VASAVI COLLEGE OF ENGINEERING(AUTONOMOUS)
Ibrahimbagh, Hyderabad-31

Approved by A.I.C.T.E., New Delhi and
Affiliated to Osmania University, Hyderabad-07

Sponsored by
VASAVI ACADEMY OF EDUCATION
Hyderabad

SYLLABI FOR
B.E V and VI SEMESTERS (CIVIL)
UNDER CBCS WITH EFFECT FROM 2018 – 2019
(For the students admitted in 2016-17)

DEPARTMENT OF CIVIL ENGINEERING
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COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION FOR BE V-SEMESTERw.e.f. 2018-19under CBCS
(Students admitted in 2016-17)

Course Code	Course Name	Instruction Hours per week				Examination			Credits
		L	T	D	P	Duration Hours	Max. Marks SEE	Max. Marks CIE	
PC510CE	Reinforced Concrete Design – I	3	1	0	0	3	70	30	3
PC520CE	Theory of Structures-I	3	1	0	0	3	70	30	3
PC530CE	Fluid Mechanics – II	3	0	0	0	3	70	30	3
PC540CE	Soil Mechanics	3	1	0	0	3	70	30	3
PC550CE	Environmental Engineering	3	0	0	0	3	70	30	3
OEXXXXX	Open Elective – IV	1	0	0	0	2	35	15	1
OEXXXXX	Open Elective – V	2	0	0	0	3	70	30	2
MC510EH	Human Values & Professional Ethics-II	1	0	0	0	2	50	25	1
MC500EH	FS: III - Soft Skills	1	1	0	0	1.5	35	15	1
MC500CE	FS: III - Technical Skills	1	1	0	0	1.5	35	15	1
LABS									
PC561CE	Hydraulics & Hydraulics Machinery Lab	0	0	0	2	2	50	25	1
PC562CE	Soil Mechanics Lab	0	0	0	2	2	50	25	1
PC563CE	Concrete Technology Lab	0	0	0	2	2	50	25	1
PW519CE	Mini Project: Surveying Camp	0	0	0	0	0	0	50	1
Total		**21**	**5**	**0**	**6**		**725**	**375**	**25**
Contact hours		**32**					**1100**		

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING
REINFORCED CONCRETE DESIGN-I
SYLLABUS FOR BE V-SEMESTER

Instruction: 3+1 Hrs /week	SEE Marks :70	Course Code :**PC510CE**
Credits : 3	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of the course are to introduce	*Upon the completion of the course, students are expected to*
1. Design philosophies of working stress method and limit state method. 2. Indian standard codes of practice for Reinforced Concrete 3. Design of concrete structural elements using limit state method as per Indian code of practice.	1.Understand design philosophies of concrete and design beams for flexure with working stress method according to IS: 456 -2000. 2.Design beams for flexure with limit state method according to IS: 456-2000. 3.Design beams for shear, torsion and compute deflections with limit state design philosophy according to IS: 456-2000. 4.Perform yield line analysis of slabs and design slabs with limit state method according to IS: 456-2000. 5.Design columns and footings with limit state method according to IS: 456-2000.

UNIT-I

Introduction to Reinforced Cement Concrete: Need for Reinforcement in Concrete – Basic requirements of an RCC Structure-stability, strength, serviceability and durability.

Design Philosophies: Design philosophies- Working stress method (WSM) and limit state method (LSM) relative merits and demerits.

Working stress method: Theory of flexure in RCC beams, Balanced, under-reinforced and over reinforced sections; Analysis and design of singly and doubly reinforced rectangular sections.

UNIT-II

Basic concepts and terminology of LSM: Basic concepts and terminology of LSM - limit state, characteristic loads and strengths, Partial safety factors. Stress strain relationship for concrete and reinforcing steel; stress blocks.

Limit State of collapse in flexure: Assumptions, Analysis for flexure, failure in tension and compression, singly reinforced, doubly reinforced rectangular and flanged beams. Anchorage and development length, Curtailment of reinforcement in beams.

UNIT-III

Limit State of collapse in shear and torsion: Analysis and design for shear and torsion.

Limit State of Serviceability: Check for deflection and cracking.

UNIT-IV

Analysis and design of slabs: Types of slabs-one way, two way simply supported and continuous rectangular slabs subjected to uniformly distributed loads. Design of solid rectangular slabs.

