress due to transverse and lateral loading.

Direct and Bending Stresses: Stresses under the combined action of direct loading and bending moment, core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability.

Beams Curved in Plan: Introduction – circular beams loaded uniformly and supported on symmetrically placed Columns – Semi-circular beam simply-supported on three equally spaced supports.

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells.

Thick Cylinders: Introduction, Derivation of Lame's formulae, distribution of hoop and radial stresses across thickness – compound cylinders, Necessary difference of radii for shrinkage – Thick spherical shells.

Unsymmetrical Bending: Introduction – Properties of Beam Cross-section – Stress in Unsymmetrical Bending – Deflection of Beams in Unsymmetrical Bending.

Shear Centre: Introduction – Determination of Shear Centre for Channel section and I-section.

4. Books and Materials

Text Book:

1. Bansal R. K, *Strength of Materials*, Laxmi Publications, 2010.

Reference Books:

1. R. Subramanian, *Strength of Materials*, Oxford University Press 2010
2. S. S. Rattan, *Strength of Materials*, Tata McGraw Hill Education Pvt. Ltd.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH II SEMESTER

COURSE STRUCTURE

A4106 – CONCRETE TECHNOLOGY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

Concrete technology is a fundamental course in civil engineering. This course mainly deals with preparation and handling of concrete. This course starts by covering properties of concrete constituents and usage of admixtures. Thereafter, it covers the tests on fresh and hardened concrete for field applications. Subsequently, it also covers mix design for different grades and special concretes. This course develops the basic fundamentals for the reinforced concrete design and pre-stressed concrete.

Course Pre/co-requisites

The course has no specific prerequisite and co-requisite

2. Course Outcomes (COs)

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

A4106.1. Evaluate properties of concrete manufacturing materials to check their quality

A4106.2. Measure properties of fresh and hardened state of concrete.

A4106.3. Understand properties of various types of Admixtures and their applications.

A4106.4. Design Different Grades of Concrete Mixes for various field applications.

A4106.5. Explain various types of special concrete and their use.

3. Course Syllabus

Theory

CEMENT: Portland cement- chemical composition- Hydration of cement -Structure of Hydrated cement test on physical properties- Different grades of cement.

AGGREGATES: Classification of aggregate- Physical and Mechanical Properties of Aggregates- Deleterious substance in aggregate- Soundness of aggregate- Alkali aggregate reaction- Thermal properties of Aggregates-Grading of Aggregates-Sieve Analysis—Standard Grading Curves-Manufactured Sand.

ADMIXTURES: Types of admixtures- mineral and chemical admixtures- properties-dosages- effects - usage.

FRESH 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.

HARDENED CONCRETE: Water/cement ratio- Gel space ration- Nature of strength of concrete- Maturity concept- Strength in tension & compression- Factors affecting strength- Relation between compression & tensile strength- Curing.

TESTING OF HARDENED CONCRETE: Compression tests- Tension tests- Factors affecting strength flexure tests- Split tensile test- Pull-out test, Non-destructive testing methods- Codal provisions for NDT. Elasticity, Creep& Shrinkage-Modulus of elasticity- Dynamic modulus of elasticity-Creep of concrete Factors influencing creep- Relation between creep & time- Effects of creep- Shrinkage- types of shrinkage.

MIXED DESIGN: Factors, the choice of mix proportions- Durability of Concrete-Quality Control of concrete- Statistical Quality Control- Acceptance criteria- Proportioning of concrete mix by normal and pumpable concretes by BIS method, ACI Method, DOE Method, Design of High Strength Concrete mix.

SPECIAL CONCRETES: Lightweight concrete mix design-No-fines Concrete- Fiber reinforced concrete Polymer concrete- Self-compacting concrete -Geopolymer Concrete-High Performance Concrete.

Practice

1. TEST ON CEMENT

1.1. Normal Consistency and fineness of cement.
1.2. Initial setting time and final setting time of cement.
1.3. Specific gravity of cement
1.4. Soundness of cement.
1.5. Compressive strength of cement.

2. TEST ON AGGREGATE

2.1. Sieve Analysis and gradation charts
2.2. Bulking of sand.
2.3. Bulk and compact densities of fine and coarse aggregates

3. TEST ON FRESH CONCRETE

3.1. Slump test
3.2. CF (compact factor test)
3.3. Vee-bee Test
3.4. Flow Table Test

4. SELF COMPACTING CONCRETE

4.1. Slump cone
4.2. V funnel

4.3. L Box
4.4. J-Ring

5. TEST ON HARDENED CONCRETE

5.1. Compression test on cubes
5.2. Flexure test
5.3. Splitting Tensile Test

6. NON DESTRUCTIVE TEST OF CONCRETE

6.1. Rebound hammer
6.2. Ultrasound pulse Velocity (UPV)

4. Laboratory Equipment/Software/Tools Required

1. Vicat's Apparatus.
2. Le-Chatelier Mould.
3. Le-Chatelier Water Bath.
4. Compaction Factor Apparatus.
5. Slump Test Apparatus.
6. Density Basket.
7. Concrete cube Moulds (150mmX150mmX150mm).
8. Concrete cube Moulds (70.6mmX70.6mmX70.6mm).
9. Cylindrical Moulds 150×300mm.
10. Vibrating Table.
11. Vibrating Machine.
12. Oven (300mmx300mmx300mm).
13. Vee-Bee Consist meter.
14. Specific Gravity Bottle 50ml.

5. Books and Materials

Text Books:

1. Concr*ete Technology by M. S. Shetty. – S. Chand & Co. 2004*
2. *Concrete Technology* by A.M. Neville. – Pearson Education Limited, 2011.

Reference Books:

1. *Concrete Technology* by Job Thomas, Cengage Learning
2. *Concrete Technology* by M.L. Gambhir, Tata McGraw Hill publishers, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH II SEMESTER

COURSE STRUCTURE

A4107 – STRUCTURAL ANALYSIS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course is offered to undergraduate students to deal with analysis of static determinate and indeterminate structures under different static loading conditions. It introduces analysis of determinate and indeterminate curved and flexural members under different static loading conditions. The course also includes developing of shear force, bending moment diagrams and elastic curves in the structural system.

Course Pre/co-requisites

- A4103- Strength of Materials-I

2. Course Outcomes (COs)

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

A4107.1. Classify two and three hinged arches and indeterminacies
A4107.2. Solve bending moments using distribution methods
A4107.3. Determine slope/rotation using slope deflection method
A4107.4. Analyse arches and portal frames
A4107.5. Construct bending moment and shear force diagrams

3. Course Syllabus

Introduction to determinate and indeterminate structures: Determination of static and kinematic indeterminacies for two- & three-dimensional frames. ARCHES: Introduction to arches and their classification – Analysis of three-two hinged parabolic and circular arches - Secondary stress in two hinged arches due to temperature and elastic shortening of rib.

Fixed beams: Analysis of fixed beams with and without varying moments of inertia, subjected to 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 for Fixed Beams - Effect of rotation of a support - Effect of sinking of supports.

Continuous beams: Clapeyron's theorem of three moments - Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed - Continuous beams with overhang - Effect of sinking of supports.

Slope - deflection method: Derivation of slope- deflection equation - Application to continuous beams with and without settlement of supports - Analysis of single bay - single storey Portal Frames Including Side Sway - Shear force and bending moment diagrams

Moment distribution method: Distribution theorem – Carryover theorem - Application to continuous beams with and without settlement of supports - Analysis of single bay single storey Portal Frames including side sway - Shear force and bending moment diagrams

Kani's method: Analysis of continuous beams including settlement of supports - Analysis of single bay single storey and single bay two storey Frames including Side sway - Shear force and bending moment diagrams.

4. Books and Materials

Text Books:

1. S. Ramamrutham and R. Narayan, *Theory of Structures*, Dhanpat Rai Publishing Company, 2014.
2. Russell Hibbeler, *Structural Analysis*, Pearson/Prentice Hall, 10th Edition, 2018.

Reference Books:

1. S. S. Bhavikatti, *Structural Analysis-I*, 4th Edition, Vikas Publishing House Pvt. Ltd, 2013.
2. S. S. Bhavikatti, *Structural Analysis-II*, 4th Edition, Vikas Publishing House Pvt. Ltd, 2013.
3. T. S. Thandavamoorthy, *Structural Analysis*, 1st Edition, Oxford University Press, 2011.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH II SEMESTER

COURSE STRUCTURE

A4108 – HYDRAULICS AND HYDRAULIC MACHINES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

This course is intended to introduce open channel hydraulics and the working of hydraulic machinery. It covers knowledge regarding various theories dealing with the flow phenomenon of fluid in open channels. Present course gives great scope to use Dimensional analysis techniques in solving fluid problems and plan hydraulic similitude studies. Major emphasis is given to understand the basics of hydro machinery, its components, function and use of different types of turbines and pumps.

Course Pre/co-requisites

- A4102- Fluid Mechanics

2. Course Outcomes (COs)

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

A4108.1. Design of hydraulic channels for different flows

A4108.2. Evaluate the model and prototype relations by similarity laws

A4108.3. Apply Impulse momentum equation to calculate impact of jets on plates

A4108.4. Distinguish between the types of turbines based on heads, discharge and efficiencies

A4108.5. Analyze the possible problems, performance and installation techniques of centrifugal pumps

3. Course Syllabus

Theory

Open Channel Flow: Introduction, Classification of Flow in channels, Type of channels, Velocity distribution - Chezy's, Manning's; and Bazin's formulae for uniform flow - Most Economical sections. Specific Energy-Critical, sub-critical and super critical flows. Non-uniform flow - Dynamic equation for G.V.F, direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

Dimensional Analysis and Similitude: Dimensional analysis, Rayleigh's method and Buckingham's theorem-study of Hydraulic models - Geometric, kinematic and dynamic similarities-dimensionless numbers - model and prototype relations.

Hydrodynamic Force of Jets: Hydrodynamic force exerted by jets on stationary and moving flat, inclined and curved vanes, jet striking centrally on symmetrical and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency of jet, Series of vanes expressions and efficiencies, Angular momentum principle for series of radial curved vanes.

Hydraulic Turbines: Introduction General Layout of a typical Hydropower Plant, Heads and efficiencies of turbine. Classification of turbines - Pelton wheel, Radial Flow Reaction Turbines-Inward and Outward Radial flow turbines, Francis, Kaplan turbine-working principles, velocity diagrams, work done and efficiency, hydraulic design. Draft tube – theory and function, efficiency. Specific Speed, Unit Quantities, Characteristic Curves of Hydraulic Turbines.

Centrifugal Pumps: Introduction, Heads and efficiencies of a Centrifugal Pump, minimum starting speed, specific speed of a pump, multistage pumps-pumps in parallel, series, priming of pump, Characteristic Curves of Hydraulic pumps, NPSH, cavitation in pumps.

Practice

1. Calibration of Venturimeter & Orifice Meter
2. Calibration of contracted Rectangular Notch and / Triangular Notch
3. Determination of friction factor of a pipe & Coefficient for minor losses
4. Verification of Bernoulli's Equation
5. Impact of Jet on Vanes
6. Performance test on Pelton wheel turbine
7. Performance test on Francis turbine
8. Performance test on Kaplan turbine
9. Performance characteristics of a single stage and multi stage centrifugal pump
10. Performance characteristics of hydraulic jump.

4. Laboratory Equipment/Software/Tools Required

1. Venturimeter and Orifice meter apparatus.
2. Notch Apparatus
3. Pipes having various losses
4. Trapezoidal cross-section pipe having piezometer
5. Impact of Jet Equipment
6. Pelton Turbine
7. Francis Turbine
8. Kaplan Turbine
9. Single and multi-stage pumps Equipment
10. Hydraulic Jump Equipment

5. Books and Materials

Text Books:

1. Dr. R.K. Bansal, *A text of Fluid mechanics and hydraulic machines*, Laxmi Publications (P) ltd., New Delhi, 10th Edition, 1st January 2018.
2. Chow, V.T., *Open Channel Hydraulics*, Blackburn Press, 2nd Edition, Reprint, 2009.

Reference Books:

1. Modi & Seth, *Fluid Mechanics, Hydraulic and Hydraulic Machines*, Standard book house, 2012.
2. D.S. Kumar, *Fluid Mechanics & Fluid Power Engineering*, Kataria& Sons, 2013.
3. K.Subramanya, *Fluid Mechanics and Hydraulic Machines*, McGraw Hill Education, 1st Edition, 2019.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH II SEMESTER

COURSE STRUCTURE

A4109 – ADVANCED SURVEYING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
1	0	2	14	0	28	2	30	70	100

1. Course Description

Course Overview

This is the advanced course in Civil Engineering. This course helps students understand latest tools for field application. This course covers the study of principles of trigonometry and tachometry for practical field applications. Also deals with advanced tools such as Total Station. This course also covers Global Positioning system (GPS) and Geographic Information System (GIS). This is an integrated course having theory and practical components that integrates theory with field condition. This course forms basis for advance courses like Remote Sensing and Geographical Information System.

Course Pre/co-requisites

- A4104 - Surveying.

2. Course Outcomes (COs)

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

A4109.1. Utilize theodolite instrument for measuring horizontal and vertical angles.

A4109.2. Measure heights and distances of the given objects using tacheometer.

A4109.3. Apply geometric and trigonometric principles in surveying.

A4109.4. Design and execute engineering projects like highway, pipeline and building works.

A4109.5. Make use of advanced surveying instruments like EDM, Total Station, and GPS in engineering works.

3. Course Syllabus

Theory

Theodolite: Types - Measurement of horizontal and vertical angles - Repetition and Reiteration-Gales traverse table – Errors in theodolite work.

Tacheometer: Principle of tachometry – theory of stadia tachometry-determination of stadia constants-analectic lens.

Trigonometric Levelling: Heights and distances.

Curves: Types of curves- Methods of setting simple curves.

Setting out Works: Introduction-Laying Out buildings, Sewer lines.

Introduction to Advanced Surveying: Electronic theodolite - Total stations- Remote sensing-basic concepts-applications - Introduction to Global Positioning system (GPS) - Introduction to Geographic Information System (GIS).

Practice

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.
4. Heights and distance using principles of tachometric surveying.
5. Curve setting different methods.
6. Setting out works for buildings and pipe lines.
7. Determination of area using total station.
8. Determination of remote height using total station.
9. Stakeout using total station.
10. Distance and gradient between two inaccessible points using total station.

4. Laboratory Equipment/Software/Tools Required

1. Theodolite
2. Tacheometer
3. Electronic Theodolite
4. Total Station
5. Electronic Distance Measuring Instrument

5. Books and Materials

Text Books:

1. B. C. Punmia, Ashok Kumar Jain, and Arunkumar Jain, *Surveying, Vol. II*, 16th Edition, Laxmi Publications Pvt. Ltd, New Delhi, 2017.

Reference Books:

1. A. M. Chandra, *Higher Surveying*, 3rd Edition, New Age International Publishers, 2015.
2. K. R. Arora, *Surveying, Vol. II*, 13th Edition, Standard Book House, Delhi, 2013.
3. SatheeshGopi, R. Sathikumar and N. Madhu, *Advanced Surveying: Total station, GIS and Remote Sensing,* Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, New Delhi, 2008.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

II B.TECH II SEMESTER

COURSE STRUCTURE

A4013 – GENDER SENSITIZATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	1	0	100	100

1. Course Description

Course Overview

Towards a World of Equals is a course that introduces students to different dimensions of gender issues. Gender Sensitization is one of the basic requirements for the normal development of an individual and primarily highlights the contribution of both the genders in creation and development of a well balanced society. A curriculum-based approach to bring a change is desired to inculcate sensitivity towards issues concerning the relationship between men and women, caste, declining sex ratio, struggles with discrimination, sexual harassment, new forums for justice, eve-teasing, etc., The need for this sensitivity has been felt and realized through times immemorial and in almost all kinds of human existence, across the globe.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4013.1. Build the significance of the process of socialization and relationships between men and women on the basis of a just and equal world

A4013.2. Examine the decline of female sex ratio and discrimination faced by people with different gender identities

A4013.3. Take part in house work, in order to allow for equality and share equal family spaces Estimate women's contribution to the nation's economy

A4013.4Analyze the consequences of sexual violence and importance of consent in friendship and other relationship

A4013.5. Perceive the invisibility of women in history and show how locating a women in history makes them visible

3. Course Syllabus

1. Gender Sensitization: Why should we study it?

2. Socialization: Making Women, Making Men
   Introduction

Preparing for womanhood
Growing up male
First lessons in caste
Different masculinities

3. Just Relationships: Being Together as Equals
   Mary Kom and Onler
   Love and Acid just do not mix
   Love letters
   Mothers and fathers
   Further Reading: Rosa Parks-The Brave heart

4. Missing Women: Sex Selection and Its Consequences
   Declining Sex Ratio
   Demographic Consequences

5. Gender Spectrum: Beyond the Binary
   Two or Many?
   Struggles with Discrimination

6. Additional Reading: Our Bodies, Our Health

7. Housework: The Invisible Labor
   "My Mother doesn't work"
   "Share the load"

8. Women's Work: Its Politics and Economics
   Fact and fiction
   Unrecognized and unaccounted work
   Further Reading: wages and conditions of work.

9. Sexual Harassment: Say No!
   Sexual harassment, not eve-teasing
   Coping with everyday harassment
   Further Reading: "Chupulu"

10. Domestic Violence: Speaking Out
    Is home a safe place?
    When women unite (Film)
    Rebuilding lives
    Further Reading: New Forums for justice.

11. Thinking about Sexual Violence
    Blaming the Victim- " I Fought for my life…"
    Further Reading: The caste face of violence.

12. Knowledge: Through the Lens of Gender
    Point of view
    Gender and the structure of knowledge
    Further Reading: Unacknowledged women artists of Telangana

13. Whose History? Questions for Historians and Others
    Reclaiming a Past
    Writing other Histories
    Further Reading: Missing pages from modern Telangana history

4. Books and Materials

Text Books:

1. "Towards a World of Equals: A Bilingual Textbook on Gender". Telugu Akademi, Hyderabad, 2015

Reference Books: NIL

SYLLABI FOR III YEAR I SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH I SEMESTER

COURSE STRUCTURE

A4110 – GEOTECHNICAL ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	1	2	28	14	28	4	30	70	100

1. Course Description

Course Overview

The aim of the course is to introduce the basic concepts of soil mechanics. The basic soil-water interactions and the stress distribution within the soil masses are brought into picture. The classical theories of soil mechanics are used to explain the index and the engineering properties of the soil. These include the density index, the grain size analysis and the consistency characteristics of the soil used for the preliminary classification of the soils and for the primary estimation of the engineering properties. The engineering properties are used in the design and analysis for various works like earth retaining walls and foundation design.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4110.1. Classify the soils based on index properties.
A4110.2. Apply the principles of soil mechanics in order to find the compaction characteristics.
A4110.3. Analyze the stress distribution of soil under various loading conditions.
A4110.4. Estimate magnitude and rate of settlement of soil.
A4110.5. Evaluate the engineering properties of soil.

3. Course Syllabus

Theory

INTRODUCTION: Origin- Soil formation – Mass- volume relationships.
INDEX PROPERTIES OF SOILS: Grain size analysis – Sieve and Hydrometer methods – Consistency limits and indices –I.S. Classification of soils.

PERMEABILITY: Darcy's law–Permeability – Factors affecting permeability – Laboratory determination of coefficient of permeability –Permeability of layered systems.
SEEPAGE THROUGH SOILS: Total, neutral and effective stresses–Flownet.

STRESS DISTRIBUTION IN SOILS: Boussinesq's and Westergaard's theories for point loads and areas of different shapes – Newmark's influence chart.
COMPACTION: Mechanism of compaction – factors affecting compaction – Field compaction Equipment – compaction quality control.

CONSOLIDATION: Spring Analogy-Void ratio and effective stress (e vs log p relationship- Tergaghi's theory of one dimensional consolidation –Computation of magnitude of settlement and time rate of settlement

SHEAR STRENGTH OF SOILS: Importance of shear strength–Mohr Coulomb's Failure theories – Shear Parameters–Laboratory tests for determination of strength tests –Direct shear test, Tri-axial compression test(UU,CU and CD) – Unconfined compression tests- Vane shear test.

Practice

1. Determination of Grain size analysis
2. Determination of Atterberg's Limits: a) Liquid limit; b) Plastic limit; c) Shrinkage limit
3. Determination of Field density by: a) core cutter method; b) Sand replacement method
4. Determination of Permeability of soil by: a) Constant head test; b) Variable head test
5. Determination of Optimum moisture content and Maximum dry density by compaction test
6. Determination of settlement parameters by consolidation test
7. Determination of Shear strength parameters by: a) Triaxial; b) Direct shear; c) Unconfined compression test.