Introduction to Yield line Theory for Slabs: Assumptions – Patterns of Yield lines – Analysis and design of a simply supported rectangular two- way slab using yield line approach.

UNIT-V

Analysis and design of columns: Assumptions, axially loaded circular, square and rectangular columns, Uniaxial and biaxial bending- interaction diagrams.

Design of Footings: Design of isolated square and rectangular footings as per IS code.

Learning Resources:

1.Unnikrishna Pillai S and Devdas Menon, "Reinforced Concrete Design", McGraw Hill Education India Pvt Ltd.,2009.

2.Varghese P.C, "Limit State Design of Reinforced Concrete", Prentice Hall of India, 2008.

3.Subramanian N., "Design of Reinforced Concrete Structures", Oxford University Press, 2013.

4.Robert Park and Thomas Paulay, "Reinforced Concrete structure", Wiley India Pvt. Ltd, 2013.

5.Shah H.J., "Reinforced Concrete", Vol.1, Charotar Publishing House, 2012.

6.Punmia B.C., Ashok K. Jain, Arun K. Jain, "Limit State Design of Reinforced Concrete", Laxmi Publications (P) Ltd. ,2012.

7.Ramamrutham, "Design of Reinforced Concrete Structures", Dhanpat Rai Publishing Co., 2015.

8.Nptel.ac.in/courses/105105105, Design of Reinforced Concrete Structures.

9.IS:456-2000, Code of Practice for Plain and Reinforced concrete, Bureau of Indian Standards, New Delhi, India.

10.SP 16: Design Aids for Reinforced Concrete to IS 456:1978, Bureau of Indian Standards, New Delhi, India

11.SP 24: Explanatory Handbook on Indian Standard Code of Practice for Plain and Reinforced Concrete to IS 456:1978, Bureau of Indian Standards, New Delhi, India

12.SP 34: Handbook on Concrete Reinforcement and Detailing (With Amendment 1), Bureau of Indian Standards, New Delhi, India

13.IS: 875-1987 Code of Practice For Design Loads (Other Than Earthquake) For Buildings And Structures Parts (1, 2, 3, 4 & 5), Bureau of Indian Standards, New Delhi, India

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE V-SEMESTER
THEORY OF STRUCTURES - I

Instruction: 3+1 Hrs /week	SEE Marks :70	Course Code :**PC520CE**
Credits : 3	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1. Explain methods of analysis for indeterminate beams, portal frames, arches and trusses 2. Describe analysis of beams and pin jointed frames using strain energy methods 3. Explain approximate methods of analysis for lateral loads	1. Find degree of indeterminacy of various structures subjected to external forces. 2. Perform analysis of beams and rigid jointed frames subjected to external loads using` moment distribution method' &'slope deflection method' and draw bending moment diagrams. 3. Analyse indeterminate structures subjected to external loads using Kani's method and draw bending moment diagrams 4. Analyse three hinged, two hinged parabolic arches carrying vertical loads and frames subjected to lateral loads and draw bending moment diagrams. 5. Apply strain energy methods in the analysis of beams and pin jointed frames subjected to external forces.

UNIT-I

Static and Kinematic indeterminacy: Determination of static and kinematic indeterminacy of beams, pin jointed and rigid jointed frames. Introduction to analysis by force method and displacement method.

Moment distribution method: Slope deflection equations, Analysis of continuous beams with and without sinking of supports, single bay single storey portal frames with and without side sway - loading on beam/portal frame shall be point load(s) and uniformly distributed load- shear force and bending moment diagrams.

UNIT-II

Slope deflection method: Analysis of continuous beams with and without sinking of supports, single bay single storey portal frames with and without side sway - loading on beam/portal frame shall be point load(s) and uniformly distributed load- shear force and bending moment diagrams.

UNIT-III

Kani's method: Analysis of continuous beams with and without sinking of supports, single bay single storey portal frames with and without side sway - loading on beam/portal frame shall be point load(s) and uniformly distributed load- shear force and bending moment diagrams.

UNIT-IV

Approximate methods: Portal method and cantilever method.

Analysis of arches: Three hinged and two hinged parabolic arches, determination of horizontal thrust, bending moment, normal thrust and radial shear for static loading.

UNIT-V

Strain energy methods: Determination of displacements using unit load method for statically determinate structures such as beams, pin-jointed trusses.

Redundant pin jointed trusses: Analysis of plane trusses with one degree of redundancy (internal / external), lack of fit and temperature effects.

Learning Resources:

1. Vazirani V.N., Ratwani M.M, Duggal S.K., "Analysis of Structures - Vol. II Theory, Design and Details of Structures", Khanna Publishers, 16th Edition, 2015.
2. Thandavamoorthy T.S., "Structural Analysis", Oxford Higher Education, Second Edition, 2012.
3. Ramamrutham S., Narayan R., "Theory of Structures", Dhanpath Rai publications, 2014
4. Devdas Menon, "Structural Analysis", 1st Edition, Narosa Book Distributors Pvt Ltd,2014.
5. Reddy C.S., "Basic Structural Analysis", 3rd Edition, Mc Graw Hill, 2010.
6. Junarkar S.B., Shah, "Mechanics of Structures", Volume II, Charotar Pub. House, 2010.
7. Chu-Kia Wang, "Intermediate Structural Analysis (English) 1st Edition", McGraw Hill Education, 2010.
8. Hibbeler R.C., "Structural Analysis", 8/E, Prentice Hall, Higher Education, 2012.
9. Louis F. Geschwindner, Harry H. West, "Fundamentals of Structural Analysis", 2nd Edition, Wiley India Pvt. Ltd., 2011.
10. Stephen P. Timoshenko and Donovan H. Young " Theory of Structures" McGraw Hill International Edition, 1968
11. http://nptel.ac.in/downloads/105101085/

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING
FLUID MECHANICS – II
SYLLABUS FOR BE V-SEMESTER

Instruction: 3+1 Hrs /week	SEE Marks :70	Course Code :**PC530CE**
Credits : 3	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1. Study various aspects of open channel flow. 2. Learn the concepts of boundary layer theory 3. Discuss the performance and design of hydraulic turbines and centrifugal pump.	1. Compute velocity, specific energy and critical depth in steady uniform flow through open channels 2. Determine water surface profiles, hydraulic jumps and surges in non uniform flow through open channels 3. Explain growth and separation of boundary layer and evaluate drag & lift forces for various shapes of bodies in a medium 4. Evaluate the performance characteristics and perform design of turbines for various conditions of head, discharges and power 5. Evaluate the performance characteristics and perform design of centrifugal pump for various conditions of head, discharges and power

UNIT-I

Steady uniform flow through open channels: Descriptions and definitions, difference between pipe flow and channel flow, velocity and pressure distribution in channel cross section, energy and momentum correction coefficients, friction to flow in open channel, uniform flow, Manning's and Chezy's formulae, most efficient channel cross-section, specific energy, concept and applications of critical depth.

UNIT-II

Gradually varied flow: Significance of Froude Number, dynamic equation of gradually varied flow, classification of gradually varied flow profiles, computation of flow profiles and characteristics of flow profiles. Hydraulic Jump- Momentum equation for a jump in horizontal rectangular channel, energy dissipation in hydraulic jumps and surges in open channels, elementary surge analysis.

UNIT-III

Boundary layer: Boundary layer growth and separation, methods to control separation, drag and lift forces, drag on airfoil and sphere, Principle of stream lining. Displacement, energy & momentum thickness stream lined body and bluff body, magnus effect.

UNIT-IV

Hydraulic Turbines: Classification, specific speed, unit quantities velocity triangles and principles of design of pelton wheel turbine, Francis turbine and Kaplan turbine, characteristics curves cavitaion in turbines .

UNIT-V

Centrifugal Pump: Component, work done, heads and efficiencies, minimum starting speed, specific speed and characteristics curves of centrifugal pump.

Learning Resources:

1. Modi P.N., Seth S.M., "Fluid Mechanics", Standard Book House, 2013
2. Bansal R.K., "Fluid Mechanics & Hydraulic Machinery", Laxmi Publications, 2015
3. Rama Durgaiah D., "Fluid Mechanics and Machinery" New Age International Publishers, 2002
4. Ojha C.S.P., Brendtsson R., Chandramouli P.N., "Fluid Mechanics and Machinery", Oxford University Press, 2010.
5. Ven Te Chow "Open - Channel Hydraulics" International Student Edition, McGraw-Hill, 1983.
6. http://nptel.ac.in/courses/105107059/, Fluid Mechanics
7. http://nptel.ac.in/courses/105103096/3, Hydraulics