4. Laboratory Equipment/Software/Tools Required

1. Set of sieves
2. Casagrande's apparatus.
3. Triaxialapparatus
4. Unconfined compression test apparatus
5. Box shear test apparatus
6. Oedometer
7. Hot Air oven

5. Books and Materials

Text Books:

1. Arora, K.R. *Soil Mechanics and Foundation Engineering*, 7th reprint edition, Standard Publishers and Distributors, Delhi, 2019.
2. Gopal Ranjanand Rao, A.S.R. *Basic and Applied Soil Mechanics*, New Age International Pvt. Ltd Publishers, 2019.

Reference Books:

1. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain. *Soil Mechanics and Foundations*, Laxmi publications Pvt. Ltd., New Delhi, 2020.
2. Venkataramiah, C. *Geotechnical Engineering*, New age International Pvt. Ltd, 2019.
3. Gulhati, S. K. and Manoj Datta. *Geotechnical Engineering*, Tata Mc.Graw Hill Publishing company, 2017.
4. Varghese, P.C. *Foundation Engineering*, Prentice Hall of India., New Delhi, 2005.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH I SEMESTER

COURSE STRUCTURE

A4111 – DESIGN OF REINFORCED CONCRETE STRUCTURES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

The aim of the course is to introduce the basic concepts of Limit State Method for RC Structures. This course provides basic concepts for concrete structure calculations and procedures. The course delivers a good knowledge about concrete materials and design aspects of concrete structures. The program has five modules: slab, beam, column, footing and stair case per Indian standard code (IS 456:2000).

Course Pre/co-requisites

- A4106 - Concrete Technology
- A4107 - Structural Analysis

2. Course Outcomes (COs)

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

A4111.1. Explain theory and principle involved in Reinforced concrete structures.
A4111.2. Identify behaviour and inter relation between structural members.
A4111.3. Analyze design loads and their actions according to their field conditions.
A4111.4. Assess reinforced concrete members for stability and serviceability.
A4111.5. Design reinforced concrete members according to codal-provisions.

3. Course Syllabus

CONCEPTS OF RC DESIGN: Limit State method - Material Stress - Strain Curves - Safety factors - Characteristic values. Stress Block parameters - IS - 456 - 2000 - Beams: Limit state analysis and design of singly reinforced, doubly reinforced, T beam sections.

SHEAR, TORSION AND BOND: Limit state analysis and design of section for shear and torsion - concept of bond, anchorage and development length. I.S. code provisions. Design examples in simply supported and continuous beams, detailing Limit state design for serviceability for deflection, cracking and codal provision.

DESIGN OF SLABS: Introduction to slabs, Design of one way slab, Design of Two- way slabs, Cantilever slab, Using I S Coefficients.

DESIGN OF COLUMNS: Introduction to Columns, Short column, Long column, End conditions, Design for Axial loads, uni-axial and bi-axial bending I S Code provisions.

DESIGN OF FOOTINGS & STAIR CASES: Introduction to Footings, Design of Isolated (square, rectangular) and combined footings. Introduction to stair cases, types of stair case, Design of stair case (dog legged).

4. Books and Materials

Text Books:

1. P.C.Varghese, *Limit State Designed Of Reinforced Concrete*, Prentice Hall of India, New Delhi.
2. S.Unnikrishna Pillai &Devadas Menon, *Reinforced concrete design*,3rd Edition Tata Mc. Graw Hill, New Delhi.

Reference Books:

1. M.L. Gambhir, Fundamentals of Reinforced concrete design, Prentice Hall of India Ltd., New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH I SEMESTER

COURSE STRUCTURE

A4112 – WATER RESOURCES ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

This course provides an introduction to major aspects of Engineering Hydrology. In this course, students will learn about the hydrological cycle and its components, occurrence and movement of groundwater and groundwater resources. Also this subject imparts adequate knowledge to understand and analyze the basic aquifer parameters and hydrographs. In addition, students can gain knowledge on irrigation water requirements and design discharge for water course.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4112.1. Apply the basic knowledge of hydrology for the development, utilisation and management of water resources.

A4112.2. Analyze the basic aquifer parameters and groundwater resources for different hydrogeological boundary conditions.

A4112.3. Measure the precipitation and abstractions from precipitation.

A4112.4. Develop Hydrographs for unknown storm durations and catchments.

A4112.5. Determine the irrigation water requirements for soil and discharge of water course.

3. Course Syllabus

INTRODUCTION TO HYDROLOGY: Introduction to engineering hydrology and it's applications, Hydrologic cycle, types and forms of precipitation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data Adjustment of record Rainfall Double Mass Curve.

ABSTRACTIONS FROM PRECIPITATION: Evaporation and Evaporation Process, measurement, estimation and control of evaporation, Evapotranspiration, Measurement and estimation of evapotranspiration, Interception and depression storage, Infiltration process, Measurement of infiltration, Infiltration models and infiltration indices and effective rainfall.

RUNOFF AND HYDROGRAPHS: Runoff Factors affecting Runoff-Runoff over a Catchment- Empirical and Rational Formulae, Hydrograph Analysis, Flood Hydrograph - Effective Rainfall, Base Flow, Base Flow Separation, Direct Runoff Hydrograph, Unit Hydrograph, Definition, Limitations and applications of Unit hydrograph, Derivation of Unit Hydrograph from Direct Runoff Hydrograph, S hydrograph, Synthetic Unit Hydrograph.

GROUND WATER HYDROLOGY: Ground water Occurrence, Types of aquifers, Aquifer parameters, Porosity, Specific yield, Permeability, Transmissivity and storage coefficient, Types of wells, Darcy's law, Radial flow to wells in confined and unconfined aquifers.

IRRIGATION: Necessity and Importance of Irrigation, Advantages and ill effects of Irrigation, Types of Irrigation, Methods of application of Irrigation water, Indian agricultural soils, Methods of improving soil fertility Crop Rotation, Preparation of land for Irrigation, Standards of quality for Irrigation water. Soil water plant relationship, Vertical distribution of soil moisture, Consumptive use, Duty and delta factors affecting duty -Design discharge for a water course. Depth and frequency of Irrigation, Irrigation efficiencies, Water Logging.

4. Books and Materials

Text Books:

1. Jayarami Reddy, *Engineering Hydrology*, 3rd Edition, Laxmi publication pvt.Ltd., New Delhi reprint 2016.
2. Punmia& Lal, *Irrigation and Water power engineering*, 16th Edition,Laxmi publications pvt. Ltd., New Delhi, 2019.

Reference Books:

1. Modi, P.N.*Irrigation and water Resources & Water power*, 9th Edition, Standard Book House, 2014.
2. Majundar, D.K. *Irrigation water Management*, 2nd Edition,Printice Hall of India, 2004.
3. Garg, S.K. *Irrigation and Hydraulic structures*,5th Edition, Khanna publishers, 2012.
4. Subramanya, K. *Engineering Hydrology*, 4th Edition, Tata Mc GrawHill Publishing Company Ltd., New Delhi, 3rd Edition, 2008.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH I SEMESTER

COURSE STRUCTURE

A4113 – ENGINEERING GEOLOGY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

This course is an introduction to the basic concepts of geology and engineering geology. It emphasizes on the origin and nature of earth materials and on geologic environments which affects site conditions, engineering designs and waste disposal sites. It stimulates the development of a culture closely linked to environmental protection.

Course Pre/co-requisites

- A1002-Engineering Physics
- A1003-Engineering Chemistry

2. Course Outcomes (COs)

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

A4113.1. Outline the importance of geology in civil engineering.

A4113.2. Identify various rocks and minerals based on their physical properties

A4113.3. Distinguish between weathered rocks and fresh rocks.

A4113.4. Examine the weathering influence on engineering structures

A4113.5. Interpret geophysical investigations based on geophysical studies.

3. Course Syllabus

Theory

Mineralogy: Importance of study of minerals, Different methods of study of minerals. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of common rock forming minerals and Economic minerals.

Petrology: 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.
Earthquake: 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. Landslides, their causes and effect; measures to be taken to prevent their occurrence.

Geology of Dams & Reservoirs: 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.
Geophysical Investigations: Importance of Geophysical studies Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Improvement of competence of sites by grouting.

Tunnels: Purposes of tunnelling, Effects of tunnelling on the ground. Role of Geological Considerations (lithological, structural and ground water) in tunnelling.

Practice

1. Study of physical properties and identification of rock forming minerals.
2. Study of physical properties and identification of economic minerals.
3. Megascopic identification of rocks & minerals.
4. Megascopic description and identification of igneous rocks.
5. Megascopic description and identification of sedimentary rocks
6. Megascopic description and identification of metamorphic rocks.
7. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
8. Study of geological maps.

4. Laboratory Equipment/Software/Tools Required

1. Geological maps
2. Streak plate
3. Models of geological structures.

5. Books and Materials

Text Books:

1. N. ChennaKesavulu, *Engineering Geology*, Trinity press, 2nd edition 2009.

Reference Books:

1. P.C.Varghese,*Engineering Geology for Civil Engineering,* , PHI Learning& private Limited,2012
2. K.V.G.K. Gokhale,,*Principals of Engineering Geology*, B.S publications,2008

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH I SEMESTER

COURSE STRUCTURE

A4151 – ADVANCED STRUCTURAL ANALYSIS

(PROFESSIONAL ELECTIVE –I)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course is offered to undergraduate students to deal with matrix methods to solve indeterminate structures. The course introduces Muller Breslau principle to solve continuous beams. This course also discusses analysis of portal frames subjected to horizontal loads. Graphical representation of bending moment and shear force in continuous beams using influence line diagrams is also included.

Course Pre/co-requisites

- A4107 - Structural Analysis -I

2. Course Outcomes (COs)

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

A4151.1. Solve continuous beams using Muller Breslau principle

A4151.2. Apply energy theorems to solve indeterminate trusses

A4151.3..Develop shear force, bending moment and influence line diagrams for indeterminate structures.

A4151.4. Analyze continuous beams using matrix methods approach.

A4151.5. Evaluate final moments of portal frames subjected to horizontal loads.

3. Course Syllabus

Theory

INFLUENCE LINES: Introduction, live load patterns, qualitative influence lines for continuous beams with constant and variable moment of inertia- ILD for frames with various support conditions.

APPROXIMATE METHODS OF ANALYSIS: Introduction - Analysis of multi-storey frames for lateral loads, loading conditions for maximum moments in beams and columns- Portal frame method, Substitute frame method.

STIFFNESS MATRIX METHOD: Introduction – force displacement relations- element stiffness matrix for beams and trusses – Analysis of continuous beams with and without settlement of supports.

FLEXIBILITY MATRIX METHOD: Introduction **–** force displacement relations- element flexibility matrix – relation between stiffness matrix and flexibility matrix- analysis of continuous beams with and without settlement of supports.

INDETERMINATE TRUSSES: Types and classification of trusses- energy theorems- Castigliano's theorem, Betti's theorem, force method for analysis of trusses having single and two degree of internal and external indeterminacies.

4. Books and Materials

Text Books:

1. G.S. Pundit and S.P. Gupta, *Structural Analysis - A Matrix approach*, 2nd edition, Tata McGraw Hill Publishers, 2008.
2. S.S.Bhavikatti, *Structural Analysis Vol I & Vol II*, 4th edition, Vikas publishing house Pvt. Ltd, 2010

Reference Books:

1. C.S.Reddy, *Basic Structural Analysis*, 3rd edition, Tata McGraw Hill Publishers, 2017.
2. S.S.Bhavikatti, *Matrix methods of structural analysis*, 1st edition, I K international publishing house Pvt Ltd, 2011.
3. R.K. Livesley, *Matrix methods of structural analysis*, 2nd edition, The commonwealth and international library of science Technology Engineering and Liberal studies, 2014.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH I SEMESTER

COURSE STRUCTURE

A4152 – ELEMENTS OF EARTHQUAKE ENGINEERING

(PROFESSIONAL ELECTIVE –I)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course enables students to fundamental concepts of earthquake engineering. The students can learn origin of earthquake its causes, its measurement and its effects on structures. The course also introduces the concept of response spectra and its use in seismic analysis. Towards the end the two basic methods of seismic analysis are discussed.

Course Pre/co-requisites

- A4107 - Structural Analysis

2. Course Outcomes (COs)

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

A4152.1. Understand the fundamental characteristics of earthquake.

A4152.2. Apply the techniques of measurement of earthquake.

A4152.3. Examine characteristics of response spectra and it's types.

A4152.4. Perceive concept of earthquake resistance design and it's virtues.

A4152.5. Solve the given structure for Seismic analysis.

3. Course Syllabus

Engineering Seismology: Causes of earthquakes - Seismic waves -Magnitudes, Intensity and energy release - characteristics of strong earthquakes, ground motions, soils effects and liquefaction.

Theory of Vibrations: Introduction, long and short period structure; single, two and multi-degree of freedom systems, damped and undamped variations, concepts of damped and undamped vibrations, Response spectrum analysis.

Seismic Design Philosophy: Concept of Seismic resistant design, reduction factors - Over strength, Ductility and Redundancy -Determination of earthquake forces on structures. Seismic Design concepts of Masonry, Reinforced Concrete and Steel Buildings.

Seismic Performance of Buildings: Case Studies of few serious earthquakes in the country in the past, damages to buildings - Damage Patterns - Performance of Non-Engineered Buildings, Rural houses during the Earthquakes.

Seismic Resistant Design: Basic principles of Earthquake resistance. Concepts of earthquake resistant construction in rural areas. Base isolation and energy dissipation devices. Seismic retrofitting - Repair, rehabilitation and retrofitting, retrofitting strategies.

4. Books and Materials

Text Book:

1. Pankaj Agarwal and Manish Shrikhande, *Earthquake Resistant Design of Structures,* Prentice Hall of India, 2006.

Reference Books:

1. Kramer, S. L. (1996). Geotechnical Earthquake Engineering, Prentice Hall, New Jersey.
2. Mario Paz, *International Handbook of Earthquake Engineering: Codes, Programs, and Examples*, Springer Verlag, 1995.
3. D.S. Prakash Rao, *Design Principles and Detailing of Concrete Structures,* Tata McGraw-Hill Publishing Company, 1995.
4. Dowrick, D. L. (1987). Earthquake Resistance Design for Engineers and Architects, John Willey & Sons, 2nd Edition.
5. Housner, G. W. &Jenning, P.C. (1982). Earthquake Design Criteria, Earthquake
6. Engineering Research Institute, Oakland, California, USA.
7. Newmark, N. M. & Hall, W.J. (1982). Earthquake Spectra &Design, Earthquake
8. Design Criteria, Earthquake Engineering Research Institute, Oakland, California, USA.
9. Wakabayashi, M. (1986). Design of Earthquake Resistance Buildings, McGraw HillBooks Company.
10. Okamoto, S. (1984). Introduction to Earthquake Engineering, University of Tokyopress, 2nd Edition.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH I SEMESTER

COURSE STRUCTURE

A4153 – AIR POLLUTION AND CONTROL

(PROFESSIONAL ELECTIVE –I)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides an introduction to major aspects of air pollution and its control technologies, with an emphasis on outdoor rather than indoor air pollution. In this course, students will learn effects of air pollutants on human beings, materials and environment; sources of air pollution and behavior of pollutants in the atmosphere; a presentation of the models that are used to predict dispersion and air pollutant concentrations; and finally a review of the strategies and key technologies for controlling emissions of gaseous pollutants and particulate matter.

Course Pre/co-requisites

- A4014-Environmental Science

2. Course Outcomes (COs)

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

A4153.1. Select sampling technique and appropriate methods to control air pollution.

A4153.2. Develop a broad overview of the strategies to manage air pollution.

A4153.3. Examine various particulate and gaseous pollutant removal mechanisms to reduce emissions.

A4153.4. Explain how atmospheric and chemical composition drives changes in the environment

A4153.5. Predict the ground level concentration of air pollutants using mathematical formulation.

3. Course Syllabus

Air pollution & Global issues: Definitions, scope, significance and episodes, air pollutants – classifications - Effects of air pollutants on man, material and vegetation - Global effects of air pollution - Green House Effect, Heat Islands, Acid Rains, Photochemical Smog, and Ozone Depletion.

Properties of Atmosphere: Meteorological Aspects of Air Pollution Dispersions, Temperature Lapse Rates and Stability, Wind Velocity and Turbulence, Plume Behavior, Dispersion of Air Pollutants, Solutions to the Atmospheric Dispersion Equation, the Gaussian Plume Model.

Air pollution Sampling and Measurement: Types of Pollutant Sampling and Measurement, Ambient Air Sampling, Collection of Gaseous Air Pollutants, Collection of Particulate Pollutants, Stock Sampling, Analysis of Air Pollutants, Sulphur Dioxide, Nitrogen Dioxide, Carbon Monoxide, Oxidants and Ozone, Hydrocarbons, Particulate Matter.

Air Pollution Control Methods: Sources, Correction Methods, Cleaning of Gaseous Effluents, Particulate Emission Control, Gravitational Settling Chambers, Cyclone Separators, Fabric Filters, Electrostatic Precipitators, Wet Scrubbers, Selection a Particulate Collector, Control of Gaseous Emissions, Adsorption by Solids, Absorption by Liquids, Combustion - Behavior and Fate of Air Pollutants.

Air Quality Management: Monitoring of SPM, SO; NO and CO Emission Standards. Air pollution laws and standards.

4. Books and Materials

Text Books:

1. Prof. Y. Anjaneyulu, "Air Pollution and Control Technologies", Allied publishers, 2002.
2. M. N. Rao, H. V. N. Rao, “Air pollution”, Tata McGraw Hill Education, New Delhi, India, 2017.

Reference Books:

1. R. K. Trivedy, P. K. Goel, “Introduction to Air pollution”, ABD Publications, New Delhi, India, 2003.
2. Wark, Warner, “Air pollution its origin and control”, Addison-Wesley, New York, 1998.
3. K.V.S.G. Murali Krishna, “Air Pollution and Control”, USP, India, 2017.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH I SEMESTER

COURSE STRUCTURE

A4018 - ENGINEERING DESIGN THINKING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

Engineering Design Thinking is an extension to Engineering Exploration course studied at first year level. This course links the primary fields of engineering and explores the engineering design process from conceptual design and optimal choice evaluation to prototyping and project construction. This course provides insights into particular design challenges within their specific fields of engineering and enables the learners to apply the knowledge in real time - designing, constructing and testing a prototype (actual physical build) to solve a real-world engineering problem. In extent, this course is an excellent roadmap for the design engineers seeking to broaden their engineering knowledge to design concepts to their current work.

Course Pre/co-requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

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

A4018.1. Interpret the problem-solving skills and product design skills

A4018.2. Apply foundational knowledge of the primary fields of engineeringand scientific concepts to find the solution

A4018.3. Identify various techniques and applications of the engineering design process

A4018.4. Inspect the design and assess a prototype that solves an engineering problem

A4018.5. Interpret the solutions and document the findings/reflections

3. Course Syllabus

1. **Introduction**
   Definition of design, design process, different problem types, characteristics of novice and informed designers, enhance negotiation and iteration in design.

2. **Case Studies**
   Recognized organizations for design and innovation, shopping cart case study, benefits of failure in design
3. **Human Centered Design**

Introduction to HCD (Human Centered Design), HCD as a Mindset, personas and scenarios, best practice working with communities

4. **Specification Development**
   Definition of specification, three examples of ways to generate specifications, how to manage specifications, functional decomposition
5. **Prototyping**
   Three kinds of prototypes, how prototypes can be used in the design process, how to use prototypes can be used to elicit input from users

6. **Ideation, Innovation & Creativity**
   Concept Selection, Interpretation of Creativity and Innovation, Brain storming Expanding the Design Space, case study using decision matrix
7. **Teamwork and Leadership in Design**
   Professional Preparation, Recognizing differences in teammates, VRE Model, Best Model for Leadership, Conflict Vs. Effectiveness, Code of Cooperation, Project (Team) and individual Artifacts, Evaluating Teams

8. **Design for Robustness**
   Review the design, Brainstorm potential failure models, List potential effects of failure & potential causes for each failure, Rank failures, Develop action plan, Implement fixes, Revisit potential failure risks

4. Books and Materials

Text Books:

1. Oakes, Leone, and Gunn (2004). *Engineering Your Future*. Okemos, MI: Great Lakes Press.
2. Crismond, D. (2007). *Contrasting strategies of beginning and informed designers:* One representation of learning progressions in engineering design.
3. Ryan Jacoby and Diego Rodriguez, *Innovation, Growth, and Getting to Where You Want to Go*, Design Management Review Vol. 18 No. 1
4. G.Pahl and W.Beitz," Engineering design: A systematic approach", Springer 2nd Editon.

Reference Books:

1. Ali k.Kamrani, EmadAbouel Nasr, "*Engineering design and Rapid Prototyping*", Springer.
2. Ken Hurst," Engineering design principles", Elesiever,2nd edition.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH I SEMESTER

COURSE STRUCTURE

A4016 - INDIAN CONSTITUTION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	0	0	100	100

1. Course Description

Course Overview

This course enables the students to understand the constitution of India as the Supreme law of India. The student will also gain knowledge about the parliament of India and how it functions. This course will survey the basic structure and operative dimensions of the Indian constitution. It will explore various aspects of the Indian political and legal system from a historical perspective highlighting the various events that led to the making of the Indian constitution.

Course Pre/co-requisites

This course facilitates graduate students to know about importance of the Indian constitution and facilitates students to know about the fundamental rights of the citizens.

2. Course Outcomes (COs)

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

A4016.1 Identify the important components of Indian Constitution.
A4016.2 Apply the fundamental rights in right way and become a more responsible citizen.
A4016.3 Illustrate the evolution of Indian Constitution.
A4016.4 Explain the basic structure of Indian Constitution.
A4016.5 Define the basic concepts democracy, liberty, equality, secular and justice.

3. Course Syllabus

Evolution of Indian constitution: Indian independence act 1947, formation of constituent assembly of India, committees of the constituent assembly, constitution of India drafting committee, brief study about Dr. *B. R. Ambedkar, time line of formation of the constitution of India.*
Structure of the constitution of India: Parts, schedules, appendices, constitution and government, constitution and judiciary.
Preamble to the constitution of India: Brief study about sovereignty, socialist, secularism, democracy, republic, justice (political justice, social justice, economic justice), liberty, equality, fraternity, unity & integrity.
Acts: Right to education act, right to information act, anti-defection law, Jan Lokpal bill.

Fundamental rights: Right to equality, right to freedom (freedom of speech and expression, right to practice any profession etc.), right against exploitation, right to freedom of religion, cultural & education rights, right to property, right to constitutional remedies.

4. Books and Materials

Text Books::

1. Dr. Durga das basu. Introduction to the constitution of India. 21st edition, Lexis Nexis books publication Ltd, 2013.

Reference Books::

1. Subhash C. Kashyap, Our Constitution, National Book Trust, New Delhi, 2011.
2. Arun K Thiruvengadam. The constitution of India. 1st edition, Hart publishing India, 2017.

SYLLABI FOR III YEAR II SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH II SEMESTER

COURSE STRUCTURE

A4114 – ENVIRONMENTAL ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

This course is designed to provide the engineering graduates with technical expertise in environmental engineering which will enable them to have a career and professional accomplishment in the public or private sector to address the complexities of real-life environmental engineering problems related to sources of water, population forecasting, water demand, water quality, treatment and water distribution systems.

Course Pre/co-requisites

- A4007 - Engineering Chemistry

2. Course Outcomes (COs)

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

A4114.1.Identify water supply schemes, population forecasting methods and water demands
A4114.2. Analyze water sources and water quality parameters
A4114.3. Select water treatment layouts and design sedimentation units
A4114.4. Propose suitable filtration units and disinfection methods
A4114.5. Design distribution systems and determine reservoir storage capacity

3. Course Syllabus

Theory

Introduction to Water supply: Water supply Schemes- Protected water supply- Population forecasts, design period- water demand- Types of demand – factors affecting-fluctuations- fire demand.

Sources of Water and Water Quality: Sources of Water - intakes- infiltration galleries, water quality parameters and testing- drinking water standards

Water treatment Layout and Sedimentation: Layout general outline of water treatment units - sedimentation, uniform setting velocity – principles - design factors - surface loading- jar test – optimum dosage of coagulant – coagulation - flocculation, clarifier design - coagulants – feeding arrangements.

Water Filtration and disinfection: Filtration - theory - working of slow and rapid gravity filters - multimedia filters - design of filters -troubles in operation comparison of filters – disinfection - types of disinfection – theory of chlorination – chlorine demand- other disinfection treatment methods.

Water Distribution systems: Distribution systems- Types of layouts of Distribution systems – design of distribution systems- Hardy Cross and equivalent pipe methods-service reservoirs- Determination of Storage Capacity.

Practice

1. Determination of pH
2. Determination of Turbidity
3. Determination of Conductivity
4. Determination of Alkalinity
5. Determination of Total solids (TDS & TSS)
6. Determination of Dissolved Oxygen
7. Determination of Chlorides
8. Determination of Iron
9. Determination of Nitrates
10. Determination of phosphates
11. Determination of Fluorides
12. Determination of Optimum dose of coagulant
13. Determination of Chlorine demand
14. Determination of B.O.D
15. Determination of C.O.D

4. Laboratory Equipment/Software/Tools Required

1. Digital P^H Meter
2. Digital Turbidity Meter
3. Digital Conductivity Meter
4. Digital TDS Meter
5. Digital DO Meter
6. U-V Visible Spectrophotometer
7. Jar Test Apparatus
8. BOD Incubator
9. Reflux Apparatus
10. Muffle Furnace
11. Micro Balance
12. Hot Air Oven
13. Titration Apparatus and Glass ware

5. Books and Materials

Text Books:

1. G.S.Birdie , J. S.Birdie ,*Water supply& Sanitary Engineering* ,9th Edition ,Dhanpat Rai Publishing Co Pvt Ltd, 2014.
2. B.C.Punmia, Ashok Jain, Arun Jain, *Water supply Engineering – Environmental Engineering (Volume-I)*, 2nd Revised edition, Laxmi Publications (P) Ltd, 2016.
3. E.W. Rice, R.B. Baird, A.D. Eaton, *Standard Methods for the Examination of Water and Wastewater*, 23rd Edition, American Public Health Association, American Water Works Association, Water Environment Federation, 2017.

Reference Books:

1. H.S Peavy, D. R. Rowe, G. Tchobanoglous, *Environmental Engineering, Indian Edition*, McGraw Hill Education (India) Pvt Ltd, 2014.
2. D. P. Sincero and G.A Sincero, *Environmental Engineering*, Pearson Education India, 2015.
3. Sawyer, Mc. Carty, *Chemistry for Environmental Engineering*, 5th editionMcGraw Hill Education, 2017.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH II SEMESTER

COURSE STRUCTURE

A4115 – DESIGN OF STEEL STRUCTURES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	0	42	14	0	4	30	70	100

1. Course Description

Course Overview

This course provides foundation knowledge and skills relevant to the concepts, principles and components of structural design. It introduces the design of steel structures using the limit state design philosophy. students will gain an understanding of statutory requirements, design standards, steel industry practices and design documentation. Steel structural members, structural design principles and evaluation of loads and estimation of member capacities for steel structures will all be addressed by this course.

Course Pre/co-requisites

- A4107 - Structural Analysis.

2. Course Outcomes (COs)

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

A4115.1. Classify the different design philosophies

A4115.2. Determine strength parameters of different end connections

A4115.3. Apply the principles, procedures and current code requirements

A4115.4. Identify the different failure modes and design strengths of axial members

A4115.5. Design members of various steel structures

3. Course Syllabus

Theory

DESIGN PHILOSOPHIES: Working stress method, ultimate load method, limit state method. Introduction to limit state, Concept of limit State Design, Different Limit States as per IS 800 – 2007.

BOLTED CONNECTIONS: Introduction Bolted Connections-Types of failure, Design specifications, High- strength bolts, Efficiency of joint - Prying action of eccentric connections with brackets, Design of Un-stiffened seated connections.

WELDED CONNECTIONS: Specifications for welding - Design Strength - Efficiency of joint. Design of eccentric connections with brackets.

TENSION MEMBERS: Introduction. Types of tension member, types of failures, Design of Tension members - Design Strength of members.
BEAMS: Introduction, Plastic moment, Bending and shear strength. Design strength in bending, Design strength in shear. Design of laterally supported and un supported beams, Web Buckling, Crippling and Deflection of Beams.

COMPRESSION MEMBERS: Introduction, Types of sections Design of compression members, Buckling class, slenderness ratio, strength design. Laced and battened columns, column bases (slab base).
WELDED PLATE GIRDER: Component of plate girders, optimum depth. Design of main section. Design of end bearing stiffness and intermediate stiffness.

ROOF TRUSSES: Introduction, Components of a roof truss, and Types of trusses. Types of loads- Dead, Live and wind loads. Problems on wind load Design of purlins.

4. Books and Materials

Text Books:

1. S.K.Duggal, 2014,*Limit State Design of steel structures*, Tata McGraw- Hill
2. S SBHavikatti, Design of Steel Structures, I K International Publishing House; edition (19 November 2012)

Reference Books:

1. N. Krishna Raju, Structural Design and Drawing: Reinforced Concrete and Steel, Universities press
2. N.Subramanian, 2010,*Design of steel structures*, Oxford University Press

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH II SEMESTER

COURSE STRUCTURE

A4116 – TRANSPORTATION ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	1	2	42	14	28	5	30	70	100

1. Course Description

Course Overview

Transportation engineering is one of the important domains within civil engineering. This field deals with the planning, design, construction, and maintenance of transportation systems at local and regional levels. Transportation engineers work to ensure the safe, economical and timely movement of people and goods. This course basically deals with highway planning, geometric design, traffic management, pavement materials, construction, design of railway track and airport runway.

Course Pre/co-requisites

The course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4116.1. Explain various concepts involved in planning, design, and construction of various transport -ation facilities

A4116.2. Analyze various forces acting on the vehicles in the geometric design of a highway.

A4116.3.Develop various traffic regulatory and control measures.

A4116.4. Estimate quality of various materials used in highway construction.

A4116.5. Design geometry of a new highway, railway track, and runway.

3. Course Syllabus

Theory

Highway Development and Alignment: Highway Development in India – Highway Planning, Different Road Development Plans, Classification of Roads; Highway Alignment – Factors affecting Alignment, Engineering Surveys, Drawings and Reports.

Highway Geometric Design: Importance of Geometric Design, Highway Cross Section Elements, and Sight Distance Elements – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance; Design of Horizontal Alignment – Super elevation, Extra widening, Transition Curves; Design of Vertical Alignment – Gradients and Vertical Curves.

Traffic Engineering: Basic Parameters of Traffic – Volume, Speed, Density and their relation, Volume Studies – Speed Studies – Traffic Signs – Road Markings – Traffic Signals – Webster Method; Rotary Intersection – Design factors and capacity; Grade Separated Intersections.

Pavement Materials and Construction: Material characterization – Soil CBR Value, Stone Aggregates, Bitumen; Construction – Bituminous Surface Dressing, Dense Bituminous Macadam, Bituminous Concrete, Cement Concrete Pavements.

Railways and Airports: Cross Section of Permanent Way, Functions of various Components like Rails, Sleepers and Ballast; Geometrics - Degree of Curve, Gradients, Grade Compensation, Cant and Negative Super elevation, Cant Deficiency, and Turn outs; Airports – Site selection, Aircraft Characteristics, Wind Rose Diagram, Orientation of Runway, Runway length, Correction for runway length.

Practice

1. Aggregate crushing value.
2. Aggregate impact test.
3. Specific gravity and water absorption.
4. Los Angeles abrasion test.
5. Shape tests.
6. Penetration test.
7. Ductility test.
8. Softening point test.
9. Flash and fire point tests.
10. Traffic speed study.

4. Laboratory Equipment/Software/Tools Required

1. Compression Testing Machine
2. Aggregate Impact Testing Setup
3. Deval's Attrition Testing Machine
4. Los Angeles Abrasion Testing Machine
5. Thickness and Length Gauges
6. Bitumen Penetrometer
7. Ductility Testing Machine
8. Softening Point Test Setup
9. Flash & Fire Point Test Setup
10. Radar Speed Gun

5. Books and Materials

Text Books:

1. S. K. Khanna, C. E. G. Justo, and A. Veeraragavan, *Highway Engineering*, Revised 10th Edition, Nemchand& Bros., New Delhi, 2014.
2. S. C. Saxena, S. P. Arora, *A Text Book of Railway Engineering*, Dhanpat Rai Publications, New Delhi, 2010.
3. S. K. Khanna, M. G. Arora, and S. S. Jain, *Airport Planning and Design*, 6th Edition, Nemchand& Bros, New Delhi, 2003.

Reference Books:

1. S. P. Bindra, *Highway Engineering*, 4th Edition, Dhanpat Rai & Sons, New Delhi, 1981.
2. L. R. Kadiyali, *Traffic Engineering & Transportation Planning*, 6th Edition, Khanna Publications, New Delhi, 1997.
3. L. R. Kadiyali, *Highway Engineering*, Khanna Book Publishing Co. (P) Ltd., New Delhi, 2018.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH II SEMESTER

COURSE STRUCTURE

A4154-ADVANCED GEOTECHNICAL ENGINEERING

(PROFESSIONAL ELECTIVE –II)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Foundations provide the connection between man-made structures and the geosphere, with foundation engineering being concerned with soil-structure interaction. Advanced Geotechnical Engineering introduces the background theory required in foundation engineering. The main objective is to introduce the principles of shear strength theory, which are required for the design and analyses of foundations of structures, including buildings, bridges, and retaining structures. A variety of the problems encountered within the soil masses are manifested as slope failure, foundation failure etc. The theories of earth pressure and slope stability provides the necessary insight into these difficulties. The necessary principles and requirements for the selection of foundations, both deep and shallow foundations are dealt with in detail, together with the required design practices.

Course Pre/co-requisites

- A4110 - Geotechnical Engineering

2. Course Outcomes (COs)

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

A4154.1. Compare the different soil exploration methods.

A4154.2. Evaluate the factor of safety to assess the stability of slopes.

A4154.3. Determine the earth pressures on foundations and retaining structures.

A4154.4. Calculate the bearing capacity of soils and foundation settlements.

A4154.5. Evaluate the bearing capacity and characteristics of deep foundations.

3. Course Syllabus

SOIL EXPLORATION: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests –Plate load test –Soil investigation report.

EARTH SLOPE STABILITY: Infinite and finite earth slopes – Types of failures – Factor of safety of finite slopes – Stability analysis by Swedish circle method– Taylor's Stability Number.

EARTH PRESSURE THEORIES: States of earth pressures-Active, Passive and at rest conditions-Rankine's theory-Computation of Active and Passive Earth Pressures in Cohesion less and Cohesive soils, Coloumb's wedge theory – Culmann's graphical method.

SHALLOW FOUNDATIONS: Types of foundation – Choice of foundation – Location and depth of foundation – Safe bearing capacity- Terzaghi – Effect of water table on bearing capacity of soil – Determination of bearing capacity by Skempton and IS method – Allowable settlement of structures.
PILE FOUNDATION: Types of piles – Load carrying capacity of piles based on static pile formulae in different soils – Dynamic pile formulae – Pile load tests - Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.

4. Books and Materials

Text Books:

1. Arora, K.R. *Soil Mechanics and Foundation Engineering*, 7th reprint edition, Standard Publishers and Distributors, Delhi, 2019.
2. Gopal Ranjanand Rao, A.S.R. *Basic and Applied Soil Mechanics*, New Age International Pvt. Ltd Publishers, 2019.

Reference Books:

1. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain. *Soil Mechanics and Foundations*, Laxmi publications Pvt. Ltd., New Delhi, 2020.
3. Venkataramiah, C. *Geotechnical Engineering,* New age International Pvt. Ltd, (2019).
4. Gulhati, S. K. and Manoj Datta. *Geotechnical Engineering,* Tata Mc.Graw Hill Publishing company, 2017.
5. Varghese, P.C. *Foundation Engineering*, Prentice Hall of India., New Delhi, 2005.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH II SEMESTER

COURSE STRUCTURE

A4155-FINITE ELEMENT METHODS

(PROFESSIONAL ELECTIVE –II)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course is an advanced course related to numerical methods with different approaches. It starts with the introduction of plane stress - plane strain constitutive relationships along with the matrix algebra and discretization. The course covers formulating stiffness matrices and load vectors for one-dimensional and two-dimensional systems.

Course Pre/co-requisites

- A4107 - Structural Analysis

2. Course Outcomes (COs)

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

A4155.1. Explain concepts of FEM and relate energy principles in functional approximation.

A4155.2.Apply the strain displacement and stress strain relations in the development of field equations.

A4155.3. Develop shape functions for 1D and 2D elements.

A4155.4. Analyse plane truss elements.

A4155.5. Determine stiffness matrix for 1D and 2D elements.

3. Course Syllabus

Introduction: Concepts of FEM, Steps involved, merits & demerits, energy principles, Discretization, Rayleigh - Ritz method of functional approximation.

Principles of Elasticity: Equilibrium equations, strain displacement relationships in matrix form, Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with axisymmetric loading.

One Dimensional FEM: Stiffness matrix for bar element, shape functions for one dimensional element, one dimensional problem.

Analysis of Trusses: Stiffness Matrix for plane truss elements, stress calculations.

Two Dimensional FEM: Different types of elements for plane stress and plane strain analysis, Displacement models, generalized coordinates, shape functions, convergent and compatibility requirements, Geometric invariance, Natural coordinate system, area and volume coordinates.

4. Books and Materials

Text Books:

1. S.Md.Jalaluddin, *Finite element Methods*, Revised and Enlarged Edition, AnuradhaPubilications, 2016.
2. J.N. Reddy, *An Introduction to The Finite Element Method,* 3rd Edition, McGraw-Hill, New York, 2005.

Reference Books:

1. Tirupathi R. Chandrupatla, Ashok D. Belegundu, *Introduction to Finite Elements in Engineering,* 4th Edition, Pearson Education India, 2015.
2. P.N. Godbole, *Introduction to Finite Element Methods*, I.K. International Publishing House Pvt. Limited, 2013.
3. S.S. Bhavikatti, *Finite Element Analysis*, 3rd Edition, New Age International Publishers, 2015.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH II SEMESTER

COURSE STRUCTURE

A4156 – PRESTRESSED CONCRETE

(PROFESSIONAL ELECTIVE –II)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

To introduce the need for pre-stressing as well as the methods, types and advantages of pre-stressing to the students. Students will be introduced to the design of pre-stressed concrete structures subjected to flexure and shear.

Course Pre/co-requisites

- A4111 - Design of Reinforced Concrete Structures

2. Course Outcomes (COs)

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

A4156.1. Apply the principle of prestressing for different types in practice

A4156.2. Analyse the stress, deflections, flexural and shear strength and apply it for the design Of Bridges.

A4156.3. Design the tension and compression members and apply it for prestressed elements.

A4156.4. Utilize the concepts of pre stressed which helps in execution of prestressed concrete elements and construction process in the field concrete elements.

A4156.5. Analyze transfer and development length as well as prestress losses.

3. Course Syllabus

INTRODUCTION: Historic development, General principles of prestressing pretensioning and post tensioning. Advantages and limitations of prestressed concrete, Materials, High strength concrete and hightensile steel their characteristics. I. S. Code provisions, 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–Udall System.

LOSSES OF PRESTRESS: Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchor age bending of member and frictional losses.

ANALYSIS OF SECTIONS FOR FLEXURE: Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.

DESIGN OF SECTIONS FOR FLEXURE AND SHEAR: Allowable stress, Design criteria as per I.S.Code. Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses, design for shear in beams, Kern- lines, cable profile.

ANALYSIS OF END BLOCKS: Analysis of end blocks by Guyon's method and Mugnel method, Anchorage zone trusses, approximate method of design, Anchorage zone reinforcement, Transfer of prestress pre- tensioned members.

COMPOSITE SECTION: Introduction, Analysis of stress, Differential shrinkage, General designs considerations.

DEFLECTIONS OF PRESTRESSED CONCRETE BEAMS: Importance control of deflection, factors influencing deflections, shorter deflections of un cracked members' prediction of long term deflections.

4. Books and Materials

Text Books:

1. Krishna Raju (2006), Pre stressed Concrete, Tata Mc. Graw Hill Publications, New Delhi, India.
2. S. Ramamrutham (1994), Pre stressed Concrete, 2nd edition, Dhanpat Rai & Sons, New Delhi, India.
3. Pandit.G.S. and Gupta.S.P(2012), "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd.