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE V-SEMESTER
SOIL MECHANICS

Instruction: 3+1 Hrs /week	SEE Marks :70	Course Code :**PC540CE**
Credits : 3	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to introduce	*Upon the completion of the course, students are expected to*
1. Study Origin, classification of soils and estimate index and engineering properties by different procedures 2. Learn Concepts of compaction and consolidation of soils 3. Estimate shear strength parameters, earth pressure and analyze stability of different slopes	1. Interpret composition and structure of soils and classify them according to IS Soil classification. 2. Evaluate effective stress under Hydrostatic Conditions, Steady State One-Dimensional Flow and Transient Hydrodynamic Conditions using analytical approach. 3. Compute stress distribution for a given loading condition using analytical and graphical methods. 4. Analyze mechanisms of compaction and consolidation of soils under given field conditions. 5. Determine and judge shear strength in soils under given field conditions. 6. Evaluate lateral earth pressure for cohesive, cohesionless and combination of them using Rankine's method and Columb's wedge theory. 7. Assess stability of finite and infinite slopes in soils under given field conditions.

UNIT-I

Introduction and clay chemistry:– Brief history of discipline, Soil formation, structure of soils, composition and structure of clay minerals, clay-water interaction

Soil phase relationships pseudo-elastic three phase particulate medium, Mass-volume &weight-volume relationships, and determination of specific gravity and water content.

Index properties: Shape and size characterization- Grain size distribution analysis including wet analysis-hydrometer analysis, Atterberg limits and consistency indices, Soil classification systems.

UNIT-II

Effective stress: Effective stress principle, Fundamentals of Effective stress under hydrostatic condition, distribution of stress with depth

influence of shifting water table, shift in ground surface and capillarity. Functional relation between effective stress and engineering properties.

Permeability of Soils: Validity of Darcy's Law - Factors affecting permeability – Field and laboratory tests to determine permeability- Equivalent permeability of stratified soils.

Effective stress under one dimensional flow – seepage force, downward flow, upward flow, Quick Sand phenomena- Remedial measures. Laplace equation, qualitative representation of flow nets under defined boundary conditions- Locating phreatic line in a homogeneous earthen dam using Kozeny's parabola – computation of seepage quantity, total, effective and neutral stress.

UNIT-III

Stress Distribution : : Boussinesq's and Westergaard's equations for point load. Application of point load formulae for uniformly distributed load on circular and rectangular areas. Use of Newmark's chart (for Boussinesq's equation). Contact pressure distribution.

Compaction Process: Compaction Mechanism; factors affecting compaction. Determination of compaction characteristics - standard and modified Proctor tests - Light and Heavy compaction tests.CBR test – Field and laboratory based.

Consolidation Process: Spring analogy - Void ratio and effective stress (e Vs logP) relationship – Terazaghi's theory of one dimensional consolidation - assumptions and derivation of one dimensional consolidation equation, computation of magnitude of settlement and time rate of settlement.

UNIT-IV

Shear Strength: Significance of Shear strength in soils – Mohr-Coulomb equation – shear parameters - Determination of shear strength – Direct shear test, large shear box test Tri-axial compression tests (Unconsolidated Undrained (UU), Consolidated Undrained (CU) and Consolidated Drained (CD)), UCC test, Vane shear test. Stress- strain behaviour of soils-Stress path-Skemptons pore water parameters

UNIT-V

Earth Pressure: States of earth pressure-Active, passive, at rest condition; Rankine's theory: computation of active and passive earth pressure in cohesionless and c-φ soils; Coulomb's Wedge theory; Introduction to graphical solution.

Slope stability: Definition and classification of slopes-types and slope failures-Factors of safety with respect to cohesion, angle of shearing resistance, Height – Analysis of stability of slope using Swedish slip circle method and Taylor's stability number.

Learning Resources:

1. Murthy V.N.S., "A Textbook of Soil Mechanics & Foundation Engineering", CBS Publishers, 2015.
2. Gopal Ranjan, Rao A.S., "Basic and Applied Soil Mechanics", Wiley Eastern Limited, third edition, 2016.
3. Venkatramaiah C., "Geo-technical Engineering", New Age Publishers, fourth edition, 2012.
4. Shashi K.Gulhati and Manoj Datta, "Geotechnical Engineering", Tata Mc-Graw Hill, 2005
5. Braja M. Das, Khaled Sobhan, "Principles of Geotechnical Engineering", Cengage Learning, 2014
6. Craig's, R.F., "Soil Mechanics" Springer, 2013
7. Karl Terzaghi, Ralph B. Peck, Gholamreza Mesri., "Soil Mechanics in Engineering Practice" John Wiley & Sons, 07-Feb-1996
8. William Lambe T., Robert V. Whitman., "Soil Mechanics" John Wiley & Sons, 1969
9. Arora K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors revised and enlarged sixth edition, 2007.
10. Scott, R.F., "Principles of Soil Mechanics", Addison Wesley, Massauchusetts,
11. IS Code: IS-2720, Methods of tests for Soils.
12. http://nptel.ac.in/courses/105101084/

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING
ENVIRONMENTAL ENGINEERING
SYLLABUS FOR BE V-SEMESTER

Instruction: 3 Hrs /week	SEE Marks :70	Course Code :**PC550CE**
Credits : 3	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1. Analyze water and waste water system and understand the concepts of demand, supply and distribution system and Identify various public health elements 2. State the stages involved in water and sewage design treatment, mechanism and disposal 3. Describe the concept of sludge and solid waste management.	1. Assess the demand, quality of water and concept of storm water. 2. Design the components of a water treatment plant. 3. Understand various characteristics of domestic Sewage and its treatment by designing a simple sewerage system. 4. Understand the sludge and solid waste treatment and disposal.

UNIT-I

Water Demand and Forecasting Methods: Water demand and per capita consumption, population forecasting approaches. Water distribution systems and solution of a simple network using hardy cross method. Storm water sewers – storm water estimation by rational method.

Water Quality: Standards of potable water, Physical and Chemical Properties.

UNIT-II

Treatment of Water: Design of rectangular and circular sedimentation tanks, coagulation and flocculation, design of a flocculator. Filtration – types of filters and filter media. Design principles of slow and rapid sand filters, Disinfections – necessity and methods, chlorination of water supplied, Removal of hardness, tastes & odour control.

UNIT-III

Wastewater Characteristics and Disposal: Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Population equivalent, Relative Stability, Natural Methods of wastewater disposal-Self-purification of streams, Oxygen sag Analysis, Dilution into sea, disposal by land treatment

UNIT-IV

Waste Water Treatment: Preliminary treatment, Screens, Grit chambers. Trickling filter, Activated sludge process, Oxidation ponds, Oxidation ditches.

Sewage Conveyance – Sewer types and appurtenances. Velocity in sewers, Design of a simple sewerage system.

UNIT-V

Sludge: Sludge digestion and disposal methods – septic tanks – design parameters and working principles. Low cost waste treatment

Solid Waste: Types, source and composition of solid waste. Methods of collection, transportation and disposal

Learning Resources:

1. Punmia B.C., "Environmental Engineering Vol. I & II", Laxmi Publications Pvt Ltd., New Delhi, 2015
2. Birdi G.S, "Water Supply and Sanitary Engineering", Dhanpat Rai & Sons, 2014
3. Peavy H.S., Rowe D.R., Tchobanoglous G., "Environmental Engineering", Tata McGraw Hills, New Delhi, 1985
4. Metcalf & Eddy M.C., "Waste Water Engineering – Treatment & Reuse", Tata McGraw Hill Publications, New Delhi, 2003
5. http://nptel.ac.in/courses/105106119/

SYLLABUS FOR B.E.- VI SEMESTER
HUMAN VALUES AND PROFESSIONAL ETHICS – II

Instruction: 1 Hrs /week	SEE Marks :35	Course Code :**MC500EH**
Credits : 1	CIE Marks: 15	Duration of SEE : 2 Hrs

Course Objectives	Course Outcomes
1. Get a holistic perspective of value- based education. 2. Grasp the meaning of basic human aspirations vis-a-vis the professional aspirations. 3. Understand professionalism in harmony with self and society. 4. Develop ethical human conduct and professional competence. 5. Enrich their interactions with the world around, both professional and personal.	**At the end of the course, students will be able to:** 1. Gain a world view of the self, the society and the profession. 2. Make informed decisions. 3. Start exploring themselves in relation to others and their work –constantly evolving into better human beings and professionals 4. Inculcate Human values into their profession. 5. Validate their aspirations through right understanding of human relationship and see the co-relation between the human values and prevailing problems. 6. Strike a balance between physical, mental, emotional and spiritual parts their being. 7. Obtain a holistic vision about value-based education and professional ethics.