Reference Books:

1. T. Y. Lin, Ned H. Burns (1981), Design of Pre stressed concrete structures, 3rd Edition, John Wiley & Sons, United States of America.
2. Dayartatnam (1985), Prestressed Concrete Structures, Oxford IBH Publishing Company, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH II SEMESTER

COURSE STRUCTURE

4020-PRODUCT REALISATION

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
0	0	2	0	0	28	1	30	70	100

1. Course Description

Course Overview

The accelerating demand for rapid product design and manufacturing, calls for constant technological innovation. The art of launching latest technological concepts and creating better products for future is achieved by strong Engineering judgment. Current research in this area includes lean product development, integration of knowledge and learning into design through product realization and rapid prototyping. In a similar note an initiative is taken to further explore and implement concepts like product realization and concurrent engineering1 Design and manufacturing tasks are central to mechanical engineering as these experiences begin in the freshman year and last until a real world component is designed and manufactured at a senior level. This process introduces the students to the concept of problems having more than one valid solution and to methods for generating parametric solutions to problems 2. Thus, a curriculum that provides a base for future professional growth is highlighted and enhanced by launching a ”learning laboratory”, or “research laboratory”, with state- of- the- art rapid prototyping and experimental stress analysis devices 4.

Course Pre/co-requisites

This course provides the alternative avenues to develop engineers who are both technically competent and who have significant experience in the design and development of products.

2. Course Outcomes (COs)

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

A4020.1. Interpret the specifications of product and solve it for Practical realization.
A4020.2. Analyze the Costumers mindset and accordingly designing of the product.
A4020.3. Applying Gantt Charts to define timeline for Product Realization.
A4020.4. Conceptualize the terms called Product, Purchase, Production and Monitoring of products.
A4020.5. Communicate the process of converting an idea to physical Product.

3. Course Syllabus

Introduction to Product Realization: Introduction to Product Realization, Need for Product Realization, Product realization process, Case Study of Product Realization for Global Opportunities.

Planning of Product Realization: Plan and develop the processes needed for product realization, Defining Quality objectives and requirements, establish processes documents. Needs - verification, validation, monitoring inspection and test activities (inspection nodes) and criteria for product acceptance and record needed. Case study on timeline of Product realization planning (Gnatt Chart).

Customer-Related Processes: Product information Enquiries, contracts or order handling Customer feedback including customer complaints, A field survey.
Design and Development: Review verification and validation of each design and development stages, Functional and performance requirements, Information for purchasing, production and service provisions, review and validation, Develop a Design model of the product.

Purchasing, Production and Service Provision : Purchasing information, Vendors evaluation and approval process, Verification of purchased product. Control of production, service provision, validation of processes for production and service provision, Identification and tractability, Customer property and Preservation of product.

Control of Monitoring and Measuring Equipment: Monitoring and measurements - Calibrated or verified, Adjusted or re-adjusted, Identified to determined the calibration status, Safeguarded from adjustment and Protection from change and deterioration.

Regulatory Investigation & Identification: Various regulatory bodies, roles and responsibilities, model of comprehensive document for the body of information about an investigational product.

4. Books and Materials

Text Books:

1. Mileta M Tomovic, Sowping Wang, Product Realization – A Comprehensive Approach, Spinger.
2. Stark, John, Product Life Cycle Management, 21st centaury Paradigm for Product Realisation 2011, Springer.

Reference Books:

1. Verna J. Bowen , Lucy V. Fusco, The Competitive Edge Research Priorities for U.S. Manufacturing, National Academy of Sciences.
2. RenukaThota, Suren Dwivedi, Implementation of product realization concepts in design and manufacturing courses, University of Louisiana-Lafayette.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

III B.TECH II SEMESTER

COURSE STRUCTURE

A4015 – ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	0	28	0	0	0	00	100	100

1. Course Description

Course Overview

The course focuses on introducing Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system to the students. The course is intended to develop the understanding of Traditional Knowledge in terms of various government acts and modern society and science among students.

Course Pre/co-requisites

This course has no specific pre/co-requisites.

2. Course Outcomes (COs)

A4015.1. Interpret the basic structure of traditional knowledge

A4015.2. Organize the need to preserve traditional knowledge through various acts

A4015.3. Identify the role of Indian contribution to modern science

A4015.4. Understanding the importance of traditional knowledge for holistic health

A4015.5. Compare Indian artistic tradition with the present art

3. Course Syllabus

Basic structure of Indian Knowledge System: Introduction to traditional knowledge and basic structure of Indian Knowledge System: Features of Indian Traditions: Nature and Characteristics of traditional knowledge-scope and importance-kinds of traditional knowledge-traditional knowledge Vs western knowledge.

Role of Government in Harnessing TK: Philosophical Tradition and Protection of traditional knowledge: Significance of traditional knowledge protection-value of traditional knowledge in global economy-role of government to harness traditional knowledge –Various Acts regarding protection of Traditional Knowledge.

Modern Science and Indian Knowledge System: Modern Science and Indian Knowledge System: Historical Background- the global problem today-Indian contributions to global science.

Yoga and Holistic Health care: AYUSH, The role of traditional medicine and its impact on the contemporary society.

Indian Artistic Tradition:

Traditional art forms and culture- the journey of Indian art from traditional to modern era.

4. Books and Materials

Text Books/ Reference Books:

1. V. Sivaramakrishnan (Ed.), *Cultural Heritage of India-course material*, BharatiyaVidyaBhavan, Mumbai. 5th Edition, 2014
2. Swami Jitatmanand, *Modern Physics and Vedant*, BharatiyaVidyaBhavan
3. Swami Jitatmanand, *Holistic Science and Vedant*, BharatiyaVidyaBhavan
4. Fritzof Capra, *The Wave of life*
6. *Yoga Sutra of Patanjali*, Ramakrishna Mission, Kolkata
7. GN Jha (Eng. Trans.), Ed. RN Jha, *Yoga-darshanam with Vyasa Bhashya*, VidyanidhiPrakashan, Delhi 2016
8. RN Jha, Science of Consciousness *Psychotherapy and Yoga Practices*, VidyanidhiPrakashan, Delhi 2016 P B Sharma (English translation), ShodashangHridayan
9. Krishna Chaitanya, *Arts of India*, Abhinav Publications, 1987.
10. R. Nagaswamy, *Foundations of Indian Art*, Tamil Arts Academy, 2002.

SYLLABI FOR IV YEAR I SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

IV B.TECH I SEMESTER

COURSE STRUCTURE

A4117 - ESTIMATION AND COSTING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
2	0	2	28	0	28	3	30	70	100

1. Course Description

Course Overview

This course introduces the skills required for students to choose career in quantity surveying. This course provides students the ability to estimate the quantities of item of works involved in buildings, road works and irrigation works. It also equip students to do rate analysis, valuation of properties and preparation of reports.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4117.1. Identify various items of work and materials in construction activities.
A4117.2. Examine the purpose and methods of valuation.
A4117.3. Explain about the Construction Contract types and Contract Documents
A4117.4. Estimate the quantity of earthwork for roads, canals and perform rate analysis.
A4117.5. Develop detailed estimates of building and bar bending schedules.

3. Course Syllabus

Theory

General items of work in Building: Standard Units, Principles of working out quantities for detailed and abstract estimates, Approximate method of Estimating.

Earthwork for roads and canals: Quantities of earthwork in embankment and Cutting using Mid sectional rule, Trapezoidal rule, Prismoidal rule.

Rate Analysis: Standard specifications for different items of building construction, Working out data for various items of work, overhead and contingency charges.

Bar Bending Schedule: Lintels, Beam and Slab of RC structures.
Contracts: Types of contracts – Contract Documents – Conditions of contract.

Valuation of Buildings: Methods of valuation, Outgoings, sinking fund, Depreciation, Methods of depreciation, Annuity.

Practice

1. Prepare detailed estimate and abstract estimate for different items of work for a building – Centre Line Method.
2. Prepare detailed estimate and abstract estimate for different items of work for a building – Long Wall-Short Wall Method.
3. Calculate the volume of earthwork in embankment by using Midsectional rule, Trapezoidal rule, Prismoidal rule.
4. Calculate the volume of earthwork in cutting by using Mid sectional rule, Trapezoidal rule, Prismoidal rule.
5. Estimate the quantity of earthwork for a portion of road.
6. Prepare a lead statement sheets and calculate the rates for different items of work.
7. Working out quantities of materials– Substructure.
8. Working out quantities of materials – Superstructure.
9. Prepare Bar Bending Schedule –Beam.
10. Prepare Bar Bending Schedule – Slabs.

4. Laboratory Equipment/Software/Tools Required

1. Drawing Tables

5. Books and Materials

Text Books:

1. B.N.Dutta, *Estimating and Costing in Civil Engineering*, 28th Revised Edition, UBS Publisers, 2016.
2. G.S.Birdie, *Estimating and Costing (Civil Engineering),* 6th Edition, DhanpatRai Publishing Company, 2014.

Reference Books:

1. Standard Schedule of Rates and Standard data book, Public works Department.
2. M. Chakraborti, *Estimating, Costing, Specification & Valuation in Civil Engineering,* 24th Edition, 2010.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

IV B.TECH I SEMESTER

COURSE STRUCTURE

A4118- REMOTE SENSING AND GIS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	2	42	0	28	4	30	70	100

1. Course Description

Course Overview

This course will introduce the students to the modern concepts and practices of remote sensing, photogrammetry and GIS and subsequently advanced methods will be covered. This course is designed to give comprehensive understanding on the application of remote sensing and GIS in solving the research and civil engineering problems. In this course students will also gain practical knowledge of computer-aided map making, georeferencing, digitization, creation of base maps, thematic maps. Students are able to perform data conversion, spatial analysis, spatial querying and simple applications of GIS in Water Resources Engineering and Transportation Engineering.

Course Pre/co-requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4118.1. Identify basic concepts, components and processes of Remote Sensing for suitable geospatial applications.

A4118.2. Apply Principles, components of Photogrammetry and GIS in different physical measurements.

A4118.3. Select different types of GIS data collection, data input and data representation methods for the required purpose.

A4118.4. Analyze spatial and attribute data using GIS and prepare geospatial maps.

A4118.5. Solve Civil Engineering related problems by using Remote Sensing and GIS techniques.

3. Course Syllabus

Theory

Remote Sensing: Basic concepts and foundation of remote sensing, Elements involved in Remote Sensing, Electromagnetic spectrum, Remote Sensing Terminology, Energy Sources, Energy Interactions with Earth Surface Features and Atmosphere, Resolution, Sensors and Satellites, Visual Interpretation Techniques-Basic Elements, Interpretation for Terrain Evaluation, Spectral Properties of Water Bodies, Introduction to Digital Data Analysis.

Introduction to Photogrammetry and GIS: Principle and Types of Aerial Photographs, Stereoscopy, Map vs. Mosaic, Ground Control, Parallax Measurements for Height Determinations.
Geographic Information System (GIS): Introduction, GIS Definition and Terminology, GIS Categories, Components of GIS, Fundamental Operations of GIS, A Theoretical Framework for GIS.

GIS Data Collection, Input and Representation: Data Collection and Input Overview, Data Input and Output. Keyboard Entry and Coordinate Geometry Procedure, Manual Digitizing and Scanning, Error Detection and Editing, Spatial and Non Spatial Data, Raster Data Structures, Vector Data Structures.

GIS Spatial Analysis: Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage in GIS, Overview of the Data Manipulation and Analysis. Integrated Analysis of the Spatial and Attribute Data.

Remote Sensing and GIS Applications: Land Use/Land Cover Mapping, Rainfall-Runoff Modelling, Surface Water Mapping, Targeting Groundwater Potential Zones, Identification of Sites for Artificial Recharge Structures, Estimation of Sediment Load, Flood Plain Zoning, Flood, Drought Assessment and Monitoring, Land Suitability Analysis, Landslide Risk Analysis, Road Network Analysis, Identification of Accident Black Spot Locations.

Practice

1. Familiarization with GIS Software, Data Input
2. Geo Referencing and Projections
3. Digitization of Map /Toposheet
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 and Transportation Engineering

4. Laboratory Equipment/Software/Tools Required

1. PC's
2. ArcGIS / QGIS - AnyoneorEquivalent
3. SOI toposheets

5. Books and Materials

Text Books:

1. T.M. Lillesand& R.W. Kifer, *Remote Sensing and Image Interpretation*,7th Edition, 2015.
2. M. Anji Reddy, *Textbook of Remote Sensing and Geographical Information systems*, BS Publications, 2019.
3. James B. Campbell, Randolph H. Wynne,*Introduction to Remote Sensing*, 5th edition, Guilford Publications Inc, 2011.

Reference Books:

1. Basudeb Bhatta, *Remote Sensing and GIS*, 2nd edition, Oxford Higher Education, 2011
2. Peter A. Burragh, Rachael, *Principals of Geo Physical Information Systems*, Oxford Press, 2016.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

IV B.TECH I SEMESTER

COURSE STRUCTURE

A4157-GREEN BUILDINGS AND SUSTAINABILITY

(PROFESSIONAL ELECTIVE-III)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces concepts of sustainability in the context of construction building materials. It also discusses the role of low carbon cements and recycled aggregate in minimizing consumption of natural resources. The course also emphasizes the concepts of embodied, operational, life cycle energy and minimizing energy consumption. It also intends to make students aware of rating systems like LEED, GRIHA etc.

Course Pre/co-requisites

- A4101 - Building Planning and Drawing
- A4106 - Concrete Technology

2. Course Outcomes (COs)

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

A4157.1. Identify green building and green building materials.

A4157.2. Make use of different rating agencies to classify the type of building.

A4157.3. Analyzesustainability and its implications for the practice of engineering.

A4157.4. Evaluate the potential of the alternative construction materials for sustainability.

A4157.5. Examine the green building rating systems and its contribution to sustainability.

3. Course Syllabus

GREEN BUILDING: Concept of Green building, Principles of green buildings, Eco-friendly materials, Certification systems – Green Rating for Integrated Habitat Assessment (GRIHA) and Leadership in Energy and Environmental Design (LEED)**.**

GREEN BUILDING MATERIALS: Green Building Materials and Equipment in India, what are key requisites for Constructing a Green Building, Important Sustainable features for Green Building.

BUILDING SERVICES: Fire protection – classes of fire and causes, development of fire, fire resisting materials, means of escape, Standing Fire Advisory Council norms. Water supply -Water distribution and plumbing fixtures.

APPLICATIONS IN THE BUILT ENVIRONMENT: Concepts of green buildings, climate responsive building - Reduction of energy consumption, direct and indirect methods - Reduction of water consumption, direct and indirect methods - Carbon footprint and eco footprints of buildings - New concepts and trends in green buildings, national and international.

SUSTAINABILITY: The Concept of Sustainability: Definition of Sustainability, Dimension of Sustainability. Three Pillars of Sustainability, Principles of Sustainability - 5R,Construction Materials Resource Efficiency, Operational Reuses of the Construction Materials, Sustainability Goals for construction Industry.

SUSTAINABILITY IN BUILT ENVIRONMENT: Environmentally sensitive design, low impact development, green infrastructure and conservation design, Green buildings and land use planning, Energy use and buildings.

5. Books and Materials

Text Books:

1. Frederick S. Merritt, Jonathan T. Ricketts, *Building design and construction Handbook*, McGraw-Hill Inc., 5t^{h} edition,1994.
2. Fred hall and Roger Greeno, *Building Services Handbook*, Routledge, 7th edition, 2013.
3. Bradley A. Striebig, Adebayo A. Ogundipe and Maria Papadakis,*Engineering Applications in Sustainable Design and Development*. First edition, 2016.

Reference Book:

1. Handbook on *Green Practices* published by Indian Society of Heating Refrigeratingand Air conditioning Engineers,2009.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

IV B.TECH I SEMESTER

COURSE STRUCTURE

A4158-CONSTRUCTION MANAGEMENT

(PROFESSIONAL ELECTIVE-III)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The Construction Management course focuses on study of the management and technological aspects of residential, industrial, commercial and institutional construction projects as well as engineering and infrastructure construction. Construction Management course provides practical problems for the students to acquire a unique combination of construction and project management skills in conjunction with the added dimension of protecting the environment and sustainability.

Course Pre/co-requisites

- A4101 - Building Planning and Drawing

2. Course Outcomes (COs)

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

A4158.1. Select appropriate tools and techniques required for construction management.

A4158.2. Identify key issues of building contracts procedures, contract documentation, specifications, and regulations.

A4158.3. Apply techniques of construction planning and management in the execution of projects.

A4158.4. Analyse quality and safety issues involved in construction projects

A4158.5. Evaluate Resources, Budget, Claims, and Disputes.

3. Course Syllabus

Construction Management: Significance, Objectives and Functions of Construction Management, Types of Construction, Resources for Construction Industry, Various stages in Construction, Construction Management Team & Types of Organization – advantages and disadvantages.

Planning and Scheduling Techniques: Work breakdown structure, Bar Charts, limitation of Bar Charts; CPM& PERT: Time estimates, Expected time. Project Scheduling, Resource Allocation/Levelling, Network Analysis, Float - Total float, Free float.

Contract Management: Types of Construction Contracts and their advantages and disadvantages, Contract Document and conditions of contract. Design and construct, Build operate and transfer contracts, Turnkey Contracts. Estimation and its types. Significance of Safety in construction.

Tenders and Specifications: Tendering and Methods of tendering for projects, tender documents. Importance of specifications. M Book, Muster Roll, Deposits by the contractor - Earnest money & Security Deposit. Quality control in construction work.

Claim Management: Construction claims and Disputes- Source of claim, Claim Management, Dispute resolution methods, Arbitration and its advantages, Construction closure, contract closure, Project closure.

4. Books and Materials

Text Books:

1. GAHLOT P.S., DHIR B.M., *Construction Planning and Management*, Wiley Eastern Limited, 2014.
2. Chitkara, K.K., *Construction Project Management, Planning, Scheduling and Controlling,* Tata McGraw Hill Publishing Co., New Delhi, 2014.

Reference Book:

1. Jha, K.N.,*Construction Project Management*, 2nd Edition, Pearson Education India, 2015.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

IV B.TECH I SEMESTER

COURSE STRUCTURE

A4159 – PAVEMENT ENGINEERING

(PROFESSIONAL ELECTIVE-III)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course begins with the introduction of different types of pavement structures, and various factors to be considered in the analysis and design of pavements. Subsequently, discusses about different theories to be followed in estimating critical strains and stresses in flexible ae well as rigid pavement designs. Then, it discusses about codal practice guidelines in flexible and rigid pavement designs. Finally, the course covers different types of pavement construction and maintenance techniques.

Course Pre/Co-requisites

- A4116 - Transportation Engineering

2. Course Outcomes (COs)

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

A4159.1. Utilize materials characteristics in the design and construction of pavements.
A4159.2. Analyze the stresses induced in various layers of the pavements.
A4159.3. Evaluate various types of pavement failures and their stability.
A5159.4. Explain construction of bituminous and cement concrete pavements.
A5159.5. Design flexible and rigid pavements along with their joints.

3. Course Syllabus

Factors Influencing Pavement Design: Types of pavements, Factors affecting design of pavements, wheel loads. ESWL Concept - tyre pressure, contact pressure, Material characteristics. Environmental and other factors. Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors.

Flexible Pavements: Flexible pavement, Bossiness Theory - one layer system, Burmister's Theory - two-layer and multi-layer system of analysis. CBR Method of Flexible Pavement Design, IRC method of flexible pavement design, and AASHO Method of Flexible Pavement design.

Rigid Pavements: Relative stiffness of slab, modulus of sub-grade reaction, stresses due to wheel load, temperature, and friction - IRC method of rigid pavement design - Importance of Joints in Rigid Pavements, Types of Joints, Use of Tie Bars and Dowell Bars.

Highway Construction: Requirements of materials such as Soil, Aggregate and Bitumen, Marshall's Method of Bituminous Mix design. Highway construction – WBM Roads, WMM, Types of Bituminous Constructions, OGPC, Prime and Tack Coats - Cement Concrete Roads – Material specifications, IRC method of construction.

Highway Maintenance: Need for Highway Maintenance, Pavement Failures - Failures in Flexible Pavements - Types and Causes - Rigid Pavement Failures - Types and causes - Pavement Evaluation, Benkelman Beam method, FWD - Strengthening of Existing Pavements - Types of Overlays, Suitability, Design of Overlays.

4. Books and Materials

Text Books:

1. S. K. Khanna, C. E. G. Justo, and A. Veeeraraghavan, *Highway Engineering*, 10th Edition, Nemchand& Bros, New Delhi, India, 2014.
2. L. R. Kadiyali and N. B. Lal, *Principles and Practices of Highway Engineering*, 7th Edition, Khanna Publishers, New Delhi, India, 2013.
3. Rangwala, *Highway Engineering*, 11th Edition, Charotar Publishers, India, 2017.

Reference Books:

1. E. J. Yoder andM. W. Witczak, *Principles of pavement design*, 2nd Edition, Wiley, 2001.
2. IRC 37-2018: *Guidelines for the Design of Flexible Pavements (Fourth Revision)*, Indian Roads Congress, New Delhi.
3. IRC 58-2015: *Guidelines for the Design of Plain Jointed Rigid Pavements for Highways(Fourth Revision)*, Indian Roads Congress, New Delhi.
4. IRC 82-2015: *Code of Practice for Maintenance of Bituminous Road Surfaces (First Revision).*

SYLLABI FOR VI YEAR II SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

IV B.TECH II SEMESTER

COURSE STRUCTURE

A4160 – REHABILITATION AND REHABILITATION OF STRUCTURES

(PROFESSIONAL ELECTIVE-IV)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course introduces the concept as well as techniques associated with repairs and rehabilitation of existing structures. The course enables the students to understand the functionality of any structures depends on various factors during its life time. The theoretical knowledge of rehabilitation will enable students to develop skills to carry out repairing or retrofitting of existing structure.

The course also discusses the modern tools/instrumentation to measure the level of damage or strength present in the structure.

Course Pre/co-requisites

- A4101 - Building Planning and Drawing
- A4106 - Concrete Technology
- A4111 - Design of Reinforced Concrete Structures

2. Course Outcomes (COs)

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

A4160.1. Illustratevarious maintenance and repair strategies.

A4160.2. Categorize the causes and prevention mechanisms of corrosion and damages occur in structures.

A4160.3. Apply various methods and techniques for damage assessment and diagnosis.

A4160.4. Formulatethe usage of different techniques for structural retrofitting.

A4160.5. Estimate the structural damage and recommend suitable repair and strengthening methods.

3. Course Syllabus

CAUSES OF DETERIORATION AND DURABILITY ASPECTS: Holistic Model for Deterioration of RCC; Permeability of Concrete: Capillary Porosity, Air Void, Micro and Macro Cracks; Aggressive Deteriorating Chemical Agents: Corrosion of reinforcing bars, Sulphate Attack, Alkali Silica Reaction, Intrinsic and Extrinsic Causes and Stages of Distress.

CONDITION SURVEY & NON-DESTRUCTIVE EVALUATION: Definition, Objective, Stages, Consideration for Repair Strategy.
NON-DESTRUCTIVE EVALUATION TESTS: Concrete Strength Assessment: Rebound Hammer Test, Ultrasonic Pulse Velocity (UPV) Test, Pull-out (LOK) Test, Core Sampling and Testing; Chemical Tests: Carbonation Test, Chloride Content; Corrosion Potential Assessment.

SELECTION OF REPAIR MATERIALS: Essential Parameters for Repair Materials. **MATERIALS FOR REPAIR:** Premixed Cement Concrete/Mortars, Cements, Mineral and Chemical Admixtures, Water Cement Ratio; Epoxies and Epoxy Systems including Epoxy Mortars/Concretes: Epoxies, Modifies Epoxy Systems.

REHABILITATION AND RETROFITTING METHODS: Repair options; Performance Requirements of Repair Systems; Important factors to be considered for Selection of Repair Methods; Repair Stages; Repair Methods: Repairs using Mortars, Dry Pack and Epoxy Bonded Dry Pack, Pre-placed Aggregate Concrete (PAC), Shotcrete, Concrete Replacement, Epoxy Bonded Concrete.

REPAIR METHODS: Ferro-cement, Plate Bonding, RCC Jacketing, Propping and Supporting, Fibre Wrap Technique. Repair/Rehabilitation Strategies – Stress Reduction, Repair/Strengthening of Columns, Beams and Slabs, Compressive Strength of Concrete, Cracks/Joints, Masonry, Protection.

4. Books and Materials

Text Books:

1. CPWD Hand book on *Repair and Rehabilitation of RCC Buildings*, NDLS 2008.
2. Santhakumar, A.R.,*Concrete Technology*, Oxford University Press, New Delhi, 2007.

Reference Books:

1. Edwards, S.C., Shaw, J.D.N. and Allen, R.T. *Repair of Concrete Structures*, Span Press, GW, UK, 1993.
2. Jacob Feld and Kenneth L Carper, *Structural Failures*, John Wiley & Sons, NY. US,1997.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

IV B.TECH II SEMESTER

COURSE STRUCTURE

A4161 – RAILWAY AND AIRWAY ENGINEERING

(PROFESSIONAL ELECTIVE-IV)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course deals with the introduction of railway and airway engineering. It begins with the discussion of railway track features, and its geometric design. Subsequently it covers about interlocking of signals, modernization of railway track and maintenance. Then, it introduces about development of air transport, airport planning and zoning laws. Finally, it discusses about airport markings, lighting, and air traffic control aids.

Course Pre/Co-requisites

- A4116 - Transportation Engineering

2. Course Outcomes (COs)

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

A4161.1. Distinguish between railway and airway transportation features.

A4161.2. Identify and plan an airport site for a given region.

A4161.3. Analyzevarious forces acting on the railway or aircraft vehicles.

A4161.4. Explain modernization of railways, airport zoning laws, and air traffic control.

A4161.5. Design geometry of railway track, and runway features.

3. Course Syllabus

Theory

Rail Transport: Role of railways in transportation, Advantages of Railways - Permanent Way - Permanent way components - Types of Gauges - Coning of Wheels - Creeps and kinks- Sleeper density – Track circuiting.

Geometric Design: Degree of Curve - Speed on curves - Widening of gauges in curves – Cantand Negative Super elevation – Points, Crossings – Classification of Signals – Control of movement of trains - Interlocking of Points and Signals.

Modernization of Railways: Modernization of Traction and Track, Speed Trends, Automation in Operations – High Speed and Its Effects on Track Structure, Geometric Requirements – Modern Maintenance – Mechanised Maintenance, Measured Shovel Packing, Directed Track Maintenance.

Air Transport: History of air transport –Directorate of Civil Aviation, National airports Authority - Airport Planning - Master plan - Site selection - Airport Obstructions – Runway Orientation, Basic Runway length and Corrections – Airport Capacity.

Airport Layout & Air Traffic Control: Terminal, Parking, Apron, Hangar Areas and Airport Layouts - Runway and Taxiway Markings, Wind Direction Indicators - Runway and Taxiway Lightings - Air Traffic Control - Enrout and Landing Air traffic Control Aids.

4. Books and Materials

Text Books:

1. S. C. Saxenaand S. P. Arora, *A Text Book of Railway Engineering*, 6th Edition, Dhanpat Rai Publishing Co Pvt Ltd, New Delhi, 2010.
2. S. K. Khanna, M. G. Arora, and S. S. Jain, *Airport Planning and Design*, 6th Edition, Nemchanadand Brothers, Roorkee, 2017.

Reference Book:

1. S. P. Chandola, *A Text Book of Transportation Engineering*, 1st Edition, S. Chand & Company Pvt. Ltd., New Delhi, 2014.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

IV B.TECH II SEMESTER

COURSE STRUCTURE

A4162- ENVIRONMENTAL MANAGEMENT SYSTEMS

(PROFESSIONAL ELECTIVE-IV)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course is designed to provide the engineering graduates with technical expertise in Advanced topics in Environmental Management systems which will enable them to have a career and professional accomplishment in the public or private sector to address the complexities of real-life environmental engineering problems related to, Advanced Water Treatment Processes, Industrial Wastewater Treatment, Solid waste management, Engineering Systems for Resource and Energy Recovery from Solid Waste, Environmental Impact Assessment.

Course Pre/co-requisites

Environmental Engineering

2. Course Outcomes (COs)

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

A4162.1. Analyze advanced water treatment processes

A4162.2. Assess Industrial waste water Characteristics and Treatment methods

A4162.3. Identify Engineering Systems for Resource and Energy Recovery from Solid Waste

A4162.4. Propose possible solid waste collection, transportation and disposal methods

A4162.5. Formulate EIA to assess Impacts of Developmental Activities on Soil, Air and Water.

3. Course Syllabus

Advanced Water Treatment Processes: Removal of final suspended solids, Removal of dissolved solids, Water Softening methods, Fluoridation and De-fluoridation techniques. Special requirements of Industrial water supply. Rural water supply systems. Rain water Harvesting processes and utilization.

Industrial Wastewater Treatment: Industrial wastewater Origin, Character and Treatment, Volume reduction, Strength reduction, Neutralization, Equalization and Proportioning, Nitrification and Denitrification Processes, Phosphorous removal, Wastewater disinfection, Joint treatment of Industrial Wastes and Domestic Sewage, Specific Case studies on Pharmaceutical and Chemical

Industries. Common Effluent Treatment Plants, Effluent Disposal Methods, Recirculation of Industrial Wastes, Use of Municipal Wastewater in Industries.

Solid Waste Management: Definition of Solid Wastes, Domestic Solid Wastes, Types of Domestic Solid Wastes, Collection, Transportation, Characteristics of Solid Waste, Segregation, Processing Techniques, Principles of Waste disposal, Site Selection, Types of Disposal Methods, Sanitary Land Fill, Incineration, Composting, Vermi Compost, Recovery of Energy from Solid Wastes.

Engineering Systems for Resource and Energy Recovery from Solid Waste: Processing techniques; materials-recovery systems; recovery of biological conversion products; recovery of thermal conversion products; recovery of energy from conversion products; materials and energy recovery systems

Environmental Impact Assessment: Introduction, Basic Concept of EIA, Initial Environmental examination (IEE), Important Steps in EIA, Systematic Approach for using EIA as a Planning Tool for Major Project Activities, concepts of water and carbon footprints. EIA Methodologies, Cost / Benefit Analysis, Assessment of Impact of Developmental Activities, Land use on Soil, Air and Water, Environmental protection laws.

4. Books and Materials

Text Books:

1. G.S.Birdie , J. S.Birdie,*Water supply& Sanitary Engineering* ,9th Edition,Dhanpat Rai Publishing Co Pvt Ltd, 2014.
2. D. Patwardhan,*Industrial Wastewater Treatment*, Published byPHI Learning private limited, New Delhi, 2019.
3. M N Rao; Razia Sultana; Sri HarshaKota,*Solid and hazardous waste management,* Oxford, England, Butterworth-Heinemann, 2017.
4. Y. Anjaneyulu (2011), Environmental Impact Assessment Methodologies, B.S. Publication, Sultan Bazar, Hyderabad.

Reference Books:

1. Metcalf and eddy*, Wastewater engineering, treatment and reuse,* fifth edition, Tata Mc Graw Hill, 2013.
2. D. P. Sincero and G.A Sincero, *Environmental Engineering*, Pearson Education India,2015.
3. M. Anji Reddy, *Textbook of Environmental Science &Technology*, BS Publications, 2010.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

IV B.TECH II SEMESTER

COURSE STRUCTURE
A4026 - MANAGEMENT SCIENCE

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

In this course, students will learn the fundamental concepts and contributions of Management. It also explains Inventory control techniques, Human Resource Practices, Quality control techniques and Project Management which plays a vital role in the organization.

Course Pre/co-requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

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

A4026.1. Explain and infer the concepts and aspects of management

A4026.2. Analyze the different organizational structures, plant layouts, work study tools for enhancement of productivity in an organization

A4026.3. Apply Inventory control and statistical quality control techniques for better management.

A4026.4. Use Human resource management techniques for better people management.

A4026.5. Apply the project management techniques to decide the optimum time and cost for completion of a project.

3. Course Syllabus

INTRODUCTION: Management - Definition, Nature, Importance of management, Functions of Management - Taylor's scientific management theory, Fayol's principles of management, Contribution of Elton mayo, Maslow, Herzberg, Douglas MC Gregor. Basic concepts of Organisation Authority, Responsibility, Delegation of Authority, Span of control, Departmentation and Decentralization - Organisation structures (Line organization, Line and staff organization, Functional organization, Committee organization, Matrix organization)

OPERATIONS MANAGEMENT: Plant location, Factors influencing location, Principles and types of plant layouts - Methods of production (job, batch and mass production), Work study - Basic procedure involved in method study and Work measurement.

QUALITY CONTROL AND MATERIALS MANAGEMENT: Statistical quality control – Meaning- Variables and attributes - X chart, R Chart, C Chart, P Chart, (simple Problems) Acceptance sampling, Sampling

plans, Deming's contribution to quality. Materials management – objectives, Need for inventory control, Purchase procedure, Store records, EOQ, ABC analysis, Stock levels.

HUMAN RESOURCE MANAGEMENT (HRM): Concepts of HRM, Basic functions of HR manager: Man power planning, Recruitment, Selection, Training and development, Placement, Wage and salary administration, Promotion, Transfers, Separation, performance appraisal, Job evaluation and Merit rating.

PROJECT MANAGEMENT: Early techniques in project management - Network analysis: Programme evaluation and review technique (PERT), Critical path method (CPM), Identifying critical path, Probability of completing project within given time, Project cost analysis, project crashing (simple problems).

4. Books and Materials

Text Books:

1. Koontz & weihrich – Essentials of management, TMH, 8th edition, 2010 .
2. O.P. Khana, Industrial engineering and Management, Dhanpat rai publication.

Reference Books:

1. Dr. A. R. Aryasri, Management Science, TMH, 4th edition, 2009.
2. Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi, 2004.
3. L. S. Srinath, PERT & CPM , 3rd edition East-West press pvt. ltd.-New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4131 - PROJECT PLANNING AND MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course will provide a general introduction to project management. This course covers key components of project management including project integration, project scope management, project time and cost management, quality management, human resource considerations, communications, and procurement management. Understand network techniques for Project planning, scheduling and Execution Control with limited resources.

Course Pre/co requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (Cos)

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

A4131. 1 Identify project characteristics and various phases of a project.
A4131. 2 Explain project organization, staffing and feasibility of projects.
A4131. 3 Apply the techniques of Project planning, scheduling and Execution Control.
A4131. 4 Analyse the role of stakeholders.
A4131. 5 Evaluate Resources, Budget, Claims and Disputes.

3. Course Syllabus

Project Management: Overview of Project Management, Concepts and Definitions. Project manager and his responsibilities. Types of projects, Various stages of projects, Organizational structures used in project management. Management Functions and staffing.
Project Planning: Time planning, Contents of Project plan, planning process, Work breakdown structure, process mapping. Project Budgeting: Financial Projections, time value of money, cost of capital, capital investment decisions.
Scheduling Techniques: Bar Charts, CPM & PERT: Time estimate- Optimistic time estimate, Most likely time estimate, Pessimistic time estimate & Expected time. Project Scheduling, Network Analysis, Cost-Time Analysis in Network Planning, Float - Total float, free float.
Monitoring and Controlling: Plan monitor control cycle, data collection and reporting, Project control. Working with stakeholders.
Conflict Management: claims and Disputes- Source of claim, Claim Management, Dispute resolution, Arbitration and its advantages, Project closure.

4. Books and Materials

Text Books:

1. Punmia B.C., Khandelwal K.K., Project *planning and control with PERT and CPM*, Fourth Edition, Laxmi Publications, New Delhi, 2016.

Reference Books:

1. Stephen A. Robbins, David A. Decenzo & Mary Coulter,*Fundamentals of Management* 7th Edition, Pearson Education, 2011.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4132 – ENVIRONMENTAL POLLUTION AND MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course has been designed to improve the understanding of the students about different pollution control strategies and the skills of application of remediation techniques to combat pollution in three environmental compartments i.e. air, water and soil. The course will also be dealing about the sources of pollution in air, soil, water, and noise and the impacts these sources on the environment and health. In addition, the students will be given the knowledge to develop the particular skills required in pollution related structured research and environmental management.

Course Pre/ Co-requisites

A4014 - Environmental Science

2.Course Outcomes (COs)

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

A4132.1. Identify water pollution sources, types and treatment methods.

A4132.2. Apply knowledge on Prevention and control of air pollution.

A4132.3. Inspect sources, effects and mitigation methods of noise pollution.

A4132.4. Examine soil pollution sources, effects and control measures.

A4132.5. Formulate Environmental management plan to minimize environmental pollution.

3. Course Syllabus

Water pollution: Water Pollution - Introduction - Sources and types of water pollutants Physical, Chemical and Biological. Ground water - Surface water - lake water - seawater. Effects of water pollution. Water Quality standards (drinking and industrial) - water treatment - physical, chemical and biological. Water Pollution Prevention and Control Act, 1974.

Air pollution: Structure and composition of atmosphere – classification, sources and effects of air pollution – Acid rain –green house effect – global warming – Ozone depletion, Prevention and control of air pollution particulate control – settling chamber, scrubber, bag filter, cyclones electrostatic precipitators. Gaseous emission control methods. Air pollution prevention and control Act 1981.

Noise Pollution: Noise Pollution Basics of acoustics- propagation of indoor and outdoor sound- noise profiling effects of noise – measurement, index and mitigation methods- health effects of noise- Vibration and its Effects, Whole body vibration problems in opencast mines-ground vibration and Air blast. Green Belt Development--Principles and design considerations, Industrial Noise Pollution Control methods.

Soil Pollution: Sources - solid waste disposal and their effects - pesticides - types and effect of pollutants on Plants - animals and human beings - biomagnifications - fertilizers and its Effect of pollutants on plants - animals and human beings - soil pollution Control measures - soil microbes and function - biofertilizer.

Environmental management: Environmental impact assessment and statement; Government strategies in pollution control: subsides, polluter pays principle and regulations; Government Agencies and Programs – The Tiwari committee – creation of NCEPC, Department of Environment & Forest – Function of State Pollution Control Board. Sources of environmental information and regulations; Sustainable development and environmental protection.

4. Books And Materials

Text Books:

3. Prof. Y. Anjaneyulu, "Air Pollution and Control Technologies", Allied publishers, 2002.
4. M. N. Rao, H. V. N. Rao, “Air pollution”, Tata McGraw Hill Education, New Delhi, India, 2017.

Reference Books:

5. R. K. Trivedy, P. K. Goel, “Introduction to Air pollution”, ABD Publications, New Delhi, India, 2003.
6. Wark, Warner, “Air pollution its origin and control”, Addison-Wesley, New York, 1998.
7. K.V.S.G. Murali Krishna, “Air Pollution and Control”, USP, India, 2017.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4133 – DISASTER MANAGEMENT (OPEN ELECTIVE-III)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course has been framed with an intention to provide a general concepts in the dimensions of disasters caused by nature beyond human control as well as the disasters and environmental hazards induced by human activities with emphasis on Natural disaster, Man-made disaster, vulnerability and risks of disasters, Disaster Management Mechanism, Capacity Building and disaster coping Strategies and Disaster management planning.

Course Pre/co requisites

A5012- Environmental science

2. Course Outcomes (Cos)

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

A4133. 1. Identify concepts, hazards and vulnerabilities of different types of disasters.
A4133. 2. Examine the components of disaster management mechanism.
A4133. 3. Select suitable capacity building frame work for disaster management
A4133. 4 Interpret various disaster coping strategies
A4133. 5. Develop Strategies for disaster management planning

3. Course Syllabus

CONCEPT- HAZARDS - VULNERABILITIES OF DISASTERS: Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional) Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards.

DISASTER MANAGEMENT MECHANISM: Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief.

CAPACITY BUILDING: Capacity Building: Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels.

COPING WITH DISASTER: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management.

DISASTER MANAGEMENT PLANNING: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans.

4. Books And Materials:

Text Books:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2017

Reference Books:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE
A4231 – TRANSDUCERS AND MEASUREMENTS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides an overall understanding of the elements and processes, including sources of errors, and digitally acquiring these measurements. Along with an overview of instrumentation principles, the physical principles and electrical characteristics for several common instrument transducers are studied. The electronic signal conditioning circuits required converting the electrical changes in the transducers to signal which can be interpreted accurately by a microprocessor or an embedded controller are analyzed and designed effectively. This course also gives an integration of hardware and software in designing computer controlled processes and/or systems with the aid of sensors, transducers data acquisition board, and instrument control.

Course Pre/co requisites

The course has no specific prerequisite and co requisite

2. Course Outcomes (Cos)

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

A4231.1. Aware the basic concepts of measurement parameters as well as instrument standards, characteristics and errors.

A4231.2. Construct and design various measuring devices like voltmeters, Ammeters, Ohmmeters, analog, digital multi-meters and analyze different types of cathode ray oscilloscopes.

A4231.3. Design different bridge networks and analyze balanced condition for finding out values of resistance, capacitance and inductance.

A4231.4. Analyze different physical parameters like pressure, force, velocity, acceleration, sound, torque, strain and stress etc. using non-electrical transducers.

A4231.5. Apply the principles and practice for instrument design and develop for real world problems.

3. Course Syllabus

CHARACTERSTICS OF INSTRUMENTS: Block schematic of measuring system, Performance characteristics of instruments-static and dynamic characteristics, Errors in measurement.

MEASURING INSTRUMENTS: DC voltmeters- multi-range, range extension, DC Ammeter- multi range, range extension, ohm-meters-series type and shunt type, AC Voltmeter.

DIGITAL VOLTMETERS: Dual slope and Successive Approximation type DVM.