UNIT-I

A. **DISTINCTION BETWEEN NEED AND GREED**
Exercising the wisdom to distinguish need from greed.

B. **IDEAL SELF-REAL SELF**-
How to define the ideal-idealism at various levels- is it possible to reach idealism –Man as a pilgrim on a journey to idealism.

UNIT - II

A. **RIGHTS AND RESPONSIBILITIES**-Educating an individual about rights and responsibilities –Safeguards-Stimulants-Social Justice-The three catalysts for deciding rights and responsibilities.

B. **IMBIBING AND INCULCATING CIVIC SENSE AND CIVIC-VIRTUES**, The true meaning of Integrity -Honesty, Humility, Openness, Transparency, Dedication, Reliability, Confidentiality, accountability, Collegiality, Sympathy, Trustworthiness, Co-operation, Courage.

a. The moral dilemma of the Modern world, Respect for Self, Others and Work.
b. Respect for women at the workplace.

UNIT - III

MANAGING FAILURE-Identifying causes for failure and learning lessons-Using failure to score success-Role of self-confidence and personal ethics in coping with failure.

• Anger/ Depression • Fear • Agitation • Failure • Lethargy • Dishonesty	• Cruelty • Jealousy • Desire • Cheating • Pride • Greed • Lying

UNIT - IV

STRESS MANAGEMENT- Identifying sources and levels of stress – Tackling stress and its associated negativity-Positive aspect of coping with stress- Some techniques to manage stress.

UNIT - V

DEVELOPING EMOTIONAL INTELLIGENCE

Self-Awareness
Handling Emotions
Motivation
Empathy
Social skills

Suggested Readings:

1. B.L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. A.N Tripathy, 2003 Human values, New Age International Publishers.
3. EG Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists and Engineers, Oxford University Press.
4. Mike Martin and Ronald Schinzinger "Ethics in Engineering "McGraw Hill
5. Charles E Haris, Micheal J Rabins, " Engineering Ethics "Cengage Learning
6. Caroline whitback, Ethics in Engineering Practice and Research, Cambridge University Press
7. Georgs Reynolds, Ethics in Information Technology", Cengage Learning

8. Charles D.Fleddermann, " Engineering Ethics", Pearson Education /Prentice Hall, New Jersey,2004 (Indian Reprint)

Online Resources

1. Value Education website, Http://www.universalhumanvalues.info
2. UPTU website, Http://www.uptu.ac.in
3. story of stuff, Http://www.storyofstuff.com
4. AlGore, As Inconvenient Truth, Paramount Classics ,USA
5. Charlie Chaplin, Modern Times, United Artists, USA
6. IIT Delhi, Modern Technology-The Untold story
7. Anand Gandhi, Right Here Right Now, Cyclewala production

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE V-SEMESTER
FINISHING SCHOOL-III (SOFT SKILLS)

Instruction: 1+1 Hrs /week	SEE Marks :35	Course Code :**MC500EH**
Credits : 1	CIE Marks: 15	Duration of SEE : 1.5 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
This is a foundation course and aims at enhancing employability skills in students. Students will be introduced to higher order thinking skills and problem solving on the following areas - Arithmetic ability, Numerical ability and General reasoning. Students will be trained to work systematically with speed and accuracy while problem solving. The three major are as covered in this course include 1. Numerical Ability 2. Arithmetic Ability 3. General reasoning	1. Solve questions on the above mentioned areas using short cuts and smart methods 2. Understand the fundamentals concepts of Aptitude skills 2. Perform calculations with

UNIT– I: QUANTITATIVEAPTITUDE-NUMERICALABILITY
Numerical Ability Introduction to higher order thinking skills Speed Maths Number systems LCM & HCF

UNIT– II:QUANTITATIVEAPTITUDE-RITHMETIC ABILITY FOUNDATION
Arithmetic Ability
Percentage
Profit loss and discounts
Ratio proportions Allegations and mixtures
Averages

UNIT– III: QUANTITATIVE APTITUDE-ARITHMETIC ABILITY ADVANCED
Arithmetic Ability
Time speed and distance
Time and work
Interest calculations

UNIT– IV: REASONING ABILITY–GENERAL REASONINGPART1

General Reasoning
Coding decoding
Directions
Series completions

UNIT–V: REASONING ABILITY-GENERALREASONINGPART2

General Reasoning
Analogies
Classification
Alphabet test
Mathematical operations

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE V-SEMESTER
FINISHING SCHOOL-III (TECHNICAL SKILLS)
MATHEMATICAL MODELLING SOFTWARE