TRANSDUCERS-I: Introduction, classification, strain gauges, LVDT, Piezo electric transducers, OP-AMP applications in measurement and transducer circuits, instrumentation amplifier, thermometers, thermocouples, thermistors, sensistors.

TRANSDUCERS-II: Measurement of non electrical quantities- displacement, pressure, torque, vibration, pH, sound, velocity, humidity, speed, analog and digital data acquisition systems, programmable logic controllers and their industrial applications.

DC and AC BRIDGES: Measurement of resistance Wheat's stone bridge, Kelvin's double bridge, measurement of Inductance using Maxwell's inductance bridge, Anderson's bridge, Hay's bridge, measurement of capacitance using Schering bridge.

CATHODE RAY OSCILLOSCOPE (CRO): Introduction to CRT, vertical amplifiers, horizontal deflection system, simple CRO, measurement of phase and frequency (lissajous patterns).

4. Books and Materials

Text Books:

1. A. K. Sawhney (2007), Electrical and Electronic Measurements and Instrumentation, 18th Edition, Dhanpat Rai & Co, New Delhi.
2. H.S.Kalsi, Electronic Instrumentation, 3rd edition, Tata McGraw-Hill Education.

Reference Books:

1. D. Helfrick, W.D. Cooper (2002), Modern Electronic Instrumentation and Measurement Techniques, 5th edition, Prentice Hall of India, New Delhi.
2. David A. Bell (2003), Electronic Instrumentation & Measurements, 2nd edition, Prentice Hall of India, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4232 – SOLAR ENERGY AND APPLICATIONS (OPEN ELECTIVES-II)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This is an engineering introduction to Solar energy technologies and potentials. The course aims to introduce a general engineering/science audience to the basic concepts of solar energy. The concepts of Photo Voltaic cells and their properties will be explained. Applications of solar cells will be explained in detail also the environmental issues of solar systems will be explained.

Course Pre/co requisites

The course has no specific prerequisite and co requisite.

2. Course Outcomes (Cos)

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

A4232.1 Compare the present and future available electrical power from solar energy in the world based on the knowledge of global solar horizontal irradiation.

A4232.2 Assimilate and acquire the skills for design and engineering of solar thermal and solar photovoltaic technology and systems.

A4232.3 Identify simple to complex problems involved in solar thermal energy conversion technique used in the liquid based solar heating and cooling systems for buildings/societal needs.

A4232.4 Examine a solar PV(Photo Voltaic) system components and their function by utilizing the previous literature knowledge on different Photovoltaic solar cells like crystalline, Multi-Crystalline, Amorphous and thin film.

A4232.5 Analyze the techno economics interaction of developments in the solar energy systems

3. Course Syllabus

PRINC PLES OF SOLAR RADIATION: Role and potential of solar energy, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and Sun shine, solar radiation data.

SOLAR ENERGY COLLECTORS: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

STORAGE AND APPLICATIONS: Different methods of solar energy storage, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating /cooling technique, solar distillation and drying.

PHOTO VOLTAICS (PV): Fundamentals of solar cells, types of solar cells, absorption of photons, excitations and photo emission of electrons.
PV CELL PROPERTIES: Solar cell properties and design, p-n junction photodiodes, depletion region, electrostatic field across the depletion layer, electron and holes transports, device physics, charge carrier generation, recombination and other losses, I-V characteristics, output power.

SOLAR CELL APPLICATIONS: PV cell interconnection, module structure and module fabrication, Equivalent circuits, load matching, efficiency, fill factor and optimization for maximum power, Design of stand-alone PV systems, system sizing, device structures, device construction, DC to AC conversion, inverters.

COST ANALYSIS AND ENVIRONMENTAL ISSUES: Cost analysis and pay back calculations for different types of solar panels and collectors, installation and operating costs, Environmental and safety issues, protection systems, performance monitoring.

4. Books And Materials

Text Books:

1. G. D. Rai (2009), Non-Conventional Energy Sources, 4th Edition, Khanna Publishers, New Delhi.
2. Martin A. Green (2008), Solar Cells: Operating Principles, Technology and system Applications, 1st Edition, Prentice Hall, New Delhi.

Reference Books:

1. B. H. Khan (2016)- Non Conventional Energy Resources-3rd Edition, McGraw Hill Education (India) Private Limited.
2. Sukatme (2008), Solar Energy, 3rd Edition, McGraw Hill Companies, New Delhi.
3. D. Yogi gosuami, Frank Kreith, Jan F. Kreider (2000), Principles of Solar Engineering, 3rd Edition, Taylor & Francis, USA.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE
A4233 – ENERGY MANAGEMENT AND AUDIT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Energy management can help industry control its operating costs. Energy management is also important for reducing local, regional and global emissions and can help mitigate the problem of global warming. This course will help industry professionals acquire the skills and techniques required to implement energy management. This course will also benefit researchers and students who are interested in working on energy management. In the context of the Energy Conservation Act 2001, the Bureau of Energy Efficiency has emphasised the importance of Energy Managers and Certified Energy Auditors. This course is designed to provide the background required for engineers to meet this role.

Course Pre/co requisites

The course has no specific prerequisite and co requisite

2. Course Outcomes (Cos)

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

A4233.1 Analyze the influence of energy availability on the development of Industries and various other organizations.

A4233.2 Discuss the concepts and technologies used for energy conservation.

A4233.3 Develop methods for evaluating worth of project.

A4233.4 Investigate the schemes for demand side management.

A4233.5 Evaluate the VAR requirements for effective voltage control.

3. Course Syllabus

ELECTRICAL ENERGY AND SAFETY AUDIT: Overview of Electricity Act – Energy conservation act – Electrical energy audit – Types – Tools – Tariff – Load factor improvement – Power factor correction – Power demand control and shifting – Electrical safety Auditing.

ENERGY CONSERVATION IN ELECTRIC MOTORS: Motors efficiency – Motor selection – Factors affecting motor performance – Efficiency at low load – Rewound motors – Variable speed drives – Load reduction – High efficiency motors – Energy savings in transformers – Case studies.

ELECTRICAL ENERGY CONSERVATION IN DRIVEN EQUIPMENTS: Input electrical energy requirements in pumps, fans and compressors – Load factor estimation in the equipment – Energy conservation potential.

ENERGY CONSERVATION IN INDUSTRIAL LIGHTING: Concept of lighting systems – Choice of lighting – Different lighting technologies – Energy saving – Control of lighting – Lighting standards and requirements – Light meter audit – Methods to reduce costs.

ENERGY MANAGEMENT: Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting – Energy manager, Qualities and functions.

4. Books and Materials

Text Books:

1. W. R. Murphy, G. McKay (2008), *Energy Management,* 1st Edition, B.S. Publications, New Delhi.
2. Tripathy S. C., "Electric Energy Utilization and conservation", Tata McGraw Hill.
3. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982.

Reference Books:

1. B. Smith (2007), *Energy Management Principles*, 1st Edition, Pergamon Press, Inc., England.
2. Energy Management Handbook, Edited by W.C.Turner, Wiley, New York, 1982.
3. IEEE Bronze Book, 'Recommended Practice for Energy Conservation and cost effective planning in Industrial facilities, IEEE Press.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE
A4331 - BASIC MECHANICAL ENGINEERING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview:

This course is designed to lay emphasis on the fundamental principles of Thermodynamics, Fluid Mechanics, Hydraulic Machines and heat transfer and to equip the students with the knowledge and skills to solve mechanical engineering problems efficiently.

Course Pre/co requisites

A4003 - Semiconductor Physics
A4001 - Linear Algebra and Ordinary Differential Equations

2. Course Outcomes (Cos)

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

A4331.1. Develop the general energy equations for thermal systems by laws of thermodynamics.

A4331.2. Compare types of fluids, fluid flows, pressure and flow measuring devices, losses in pipes, laminar and turbulent boundary layer concepts.

A4331.3. Evaluate design parameters of hydraulic turbines at given efficiency and discharge

A4331.4. Analyze an expression for force, workdone and efficiency of vane, turbines and pumps.

A4331.5. Apply the principles of conduction, convection and radiation heat transfer to analyze natural phenomena.

3. Course Syllabus

BASIC THERMODYNAMIC CONCEPTS: System, surroundings, universe, Intensive and Extensive Properties, Macroscopic and Microscopic Approach, Force, Pressure, Energy, Work, Power, Heat, Temperature, Specific Heat Capacity, Change of State, Path, Process, Cycle, Internal Energy, Enthalpy, Statements of Zeroth and First Laws of Thermodynamics**.**

FUELS AND COMBUSTION: Types of Fuels and their Characteristics, Combustion and Combustion Products of Fossil Fuels, Environmental Effects of Fossil Fuel Combustion, Bio-fuels, Comparison of Bio-fuels with Petroleum Fuels in Terms of Calorific Value and Emission.

ENERGY RESOURCE UTILIZATION:

Classification of Energy Resources, Non-Renewable Energy - Principles of Generating Electricity by Steam, Gas and Nuclear Power Plants; Renewable Energy - Utilization of Hydro, Solar, Wind, Geothermal and Biomass Energies**.**

ENGINEERING MATERIALS AND MACHINING PROCESSES:

Classification of Materials, Types and Applications of Ferrous & Non-Ferrous Metals, Alloys and Composites; Principles of Metal Joining Processes -Riveting, Bolting, Soldering, Brazing, and Welding, Principles of Metal Cutting Processes - Turning, Drilling, Milling, Boring, Shaping, Slotting Broaching and Sawing

POWER TRANSMISSION DRIVES:

Types of Power Transmission, Belt Drives - Open and Crossed Belt, Flat and V-Belt, Stepped Pulley; Gear Drives – Spur, Helical and Bevel Gears, Rack and Pinion, Worm Gear; Gear Trains – Simple and Compound; Chain Drives, Rope Drives, Advantages and Disadvantages of Chain Drive Over Belt or Rope Drive.

4. Books and Materials

Text Book(s)

1. B S Grewal, *Higher Engineering Mathematics*, 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. B V Ramana, *Engineering Mathematics*, 23rd Reprint, Tata Mc Graw Hill Education Private Limited, New Delhi, 2015.

Reference Book(s)

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, *A text book of Engineering Mathematics*, Laxmi Publications, 2010.
3. D. Poole, *Linear Algebra: A Modern Introduction*, 2nd Edition, Brooks/Cole, 2005.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE
A4332 - INTRODUCTION TO 3D PRINTING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

3D printing is an additive manufacturing process whereby objects are built up from plastic filament, liquid resin, layers of powder, or even bio-compatible and edible materials. Desktop 3D printing is today's printing press, putting rapid prototyping, customizable products, and individualized medical appliances in reach of the general public. Literacy in basic 3D modeling and manufacturing is an essential skill for future STEM success in this country. In this course students will learn how to be "makers" by using various types of 3D modeling software and imaging equipment, printing actual physical objects that they have designed and modeled themselves, and participating in educational outreach in the institute and the community

Course Pre/co requisites

- AutoCAD and Manufacturing Process

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to

A4332.1. Understand the fundamental concepts of Additive Manufacturing (i.e. Rapid Prototyping) and 3-D printing, its advantages and limitations.

A4332.2. Apply engineering knowledge, techniques, skills and modern tools to analyze problems in 3D PRINTING .

A4332.3. Appraise additive manufacturing through 3d printing.

A4332.4. Solve Complex manufacturing problems for significant technological and societal development

A4332.5. Analyze, design and evaluate engineering products using the knowledge of mathematics, science, engineering and IT tools.

3. Course Syllabus

INTRODUCTION TO 3D PRINTING: Fundamental of 3D printing, Need for 3D printing Generic 3d printing process, Distinction between 3D printing and CNC, Classification of 3D printing Processes, Steps in 3D printing process, Advantages of 3D printing, standards for 3D printing, Major Applications.

VAT PHOTO POLYMERIZATION 3D PRINTING PROCESSES: Stereo lithography (SL), Materials, SL resin curing process, Process Benefits and Drawbacks, Applications of Photo polymerization Processes

MATERIAL JETTING 3D PRINTING PROCESSES:- Binder Jetting 3D PRINTING Processes: Evolution of Printing as a 3D printing Process, Materials, Process Benefits and Drawbacks, Applications of Material Jetting Processes.

BINDER JETTING 3D PRINTING PROCESSES: Materials, Process Benefits and Drawbacks, Research achievements in printing deposition, Technical challenges in printing, Applications of Binder Jetting Processes

EXTRUSION-BASED 3D PRINTING PROCESSES: Fused Deposition Modeling (FDM), Principles, Materials, Plotting and path control, Bio-Extrusion, Process Benefits and Drawbacks, Applications of Extrusion-Based Processes.

POWDER BED FUSION 3D PRINTING PROCESSES: Selective laser Sintering (SLS), Materials, Powder fusion mechanism, SLS Metal and ceramic part creation, Electron Beam melting (EBM), Process Benefits and Drawbacks, Applications of Powder Bed Fusion Processes.

DIRECTED ENERGY DEPOSITION 3D PRINTING PROCESSES: Process Description, Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Electron Beam Based Metal Deposition, Benefits and drawbacks, Applications of Directed Energy Deposition Processes.

Wire arc based additive manufacturing methods, Advantages and disadvantages, comparison with conventional 3D printing and WAAM.

POST PROCESSING OF 3D PRINTING PARTS: Support Material Removal, Surface Texture Improvement, Accuracy Improvement, Aesthetic Improvement, Preparation for use as a Pattern, Property Enhancements using Non-thermal and Thermal Techniques.

Inspection of 3D printing parts: Different destructive and non-Destructive testing of 3D printing parts, acceptance standards for 3D printing parts

3D PRINTING APPLICATIONS: Functional models, Pattern for investment and vacuum casting, Medical models, art models, Engineering analysis models, Rapid tooling, new materials development, Bi-metallic parts, Re-manufacturing. Application examples for Aerospace, defense, automobile, Bio-medical and general engineering industries

Software Package: FUSION 360 and CATIA

4. Books And Materials

Text Books:

1. Ian Gibson, David W Rosen, Brent Stucker (2015) “Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing”, 2nd Edition, Springer.
2. Ali K. Kamrani, EmandAbouel Nasr (2006) “Rapid Prototyping: Theory & Practice”, Springer

Reference Books:

1. D.T. Pham, S.S. Dimov (2001) “Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling”, Springer.
2. Rafiq Noorani (2006) “Rapid Prototyping: Principles and Applications in Manufacturing”, John Wiley & Sons.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE
A4333 - FUNDAMENTALS OF ROBOTICS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces students to the basics, types and elements of robots. The course exposes students to the theoretical concepts of robot kinematics. Path planning and trajectory planning concepts gives the perception on control of robotics. The concepts on actuators and sensors gives clear understanding and design ability for mobility systems. It gives an overview on application of robotics in manufacturing industry.

Course Pre/co requisites

The course has no specific prerequisite and co requisite

2. Course Outcomes (Cos)

After the completion of the course, the student will be able to

A4333.1. Understand the basic concepts and components of a robotic system.

A4333.2. Identify the use of actuators and sensors for designing robot mobility system.

A4333.3. Solve transformation problems to describe the robot position and orientation of robot.

A4333.4. Apply the concepts of robot work cell design and control.

A4333.5. Select appropriate robots for various applications suitable to modern manufacturing systems.

3. Course Syllabus

Introduction to Robotics, Classification of Robots, Advantages and Disadvantages of Robots, Degree of freedom, joints, Robot coordinates, Robot workspace, Robot characteristics, Robot Components, types of robot arms, end effectors, grippers.

Actuators:Characteristics of Actuating Systems, Comparison of Actuating Systems, Hydraulic and Pneumatic Devices, Electric Motors in Robotics.
Sensors: Sensor Characteristics, Position Sensors, Velocity Sensors, Acceleration Sensors, Touch and Tactile Sensors, Proximity Sensors, Range Finder.

Manipulator Kinematics:Specifications of matrices, Homogeneous Transformation, D-H notation, joint coordinates and world coordinates, Forward and inverse kinematics, Simple problems.

Path Planning:Trajectory planning and avoidance of obstacles, Path planning, introduction to robot programming.

Robot Work Cell Design and Control:Robot Cell Layouts, Multiple Robots and Machine Interface, Some Consideration in Work Cell Design, Interlocks, Error Detection and Recovery, Robot Cycle Time Analysis.

Robotic Applications:Robots in manufacturing and non- manufacturing applications, Health Service, Intelligent Home Applications, Military Applications, Space Application, Entertainment robots, Service robots, Domestic or household robots.

4. Books and Materials

Text Books:

1. Richard D. Klafter (2010), Robotic Engineering, 2nd edition, Prentice Hall of India, New Delhi.
2. M.P. Groover (2010), Industrial Robotics, 3rd edition, Pearson Education, New Delhi.

Reference Books:

1. R.K. Mittal, I.J. Nagrath (2012), Robotics and Control, 1st edition, Tata Mc Graw Hill, New Delhi.
2. P. Coiffet, M. Chaironze (2010), An Introduction to Robot Technology, 3rd edition, Kogam Page Ltd., London.
3. Ganesh S. Hegde (2015), A Textbook of Industrial Robotics, 2nd edition, University Science Press.
4. K.S. Fu (2010), Robotics, 1st edition, Tata Mc Graw Hill, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE
A4431 - FUNDAMENTALS OF IoT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course introduces you to advance concepts and design methodologies to design IoT systems and developing IoT applications programming languages and tools optimized for IoT domain. It also exposes participants to communication technologies and legacy protocols as well as newly developed IoT specific application and physical layer protocols. The course covers python languages in great detail with set of packages which makes it obvious choice as a leading IoT language.

Course Pre/Co Requisites

The course has no specific prerequisite and co-requisite.

2. COURSE OUTCOMES (Cos)

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

A4431.1. Identify the basic building blocks of IoT and its characteristics

A4431.2. Choose the application-layer protocols and web services architectures for a seamless integration of various components within an IoT ecosystem

A4431.3. Utilize Python standard libraries for implementing various IoT Applications

A4431.4. Examine the communication between a machine or a device with a remote system

A4431.5. Analyze cloud infrastructure, services, APIs and architectures of commercial and industrial cloud platforms

3. Course Syllabus

INTRODUCTION TO INTERNET OF THINGS: Introduction, Physical Design of IoT, Logical Design of IoT, IoT enabled Technologies, IoT Levels and Templates, IoT Platforms Design Methodology.

INTRODUCTION TO PYTHON: Language features of Python, Data types& data structures, Control of flow, Functions, Modules, Packages, File Handling, Data/Time operations, Classes, Python packages of interest for IoT(JSON,XML)

IoT AND M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT, **IoT System Management with NETCONF- YANG**-Need for IoT Systems Management, SNMP, Network Operator Requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG

IoT PHYSICAL DEVICES AND ENDPOINTS: Introduction to IoT Device, Exemplary Device: Raspberry Pi, Components of Raspberry Pi Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming – Raspberry Pi with Python

I0T PHYSICAL SERVERS AND CLOUD OFFERINGS: Introduction to Cloud Storage models and communication APIs,WAMP – AutoBahn for IoT, Xively Cloud for IoT, Python web application framework-Django, Designing a RESTful web API

4. Books and Materials

Text Book:

1. ArshdeepBahga and Vijay Madisetti: *Internet of Things,A Hands-on Approach*; University Press, 2016.

Reference Books:

1. Getting Started with Raspberry Pi:Matt Richardson & Shawn Wallace,O'Reilly (SPD),2014.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4432 - PRINCIPLES OF ANALOG AND DIGITAL COMMUNICATIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course is useful to understand the basics of Signals, Systems, Random Variables and Communication. The course presents and integrates the basic concepts for both continuous-time and discrete signals and systems. This course provides a foundation in the theory and applications of random variables stochastic processes and an understanding of the mathematical techniques elating to random processes in the areas of signal processing, detection & estimation theory and communications. it gives the basics of Analog and Digital Communication and also gives the background required for advanced study on the course. This is accomplished by providing overviews of the necessary background in signal, system, probability, and random process theory required for the analog and digital communications. It gives more emphasis on stressing fundamental concepts. The topics in the course, more than enough to students needs.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (Cos)

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

A4432.1. Analyze linear and non - linear modulators and demodulators in time as well as frequency domain.

A4432.2. Design a linear and non linear modulators and demodulators for the analog signals

A4432.3. Outline the basic concepts of digital communications with an insight into practical applications and Differentiate between PCM and DM and identify the applications of these modulation schemes in base band transmission

A4432.4. Estimate a overall digital communication system for the improvement of the system performance.

A4432.5. Analyze the performance of a digital communication system by introducing various spread spectrum modulation techniques.

3. Course Syllabus

UNIT-I: Introduction to communication system, need for modulation, Types of modulation techniques: AM, FM, PM, Generation and detection. Radio Transmitters,Radio Receivers AM,FM Comparison of Radio transmitters and receivers.