Instruction: 1+1 Hrs /week	SEE Marks :35	Course Code :**MC500EH**
Credits : 1	CIE Marks: 15	Duration of SEE : 1.5 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1. Explain MATLAB basic environment 2. Describe creating and running m-files 3.Discuss the syntax control structures and execute related program 4. Explain matrix operations 5. Describe input/output operations	1. Understand basic MATLAB environment 2. Create and execute m-files 3. Write program using control Structures 4. Perform matrix operations 5. Understand input /output operations

UNIT-I
Introduction: MATLAB Environment , basic syntax, variables, commands, data types, operators.

UNIT-II
User defined functions: M-files, creating and running script files.

UNIT-III
Control Structures: for loop, while loop, nested loops, if-else, switch statement.

UNIT-IV
Matrix Algebra: Matrix operations, addition and subtraction of matrices, transpose of a matrix, matrix multiplication, inverse of a matrix.

UNIT-V
Controlled Input-Output: User defined input and output operations, reading and writing data from file.

Learning Resources:

1.HollyMoore,"MATLABforEngineers",3rdedition, Pears on Publication, 2012.
2.Agam Kumar Tyag, "MATLAB and Simulink for Engineers", Oxford Higher Education

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE V-SEMESTER
HYDRAULICS & HYDRAULIC MACHINERY LAB

Instruction: 2 Hrs /week	SEE Marks :50	Course Code :**PC551CE**
Credits : 1	CIE Marks: 25	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to introduce	*Upon the completion of the course, students are expected to*
1. Manning's rugosity coefficient and super elevation in open channels. 2. Impact coefficient on different types of vanes and drag & lift forces in wind tunnel. 3. Pre and post jump depths and calculate loss of energy in hydraulic jump. 4. Familiarize with the procedures of calculating over all efficiency of different types of pumps and turbines.	1. Determine Manning's rugosity coefficient and measure super elevation in an open channel and estimate loss of energy in hydraulic jump. 2. Evaluate impact coefficient for different types of vanes. 3. Evaluate the overall efficiency of various pumps and turbines and draw performance characteristic curves. 4. Practice working as a team member and lead a team 5. Demonstrate professional behaviour in conducting the experiments and presenting the results effectively

LIST OF EXPERIMENTS

1	Open Channel coefficient	Determination of Manning's rugosity coefficient
2	Open Channel Bend	Determination of super elevation
3	Impact of Jets	Determination of vane coefficient on different types of vanes
4	Centrifugal pump	Determination of efficiency and performance
5	Centrifugal pump test rig	Determination of efficiency and performance Characteristics under varying loads
6	Pelton Wheel Turbine	Determination of efficiency and Performance
7	Francis Turbine	Determination of efficiency and Performance characteristics
8	Kaplan Turbine	Determination of efficiency and Performance characteristics
9	Self-priming pump	Determination of efficiency and performance characteristics

10Wind tunnel	a) To study Drag & Lift characteristic of different angles of attack and find coefficient of drag and lift b) Study pressure distribution over an aerofoil
11Hydraulic Jump	Determination of pre- and post-jump depth in channel flow

Online Resources:

Virtual Lab: http://eerc03-iiith.virtual-labs.ac.in/ index.php? section=List% 20of%20experiments

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE V-SEMESTER
SOIL MECHANICS LAB

Instruction: 2 Hrs /week	SEE Marks :50	Course Code :**PC561CE**
Credits : 1	CIE Marks: 25	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of the course are to introduce	*Upon the completion of the course, students are expected to*
1. Index and engineering properties of various soils 2. Field test procedures	1. Determine the index properties of soils and classify soils. 2. Determine Direct shear strength and Triaxial shear strength of a soil sample 3. Calculate Permeability and determine the impaction characteristics of soils 4. Practice working as a team member and lead a team 5. Demonstrateprofessionalbehaviour in conductingthe experiments and presenting the results effectively.