UNIT-II: Sources of Noise, Resistor Noise, Shot Noise, Calculation of Noise in a Linear System, Noise in AM Systems, Noise in Angle Modulation Systems, Comparison between AM and FM with respect to Noise, Figure of Merit, Threshold Improvement in Discriminators.

UNIT-III: Analog-to-Digital Conversion: Pulse modulation Techniques, Sampling Process, PAM,PWM and PPM. Time Division Multiplexing, Digital Modulation Techniques: Pulse Code Modulation, Companding, Differential Pulse Code Modulation, Delta Modulation, Noise in Pulse-Code Modulation Systems.

UNIT-IV: Binary Amplitude Shift-Keying, Frequency Shift-Keying, Phase-Shift Keying, Differential Phase-Shift Keying, Quadrature Phase-Shift Keying (QPSK), Comparison of BASK, BFSK and BPSK, Minimum Shift Keying (MSK), Duo binary Encoding.

UNIT- V: Spread Spectrum Modulation: Direct Sequence (DS) Spread Spectrum, Use of Spread Spectrum with Code Division Multiple Access (CDMA), Ranging using DS Spread Spectrum, Frequency Hopping (FH) Spread Spectrum, Generation and Characteristics of PN Sequences, Acquisition (Coarse Synchronization) of a FH Signal, Tracking (Fine Synchronization) of a FH Signal, Acquisition (Coarse Synchronization) of a DS Signal, Tracking of a DS Signal.

4. Books and Materials

Text Book:

1. Principles of Communications By Taub and Schilling

Reference Books:

1. Communication Systems, Simon Haykins (2nd Edition).
2. Analog and Digital Communication Systems by Martin S. Roden, 3rd edition, Prentice Hall, 1994.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4433 - INTRODUCTION TO SIGNAL PROCESSING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Signal Processing is an introductory course essentially attempts to cover classification, representation of signals and analysis in time domain and frequency domain of systems. It is a foundation course to advanced courses like Communication Systems, Image and Speech Processing in their undergraduate program. This course provides coherent and comprehensive coverage of signal processing.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (COs)

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

A4433.1. Understand mathematical description of signals and representation of systems
A4433.2. Identify the spectrum of continuous-time periodic and non-periodic signals
A4433.3. Apply various transforms to analyze continuous and discrete-time systems
A4433.4. Analyze digital systems using various transform techniques
A4433.5. Design and implement FIR and IIR filters for given specifications

3. Course Syllabus

CLASSIFICATION OF SIGNALS: Continuous time (CT) and Discrete time (DT) signals, elementary signals-Unit, Step, Impulse, ramp signals, singularity functions and operations on signals.
SIGNAL TRANSMISSION THROUGH LTI SYSTEMS: Classification of systems, discrete time LTI systems and continuous time LTI systems, properties of LTI system, Convolution

FOURIER TRANSFORM (FT): Fourier series, convergence of Fourier series, Fourier transform (FT), Fourier transform of standard signals, Hilbert transform and its properties
LAPLACE TRANSFORM (LT): The Laplace transform (LT), The Region of convergence (ROC) for Laplace transforms, Properties of Laplace transforms, some Laplace transform pairs, Inverse Laplace transforms

SAMPLING: Sampling of continuous time signals, sampling theorem, reconstruction of signal from its samples, the effect of under sampling- aliasing, practical aspects of sampling.

Z - TRANSFORMS: The Z - Transform, The Region of Convergence (ROC) for Z - transform and its properties, properties of Z –transform

DISCRETE FOURIER TRANSFORM: Frequency domain representation of discrete time signals & Systems, Discrete Fourier transforms: Frequency domain sampling, Relationship of DFT to other transforms, Properties of DFT

FIR & IIR FILTERS: Design of linear phase FIR Digital Filters using Windows, IIR filter design (Butter worth) by suitable mapping technique, comparison of IIR & FIR filters

4. Books And Materials

Text Books:

1. Oppenheim A. V, Willisky (2009), Signals and Systems, 2nd edition, Prentice Hall of India, India.
2. John G. Proakis, Dimitris G. Manolakis (2007), Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education / PHI, India.

Reference Books:

1. Anand Kumar, Signals and Systems, PHI Learning Pvt. Ltd.
2. B. P. Lathi (2001), Signals, Systems & Communications, BS Publications, New Delhi.
3. M. H. Hayes (2007), Schaums Outlines of Digital Signal Processing, Tata McGraw Hill, India.
4. Dimitris G. Manolakis, Vinay Ingle (2011), Applied Digital Signal Processing, Cambridge University Press, Newyork.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE
A4531 – FUNDAMENTALS OF JAVA

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course provides OOP concepts using Java. The course focuses on different aspect of core Java Environment suitable to write efficient, maintainable, and portable code. It also ignites Object Oriented thinking and explores with the evolution of Java and its basics. It provides strong foundation on Inheritance, Packages, and Interfaces and also illustrates Exception Handling and Multithreaded mechanisms. In depth knowledge to implement Collection frameworks. Emphasis on AWT concepts used for GUI applications is given with event handling. The course plays a vital role in developing front-end interface for Mini and Major Projects.

Course Pre/ co-requisites

- Programming for Problem Solving (A4501)

2. Course Outcomes (Cos)

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

A4531.1. Understand the principles of Object Oriented Programming to model real world problem.

A4531.2. Use various constructs / concepts to write programs in OOP paradigm.

A4531.3. Analyze the applications for Handling Exceptions and Multithreading in Java runtime environment.

A4531.4. Implement Collection Frameworks to retrieve and process data efficiently.

A4531.5. Build GUI applications using AWT for Interactive applications.

3. Course Syllabus

Introduction to OOP: Evolution of Java, OOP principles, Java Buzzwords, Implementing Java program, JVM, Data Types, Variables, Type conversions and Casting, Operators, Control statements, Arrays**.**CLASS, METHODS, OBJECTS AND CONSTRUCTORS- Classes, Objects, Methods, Constructors, this keyword, Overloading Methods and Constructors, Argument passing, Exploring String class.

Inheritance, Interfaces and Packages:INHERITANCE: Inheritance Basics, Using super, Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Abstract classes, final keyword. PACKAGES

AND INTERFACES: Defining a Package, Finding Packages and CLASSPATH, Access Protection, Importing Packages, Defining and Implementing interfaces, Extending interfaces.

Exception Handling and Multithreading: EXCEPTION HANDLING-Exception Handling Fundamentals, Exception Types, Using try catch, throw throws and finally keywords, Built-in Exceptions, Creating own exception subclasses. MULTITHREADING- Life cycle of a thread, creating threads, thread priorities, Synchronizing threads, Interthread Communication.

Collections and Event Handling:COLLECTIONS FRAMEWORK-Collection classes- ArrayList, LinkedList, HashSet, and TreeSet. EVENT HANDLING-Delegation Event Model, Event Sources, Event Classes, Event Listener Interfaces, Handling Mouse and Keyboard Events, Adapter classes.

AWT: AWT Hierarchy, AWT controls – Label, Button, TextField, TextArea , Checkbox , CheckboxGroup List and Choice. Layout Managers: FlowLayout, BorderLayout, GridLayout, and CardLayout. Limitations of AWT.

4. Books and Materials

Text Books:

1. Herbert Schildt (2011), Java: The Complete Reference, 8th Edition, Tata McGraw-Hill Education, New Delhi.

Reference Books:

1. Michael Ernest (2013), Java SE 7 Programming Essentials, John Wiley & Sons Inc.
2. Y. Daniel Liang (2014), Introduction to Java Programming, Comprehensive Version, 10thEdition, Pearson Education, India.
3. Kathy Sierra, Bert Bates (2014), OCA/OCP Java SE 7 Programmer I & II Study Guide (Exams 1Z0-803 & 1Z0-804), 1st Edition, McGraw-Hill Education Publisher, USA.
4. T. Budd (2010), An Introduction to Object Oriented Programming, 3rd Edition, Pearson Education, India.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4532 – OPERATION RESEARCH (OPEN ELECTIVE – I)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. COURSE DESCRIPTION

Course Overview

Operation Research facilitates the comparison of every possible alternative (courses of action or acts) to Know the potential outcomes, permits examination of the sensitivity of the solution to changes or errors in numerical values, and encourage rational decision-making based on the best available approaches or Techniques.

Course Pre/co requisites

- A4001- Linear Algebra and Ordinary Differential Equations
- A4012- Probability and Statistics.

2. COURSE OUTCOMES (COS)

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

A4532.1. Explain the Operations Research features, models, applications and methods such as linear programming, transportation, sequencing, assignment, replacement, games theory.

A4532.2. Build mathematical models for finding optimum solutions for various real world problems and case studies.

A4532.3. Evaluate various alternatives available to aid in decision making situations.

A4532.4. Choose the best strategies to maximize the profit in the presence of a competitor

A4532.5. Devise operating policies for the efficient and effective management of men, materials and machines, production, distribution and service systems.

3. COURSE SYLLABUS

Theory

INTRODUCTION TO OPERATIONS RESEARCH: Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem, Formulation and Graphical solution of Linear Programming Problem. Simple Method, Artificial variables Techniques, big -M method.

TRANSPORTATION PROBLEM: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions, North-West corner rule, least cost method and Vogel's approximation

method. Optimality test – MODI method. Assignment Problem-formulation, types, application to maximization cases and travelling salesman problem.

SEQUENCING MODELS: Solution of Sequencing Problem, Processing n Jobs through two machines, Processing n Jobs through three machines, Processing two Jobs through m machines, Processing n Jobs through m Machines.

QUEUING THEORY: Introduction, Single Channel, Poisson arrivals, exponential service times with infinite population and finite population models

REPLACEMENT MODELS and GAME THEORY: Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value, Replacement of items that fail suddenly, individual replacement policy, group replacement policy. GAME THEORY: Formulation of games, types, solution of games with saddle point, graphical method of solving mixed strategy games, dominance rule for solving mixed strategy games.

4. BOOKS AND MATERIALS

Text Books:

1. S.D. Sharma (2010), Operations Research – Theory and Applications, 15th edition, Kedar Nath Ram Nath, , India.
2. Frederick S Hillier; Gerald J Lieberman (2015), Introduction to Operations Research,10th Edition, McGraw-Hill , New York

Reference Books:

1. Hamdy Abdelaziz Taha (2015), Operations Research: an Introduction, 9 th edition, Pearson, Boston
2. Prem Kumar Gupta & D S Hira (2015), Operations Research, Revised edition, S. Chand Publishing, New Delhi, India.
3. P Shankara Iyer (2008), Operations Research 1st Edition, Tata McGraw Hill, Publishing Company, New Delhi, India.
4. S Kalavathi (2012), Operations Research, 4th Edition, Vikas Publication.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4533 – FUNDAMENTALS OF DBMS (OPEN ELECTIVE-II)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course introduces the core principles and techniques required in the design and implementation of database systems. This course focus on relational database management systems, including database design theory: E-R modeling, data definition and manipulation languages, database security and administration. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control, Recovery and various types of databases like distributed database, and intelligent database, Client/Server.

Course Pre/co requisites

A4531- Object oriented Programming

2. Course Outcomes (COs)

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

A4533.1: Understand design and implementation of a database for a given problem domain.
A4533.2: Construct Queries in Relational algebra, relational calculus and SQL.
A4533.3: Apply Normalization techniques to reduce data redundancy in data base.
A4533.4: Analyze various transaction control and recovery methods to keep data base consistent

3. Course Syllabus

INTRODUCTION: History of database systems, introduction to database management systems, database system applications, database systems versus file systems, view of data, data models, database languages- DDL & DML commands and examples of basic SQL queries, database users and administrators, transaction management.

SQL: Overview, the form of a basic SQL query, union, intersect and except operators, nested queries, aggregate operators, null values, complex integrity constraints in SQL, cursors, triggers

SCHEMA REFINEMENT AND NORMAL FORMS: Functional dependencies, reasoning about FDs. Normal forms: 1NF, 2NF, 3NF, BCNF, properties of decompositions, normalization, schema refinement in database design, other kinds of dependencies: 4NF, 5NF.

TRANSACTIONS MANAGEMENT: Transaction concept, transaction state, implementation of atomicity and durability, concurrent executions, Anomalies due to interleaved execution of transactions, serializability, recoverability.

CONCURRENCY CONTROL AND RECOVERY SYSTEM: Concurrency control - lock based protocols, timestamp based protocols, validation based protocols, deadlock handling.

4. Books and Materials

Text Books

1. Raghurama Krishnan, Johannes Gehrke (2007), Database Management Systems, 3rd Edition, Tata McGraw-Hill, New Delhi, India.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan (2010), Database System Concepts, 6th Edition, McGraw- Hill, New Delhi, India.

Reference Books

1. ElmasriNavate (2014), Fundamentals of Database Systems, Pearson Education, India
2. C. J. Date, A. Kannan and S. Swamynathan(2009),*An Introduction to Database Systems,*3rd Edition,Pearson Education, India.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4534 – FUNDAMENTALS OF OPERATING SYSTEMS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

Operating Systems is a graduate-level introductory course that teaches the basic concepts in operating systems like abstractions, mechanisms, and their implementations. This course also deals with Process Management & Synchronization, Inter process communication, Memory Management, Virtual Memory, File & Disk Management and Deadlock handling methods.

Course Pre/co requisites

A4505- Digital Design and Computer Organization

2. Course Outcomes (Cos)

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

A4533.1. Understand the various services provided by the operating system.
A4533.2. Analyze the concepts of Process management and Synchronization in a multi processing system.
A4533.3. Apply the Memory management techniques for efficient usage.
A4533.4. Use File and Disk management schemes for effective storage management.
A4533.5. Demonstrate Deadlock Handling Methods to allocate resources among processes.

3. Course Syllabus

OPERATING SYSTEMS OVERVIEW: Definition, Operating System Types, Operating System operations, Operating system services, System calls and System Programs, Distributed Systems, Special Purpose Systems.

PROCESS MANAGEMENT: Process concepts- Process, Process State Diagram, PCB and Operations on processes, IPC- Pipes, Message Passing and Shared Memory. Process Scheduling- Scheduling Criteria, Scheduler Types and Scheduling Algorithms. PROCESS SYNCHRONIZATION-Concept of Synchronization, Critical section problem, Peterson's solution, Semaphores, Classic problems of Synchronization-The Bounded Buffer Problem, The Readers –Writers Problem, Dining - Philosophers Problem.

MEMORY MANAGEMENT: Introduction to Memory Management, Swapping, Contiguous Memory Allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, Page-replacement algorithms, allocation of frames, thrashing.

FILE SYSTEM AND MASS STORAGE STRUCTURE: Concept of a file – File Attributes, File Types, Access Methods, Directory Structure, File System structure, File System Implementation, directory implementation, File Allocation methods, and Free-Space management. MASS-STORAGE STRUCTURE: Introduction to Magnetic Disks, Disk Structures, Disk Scheduling, Swap Space Management, RAID Structure- Levels and Purpose.

DEADLOCKS: System Model, Deadlock Characterization, Deadlock Prevention, Avoidance, Detection and recovery from deadlock.

4. Books and Materials

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2009), *Operating System Concepts*, 8th Edition, Wiley India Private Limited, New Delhi.
2. Dhananjay M. Dhamdhere (2009), Operating Systems, A Concept-Based Approach, 3rd Edition, McGraw Hill, New Delhi.

Reference Books:

1. William Stallings (2006), *Operating Systems, Internals and Design Principles*, 5th Edition, Pearson Education, India.
2. Achyuth S Godbole, Atul Kahate (2017),Operating Systems, 3rd Edition, McGraw Hill, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE
A4631 - PRINCIPLES OF SOFTWARE ENGINEERING)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course acts as a foundation in the field of software engineering and is aimed at helping students develop an understanding of how software systems are developed from scratch, by guiding them through the development process, adopting the fundamental principles of system development. The course will orient the students to the different software process models, software requirements engineering process, systems analysis and design as a problem-solving activity, with focus on quality.

Course Pre/ Co-requisites:

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (Cos)

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

A4631.1. Understand metrics in the process and project domains.

A4631.2. Identify the right process model to develop the right software system.

A4631.3. Gather requirements and analyze them scientifically in order to develop the right product, besides authoring software requirements documents.

A4631.4. Apply testing strategies for application being developed.

A4631.5. Propose design as per functional and non-functional requirements using design principles.

3. Course Syllabus

INTRODUCTION TO SOFTWARE ENGINEERING: The Evolving nature of software engineering, Changing nature of software engineering, Software engineering Layers, The Software Processes, Software Myths.

PROCESS MODELS:A Generic Process Model, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Spiral Model, the Unified Process, Personal and Team Process Models, the Capability Maturity Model Integration (CMMI).

REQUIREMENTS ENGINEERING: Functional and Non-Functional Requirements, The Software requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and Analysis, Requirement Validation, Requirement Management.

SYSTEM MODELING: Context Models, Interaction Models, Structural Models, Behavioural Model, Model-Driven Engineering.
DESIGN CONCEPTS: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles.

DESIGN AND IMPLEMENTATION: The Object Oriented Design with UML, Design Patterns, Implementation Issues, Open Source Development.
USER INTERFACE DESIGN: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.
SOFTWARE TESTING STRATEGIES: A Strategic approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing.

PRODUCT METRICS:A Framework for Product Metrics, Metrics for the Requirements Model, Metrics for Design Model, Metrics for Source Code, Metrics for Testing.
PROCESS AND PROJECT METRICS: Metrics in the Process and Project Domains, Software Measurements, Metrics for Software Quality.
RISK MANAGEMENT: Risk versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinements, Risk Mitigation Monitoring and Management (RMMM), The RMMM Plan.

QUALITY MANAGEMENT: Quality Concepts, Software Quality, Software Quality Dilemma, Achieving Software Quality. Review Techniques, Reviews: A Formal spectrum, Informal Reviews, Formal Technical Reviews.
SOFTWARE QUALITY ASSURANCE: Background Issues, Elements of Software Quality Assurance, Tasks, Goals and Metrics, Software Reliability, the ISO 9000 Quality Standards.

4. Books And Materials

Text Book (S)

1. Roger S. Pressman (2011), Software Engineering, A Practitioner's approach, 7th edition, McGraw Hill International Edition, New Delhi.
2. Sommerville (2001), Software Engineering, 9th edition, Pearson education, India.

Reference Books:

1. K. K. Agarval, Yogesh Singh (2007), Software Engineering, 3rd edition, New Age International Publishers, India.
2. Lames F. Peters, WitoldPedrycz(2000), Software Engineering an Engineering approach, John Wiely& Sons, New Delhi, India.
3. Shely Cashman Rosenblatt (2006), Systems Analysis and Design, 6th edition, Thomson Publications, India.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4632 - E-COMMERCE TRENDS (OPEN ELECTIVE-II)

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The tremendous growth of the Internet and World Wide Web is having great impact on businesses, governments and individuals throughout the world. In this course, we will attempt to understand the phenomena, technological, economic and social, behind these rapid changes, and how organizations successfully conduct Internet-based activities. We will also study some of the technology of the Internet. This course provides an overview of e-commerce from both technological and managerial perspectives. It introduces e-commerce frameworks, and technological foundations; and examines basic concepts such as strategic formulation for e-commerce enterprises, management of their capital structures and public policy. It is particularly important that the student place a great deal of emphasis in understanding the different E-Commerce system design principles.

Course Pre/co requisites:

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (Cos)

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

A4632.1. Illustrate the components and roles of the E-Commerce environment.

A4632.2. Understand legal and ethical issues related to E-Commerce and web marketing approaches.

A4632.3. Identify how to sell products and services on the web as well as to meet the needs of web site Visitors.

A4632.4. Analyze e-commerce payment systems.

3. Course Syllabus

INTRODUCTION TO E-BUSINESS AND E-COMMERCE: What is the difference between e-commerce and e-business, Anatomy of E-Commerce applications, E-Business risks and barriers to business adoption, Management responses to E-Commerce and E-Business, Electronic Commerce-Frame work.

E-COMMERCE FUNDAMENTALS- Location of trading in the marketplace, Business models for ecommerce, Focus on auction business models, Focus on Internet start-up companies.

E-BUSINESS INFRASTRUCTURE- Introduction, Internet technology, Web technology, Internet-access software applications, Managing e-business infrastructure, Focus on web services, SaaS and service oriented Architecture (SOA), Focus on mobile commerce.
E-ENVIRONMENT- Social and legal factors, Environmental and green issues related to Internet Usage, Focus on e-commerce and globalization, Political factors.

E-BUSINESS STRATEGY- What is e-business strategy, Strategic analysis, Strategic objectives, Strategy definition, Strategy implementation, Focus on information systems strategy and e-business strategy.
E-SECURITY - Securing the Business on Internet- Security Policy, Procedures and Practices, Transaction Security, Cryptology, Digital Signatures, Security Protocols for Web Commerce.

SUPPLY CHAIN MANAGEMENT- What is supply chain management? Focus on the value chain, Using e- business to restructure the supply chain, Supply chain management implementation
E-PROCUREMENT- What is e-procurement, Drivers of e-procurement, Focus on estimating eprocurement cost, implementing e-procurement.

E-MARKETING- What is e-marketing? E-marketing planning, Situation analysis, Objective setting, Strategy, Tactics, Focus on online branding.
CUSTOMER RELATIONSHIP MANAGEMENT- What is e-CRM and its applications, online buying process, focus on marketing communications for customer Acquisition, Customer retention management and Technology solutions for CRM.

4. Books And Materials

Text Book (S)

1. *E-Business and E-Commerce Management, strategy, Implementation and practice*, Dave Chaffey, Fourth Edition, Prentice Hall

Reference Books:

1. *Frontiers of electronic commerce* – Kalakata, Whinston,Pearson.
2. Bharat Bhaskar: *Electronic Commerce*,Tata Mc-Graw-Hill, New Delhi, 2003
3. *E-Commerce — Business, Technology, Society*, Kenneth C.Taudon, Carol Guyerico Traver.
4. *Electronic Commerce* Gary,P.Schneider — Thomson
5. *E-Commerce fundamentals and applications,* Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth - 215 - Chang, JohnWiley.
6. *E-Commerce*, S.Jaiswal –Galgotia.
7. *E-Commerce*, Efrain Turbon, Jae Lee, David King, H.Michael Chang.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4633 - FUNDAMENTAL OF CYBER SECURITY

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course drawing upon a wealth of experience from academia, industry, and government service, Cyber Security details and dissects, in current organizational cyber security policy issues on a global scale—taking great care to educate students on the history and current approaches to the security of cyberspace. It includes thorough descriptions—as well as the pros and cons—of an excess of issues, and document policy alternatives for the sake of clarity with respect to policy alone. It also delves into organizational implementation issues, and equips students with descriptions of the positive and negative impact of specific policy choices.

Course Pre/co requisites

The course has no specific prerequisite and co-requisite.

2. Course Outcomes (Cos)

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

A4633.1. Understand how to protect them self and ultimately society from cyber-attacks by studying various case studies.
A4633.2. Summarize different government cyber laws and cyber-forensics techniques.
A4633.3. Apply different techniques to classify different types of cybercrimes
A4633.4. Analyze cyber-attacks on different online web applications
A4633.5. Apply various investigating methods on the new cases using previous case studies

3. Course Syllabus

INTRODUCTION: Cyber Security, Cyber Security policy, Domain of Cyber Security Policy, Laws and Regulations, Enterprise Policy, Technology Operations, Technology Configuration, Strategy Versus Policy,

CYBER SECURITY EVOLUTION: Productivity, Internet, E-commerce, Counter Measures and Challenges.

CYBER SECURITY OBJECTIVES AND GUIDANCE: Cyber Security Metrics, Security Management Goals, Counting Vulnerabilities, Security Frameworks, E-Commerce Systems, Industrial Control Systems, Personal Mobile Devices, Security Policy Objectives.

GUIDANCE FOR DECISION MAKERS: Tone at the Top, Policy as a Project, Cyber Security Management, Arriving at Goals, Cyber Security Documentation.
THE CATALOG APPROACH: Catalog Format, Cyber Security Policy Taxonomy.

CYBER SECURITY POLICY CATALOG: Cyber Governance Issues, Net Neutrality, Internet Names and Numbers, Copyright and Trademarks, Email and Messaging, Cyber User Issues, Malvertising, Impersonation, Appropriate Use, Cyber Crime, Geolocation, Privacy, Cyber Conflict Issues, Intellectual property Theft, Cyber Espionage, Cyber Sabotage, Cyber Welfare.

CYBER MANGEMENT ISSUES: Fiduciary Responsibility, Risk Management, Professional Certification, Supply Chain, Security Principles, Research and Development, Cyber Infrastructure Issue, Banking and finance, Health care, Industrial Control systems.
CASE STUDY: A Government's Approach to Cyber Security Policy

4. Books And Materials

Text Books:

1. Jennifer L. Bayuk , J. Healey , P. Rohmeyer , Marcus Sachs , Jeffrey Schmidt , Joseph Weiss " Cyber Security Policy Guidebook" John Wiley & Sons 2012.

Reference Books:

1. Richard A. Clarke, Robert Knake" Cyberwar: The Next Threat to National Security & What to Do About It" Ecco 2010.
2. Dan Shoemaker Cyber security The Essential Body Of Knowledge, 1st ed. Cengage Learning 2011
3. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.
4. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication Wiley.
5. Rick Howard "Cyber Security Essentials" Auerbach Publications 2011

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4031 - NUMERICAL TECHNIQUES

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics required to analyze the problems in engineering. Topics to be covered in this course include: Solution of Algebraic, Transcendental Equations and System of Linear Equations, Interpolation, Numerical Differentiation and Integration, Curve fitting, Numerical solutions of Ordinary and Partial differential equations. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/co requisites

The course has no specific prerequisite and corequisite.

2. Course Outcomes (Cos)

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

A4031. 1. Apply appropriate Numerical method to find a root of an equation.

A4031. 2. Make use of interpolation to find approximate values of the function at intermediate points.

A4031. 3. Evaluate definite integral using appropriate Numerical methods.

A4031. 4. Construct curve of best fit for the bivariate data using method of least squares.

A4031. 5. Determine approximate solution of ordinary and partial differential equations.

3. Course Syllabus

Solution of Algebraic, Transcendental Equations and System of Linear Equations: Bisection method, Regula-Falsi method, Iteration method, Newton-Raphson method. Iterative methods of solution of system of equations: Jacobi's iteration method, Gauss-Seidel iteration method.

Interpolation: Finite differences: Forward, Backward and Central differences, Other difference operators and relations between them, Differences of a polynomial, Missing terms, Newton's interpolation formulae, Central difference interpolation formulae: Gauss's forward and backward interpolation formulae, Interpolation with unequal intervals: Lagrange's interpolation formula.

Numerical Differentiation, Integration and Curve fitting: Numerical differentiation: Derivatives using Newton's interpolation formulae. Numerical integration: Newton-cotes quadrature formula, Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule. Curve Fitting: Method of least squares**,** Fitting a straight line, Second degree parabola and Non-linear curves of the form $y = ae^{bx}$, $y = ab^{x}$, $y = ax^{b}$ by the method of least squares.

Numerical Solution of Ordinary Differential Equations of First Order: Taylor's series method, Picard's method, Euler's and modified Euler's Method, Runge-Kutta method of fourth order, Predictor and Corrector methods: Milne's method, Adams-Bashforth-Moulton method.

Numerical Solution of Partial Differential Equations: Finite difference approximations to partial derivatives, Elliptic equations: Solution of Laplace equation by Liebmann's iteration process, Parabolic equations: Solution of one dimensional Heat equation by Schmidt explicit method and Crank-Nicolson implicit method.

4. Books And Materials

Text Book:

1. M.K. Jain, S.R.K Iyengar and R.K.Jain, *Numerical Methods for Scientific and Engineering Computation*, 5th Edition, New Age International Publishers, New Delhi, 2007.

Reference Books:

1. B.S.Grewal, *Higher Engineering Mathematics*, 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. B.V. Ramana, *Higher Engineering Mathematics*, 23rd Reprint, Tata Mc-Graw Hill Education Private Limited, New Delhi, 2015.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4032 – MATHEMATICAL PROGRAMMING

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The course deals with more advanced engineering mathematical topics which provide students to impart knowledge about various tools in Mathematical Programming to apply and solve real life problems in Engineering. The topics covered are Linear programming problem, Formulation and Graphical solution of Linear programming problem, Simplex method, Big -M method, Two-phase simplex method, Dual simplex method, Degeneracy in simplex and unbound solutions, Transportation problem, Assignment model, Replacement models and Sequencing models. The mathematical skills derived from this course provides necessary base to analytical and theoretical concepts occurring in the program.

Course Pre/co requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (Cos)

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

A4032.1.Identify LPP and express in mathematical form to solve by graphical or simplex method
A4032.2.Apply artificial variable techniques to obtain the optimal solution of an LPP
A4032.3.Interpret various methods under transportation model toget optimal results
A4032.4.Solve travelling salesmen problem using Hungarian method
A4032.5.Develop various replacement and sequencing models toarrive at an optimal decision

3. Course Syllabus

Introduction to Operations Research Basic definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem, Formulation and Graphical solution of Linear Programming Problem Simplex method

Artificial Variables Techniques Big -M method, Two-phase simplex method, Duality in simplex method, Dual simplex method, degeneracy in simplex and unbound solutions.

Transportation problem Formulation, solution, unbalanced Transportation problem. Finding initial basic feasible solutions, North-West corner rule, lowest cost entry method and Vogel's

approximation method. Optimality test- MODI method, degeneracy in transportation, restricted transportation problem, conditional transportation problem.

Assignment Model Formulation, Hungarian method for optimal solution, solving unbalanced problem, restricted assignment, conditional assignment problems, crew assignment problems, Travelling salesman problem, Transportation problem as assignment problem.

Replacement Models and Sequencing Models Replacement Models**:** Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value, Replacement of items that fail suddenly, individual replacement policy, group replacement policy.

Sequencing Models: Solution of Sequencing Problem, Processing n Jobs through two machines, Processing n Jobs through three machines, Processing two Jobs through m machines, Processing n Jobs through m Machines.

4. Books and Materials

Text Book:

1. Robert Hisrich, Michael P. Peter, Dean A. Shepherd (2010), Entrepreneurship, Tata Mc Graw Hill, New Delhi

Reference Books:

1. Bholanath Datta (2009), Entrepreneurship, Excel publications, India.
2. David H Holt (2010), Entrepreneurship, Prentice hall of India, New Delhi, India

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4033 - SPECIAL FUNCTIONS

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course offers more advanced topics of mathematics, required to analyze the problems in engineering. Topics to be covered in this course include: series solutions to Differential Equations, Bessel functions, Legendre polynomials, Hermite polynomials and Z - transforms. The mathematical skills derived from this course provides necessary base to analytical and design concepts occurring in the program.

Course Pre/co requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (COs)

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

A4033.1. Determine series solutions of ordinary differential equations about ordinary and regular singular points.

A4033.2. Solve problems in cylindrical and spherical coordinate systems using Bessel functions.

A4033.3. Relate algebraic polynomials with Legendre and Hermite polynomials.

A4033.4. Apply Z - Transforms to solve difference equations.

3. Course Syllabus

Series Solutions of Second Order Ordinary Differential Equations: Classification of Singularities, series solutions to Differential Equations around zero, Frobenius Method around zero.

Bessel Functions: Bessel's Differential equation, Recurrence formulae for $J_n(x)$, Generating function for $J_n(x)$, Orthogonality of Bessel functions.

Legendre Functions: Legendre's Differential equation, Rodrigue's formula, Legendre Polynomials, Generating function for $P_n(x)$, Recurrence formulae for $P_n(x)$, Orthogonality of Legendre functions.

Hermite Functions: Hermite's equation, Generating function of Hermite Polynomials, Orthogonal Property, Recurrence formulae for $H_n(x)$.

Z-Transforms: Definition, Some standard Z-transforms, Damping rule, Shifting rule, Multiplication by n, Initial and final value theorems. Inverse Z-transforms using partial fractions, Convolution theorem, Solution of difference equations by Z - transforms.

4. Books and Materials

Text Books:

1. B.S. Grewal, *Higher Engineering Mathematics*, 43rdEdition, Khanna Publishers, New Delhi, 2014.

Reference Books:

1. *M.D. Raisinghania, Ordinary and Partial Differential Equations, 6th Edition,* S.Chand& Co. Ltd. New Delhi.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4034 – ENTREPRENEURSHIP DEVELOPMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

This course aims to provide students with an understanding of the nature of enterprise and entrepreneurship and introduces the role of the entrepreneur, will inculcate the knowledge of government supporting programs like financial assistance by public sector banks. Apart from this, students learn about the women entrepreneurs and success stories of women entrepreneurs, gain the knowledge of project management and profitability appraisal, focus on importance of training the new entrepreneurs as well as existing entrepreneurs.

Course Pre/co requisites

This course has no specific prerequisite and co requisite.

2. Course Outcomes (Cos)

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

A4034.1. Understand the role, characteristics, qualities and functions of entrepreneur and use this knowledge to become future entrepreneurs.

A4034.2. Interpret various Institutional supports for setting up a business enterprise and apply this knowledge while approaching these institutions for financial support.

A4034.3. Illustrate role, importance and functions of women entrepreneur and use this knowledge to become future women entrepreneurs.

A4034.4. Infer the concept of Project Management and steps in Project development and analyze while taking future project assignments.

A4034.5. Indicate training programs and different training institutions to impart training and apply this knowledge to train existing and future entrepreneurs.

3. Course Syllabus

ENTREPRENEURSHIP: Importance and role of entrepreneurship, Qualities of an entrepreneur, Functions of entrepreneur, Theories of entrepreneurship, Stimulants of entrepreneurship and Barriers to entrepreneurship, Ethics and Social Responsibility, Role of entrepreneur in economic development

INSTITUTIONAL SUPPORT: Role of Government: Role of IDBI, SIDBI, SIDO, NIESBUD, DIC, Entrepreneurship Development Institute, T-Hub (Telangana Hub).

WOMEN ENTREPRENEURSHIP: Role & Importance, Functions of women entrepreneur, Profile of Indian Women Entrepreneur, Problems of Women Entrepreneurs, Women Entrepreneurship Development in India and in Foreign Countries.

PROJECT MANAGEMENT: Concept of project and classification of project, Project life cycle identification, Project formulation, Project report, Project evaluation- profitability appraisal, social cost benefit analysis, feasibility analysis, financial analysis and project financing, Project implementation, Project completion.

ENTREPRENEUR TRAINING: Designing appropriate training programmes to inculcate Entrepreneurial Spirit, significance of entrepreneurial training, Feedback and Performance ofTrainees, NSIC, Pradhan Mantri Kaushal Vikas Yojana (PMKVY), Telangana Academy for Skill and Knowledge (TASK).

4. Books and Materials

Text Book:

1. Robert Hisrich, Michael P. Peter, Dean A. Shepherd (2010), Entrepreneurship, Tata Mc Graw Hill, New Delhi

Reference Books:

1. Bholanath Datta (2009), Entrepreneurship, Excel publications, India.
2. David H Holt (2010), Entrepreneurship, Prentice hall of India, New Delhi, India

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4035– HUMAN RESOURCE MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

1. Course Description

Course Overview

The Students are able to understand the nature and significance of human resource management in contemporary world, the challenges that HR managers face in performing the HR functions. The Course provides the various Human Resource Development functions that an organization deals with individual employees for employee and Organizational growth. It also addresses the grievances of the employees and settlement of disputes for Industrial relations.

Course Pre/co requisites

This course has no specific pre/co requisites.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to

A4035.1. Identify functions of Human Resource Management
A4035.2. Illustrate the process of Recruitment and selection
A4035.3. Analysis the needs and methods for training
A4035.4. Outline the functional relationship of performance and compensation
A4035.5. Illustrates the importance of Industrial relations through collective bargaining, trade unions and industrial settlement machinery.

3. Course Syllabus

INTRODUCTION HUMAN RESOURCE MANAGEMENT: Introduction and significance of HRM, Scope, functions of HRM, changing environment of HRM and Challenges. Human Resource Planning, Objectives, Factors influencing Human Resource planning, HR Planning Process.

JOB ANALYSIS AND RECRUITMENT: Job analysis- Job description, Job specification, Sources of Recruitment; Selection, process of selection and techniques, Retention of Employees.

HUMAN RESOURCES DEVELOPMENT: Training Vs Development, Need, Process of training, Methods of training, Training Evaluation, Career planning, Performance Management System, Methods of Appraisal, Common Errors.

COMPENSATION MANAGEMENT: Concepts and components of wages, Factors influencing wage fixation, Job evaluation, Methods of payment, Incentives and Fringe benefits.

INDUSTRIAL RELATIONS: Components of Industrial Relation, Trade Unions, functions of Trade Union, Employee Participation, Collective Bargaining, Grievance Redressal, Industrial Dispute Settlement machinery.

4. Books and Materials

Text Books:

1. BiswajeetPattnayak (2009), Human Resource Management, Prentice hall of India, New Delhi, India.
2. R. Wayne Mondy and Robert M. Noe (2009), Human Resource Management, Pearson, India.

Reference Books:

1. Aswathappa. K. (2007), Human Resources and Personnel Management, Tata MC Graw Hill, New Delhi, India.
2. Monappa. A, Saiyadain. M. (1979), Personnel Management, Tata Mc Graw Hill, New Delhi, India.
3. C. B. Mamoria (2003), Personnel Management, Himalaya Publishing House, India.

VARDHAMAN COLLEGE OF ENGINEERING, HYDERABAD

OPEN ELECTIVE

COURSE STRUCTURE

A4036 – LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Hours Per Week			Hours Per Semester			Credits	Assessment Marks		
L	T	P	L	T	P	C	CIE	SEE	Total
3	0	0	42	0	0	3	30	70	100

2. Course Description

Course Overview

This course addresses the concepts and techniques of Logistics and Supply chain management. It covers Customer services, Bench marking process, Sourcing issues. Apart from Network design and Co-ordination in supply chain, it discusses role of Information Technology and Global logistics & Global supply chain issues.

Course Pre/co requisites

This course has no specific pre/co requisites.

2. Course Outcomes (COs)

After the completion of the course, the student will be able to

A4036.1. Explain the concepts of Logistics & Supply chain management.
A4036.2. Analyze the role of Supply chain drivers & Customer services of supply chain.
A4036.3. Examine the Benchmarking process and role of Sourcing in supply chain.
A4036.4. Analyze Network design in supply chain along with Coordination in supply chain.
A4036.5. Examine the role of IT in supply chain as well as Global logistics & Global supply chain.

3. Course Syllabus

Introduction to Supply Chain Management: Concept, Objectives, Scope and Functions of Supply Chain; Process view of a Supply Chain. Supply Chain Drivers - Facilities, Inventory, Transportation, Information, Sourcing, Pricing; Obstacles to achieve Strategic fit, Role of Aggregate Planning in Supply Chain, Methods and Managing Supply and Demand.

Logistics Management: Introduction, Difference between Logistics and Supply Chain; Inbound, Inter and Outbound Logistics; Integrated Logistics Management; 3PL, 4PL, Intermodal and Reverse Logistics. Supply Chain Customer Service - The Marketing and Logistics interface, Customer Service and Customer Retention, Service-Driven Logistics System, Setting customer Service Priorities and Service Standards.

Bench marking: Objectives, Bench marking Cycle, Process and types, Setting Bench marking Priorities. Sourcing in supply chain: Role of Sourcing in Supply Chain Management, Supplier Scoring

and Assessment; Supplier Selection and Controlling; The Procurement process, Sourcing Planning and Analysis; Global Sourcing.

Network design in Supply Chain: The role of distribution in the Supply Chain Management, factors influencing distribution network design; Transportation Fundamentals: The role of Transportation in Supply Chain, Factors influencing Transportation Decisions, Modes of transportation, Transportation documentation. Coordination in Supply Chain: Introduction, Lack of Supply Chain Coordination and the Bullwhip effect, Impact of Lack of Coordination, Obstacles to Coordination in Supply Chain, Managerial levers to achieve Coordination.

IT in Supply Chain: The role of IT in the Supply Chain, The Supply Chain IT framework; CRM, Internal SCM, SRM; The future of IT in Supply Chain, Supply Chain IT in Practice. Global Logistics and Global Supply Chain: Logistics in Global Economy, Change in Global Logistics, Global Supply Chain business process; Global Strategy; Global Purchasing, Global SCM.

4. Books and Materials

Text Book:

2. K.Shridharabhat, “Logistics and Supply Chain management”, Himalaya Publishers, New Delhi, 2009.

Reference BookS:

1. Sunil Chopra and Peter Meindl, “ Supply Chain Management: Strategy, Planning & Operations”, Pearson Education, New Delhi, 2004.
2. Donald J Bowerfox and David J Closs, “ Logistics Management: The integrated Supply Chain Process”, TMH, 2003.
3. D.K.Agarwal, “Logistics and Supply Chain management”, Mc millan Publishers, 2011.
4. B.Rajasekhar, Acharyulu, “Logistics and Supply Chain management”, Excel Books, New Delhi, 2009.