LISTOF EXPERIMENTS

DETERMINATION OFINDEXPROPERTIES:

1. Determination of Specific Gravity of soil solids using "Density bottle" method.
2. Determination of Specific Gravity &water contentusing "Pycnometer" method.
3. Determination of Liquid limit using Casgrande's and Cone Penetration standard LL device.
4. Determination of Shrinkage and Plastic limits
5. Sieve Analysis including Hydrometer Analysis for plotting Particle size distribution curve
6. Determination o f Field Density using Core cutter Method
7. Determination o f Field Density using Sand Replacement Method

DETERMINATION OFENGINEERINGPROPERTIES

8. Determination of Compaction Characteristics by Standard Proctor test
9. Determination of Laboratory California Bearing Ratio (CBR)value
10. Determination of Co-efficient of Permeability by Constant Head Permeameter test and Variable Head Permeameter tests
11. Swell pressure test on expansive soils

12. Determination of shear strength parameters by Direct Shear Test
13. Determination of Shear Strength of Cohesive soils by "vane shear test"
14. Determination of Shear Strength by conducting "Triaxial Shear Test"
15. Consolidometer

DEMONSTRATION OF TEST PROCEDURES:

16. Standard Penetration Test

Learning Resources:

1. http://eerc02-iiith.virtual-labs.ac.in/
2. http://home.iitk.ac.in/~madhav/geolab.html

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE V-SEMESTER
CONCRETE TECHNOLOGY LAB

Instruction: 2 Hrs /week	SEE Marks :50	Course Code :**PC571CE**
Credits : 1	CIE Marks: 25	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1. Determine the physical properties of cement, fine aggregate and coarse aggregate 2. Determine work ability of concrete 3. Determine the strength of concrete using destructive and non-destructive methods	1. Determine the physical properties of cement, fine aggregate and coarse aggregate 2. Determine the workability of concrete 3. Determine the compressive strength using destructive and non-destructive methods and flexural strength by destructive method. 4. Practice working as a team member and lead a team 5. Demonstrate professional behaviour in conducting theexperiments and presenting theresults effectively

LISTOFEXPERIMENTS I.TESTSONCEMENT:

I TESTSONCEMENT

1 (a) Specific gravity of cement.
(b) Unit weight for bulk density of cement.
2 Normal consistency of cement.
3 (a) Initial setting time of cement
(b) Final setting time of cement
(c) Fineness of cement by sieving
4 Compressive strength of cement

II TESTSONAGGREGATE:

5 Silt content of sand.
6 (a)Specific gravity of fine aggregate.
(b) Bulk density offine aggregate.
7 (a)Specific gravity of coarse aggregate.
(b) Bulk density of coarse aggregate.
8 Bulking of sand by laboratory method.
9 Bulking of sand by field method.
10 Fineness modulus offine aggregate.
11 Fineness modulus of coarse aggregate.

III TESTSONCONCRETE

12 Workability of concrete by slump test

13 Workability of concrete by compacting factor test
14 Compressive strength of concrete
15 Flexural strength of concrete

IV EXPERIMENTS FORDEMONSTRATION ONLY

16 Fineness of cement by Blain's air permeability method
17 Non-Destructive Testing of Concrete Structures.
18 Workability of concrete by Flow test
19 Workability of concrete by Vee-Bee test.

Learning Resources:

1. IS:269-1989,Indian Standard Code of Practice for Ordinary Portl and Cement,33 Grade– Specifications (Fourth Revision), Bureau of Indian Standards, New Delhi
2. IS:8112-1989, Indian Standard Code of Practice for 43 Grade Ordinary Portland Cement–Specifications (First Revision), Bureau of Indian Standards, New Delhi
3. IS:12269-1987, Indian Standard Code of Practice for Ordinary Portl and Cement, 53 Grade–Specifications, Bureau of Indian Standards, New Delhi
4. IS:650-1991,Indian Standard Code of Practice for Standard Sand for Testing Cement–Specifications (Second Revision), Bureau of Indian Standards, New Delhi
5. IS: 2386(Part-III) -1963, Indian Standard Methods of Test for Aggregates for Concrete, Bureau of Indian Standards, New Delhi
6. IS: 1199-1959, Indian Standard Methods of Sampling and Analysis of Concrete, Bureau of Indian Standards, New Delhi
7. IS: 516-1959, Indian Standard Methods of Tests for Strength of Concrete, Bureau of Indian Standards, New Delhi
8. IS:13311(Part-1)-1992,Indian Standard Non-Destructive Testing of Concrete–Methods of Test, Part-1 Ultrasonic Pulse Velocity, Bureau of Indian Standards, New Delhi
9. IS:13311(Part-2)-1992, Indian Standard Non-Destructive Testing of Concrete–Methods of Test, Part-2 Rebound Hammer, Bureau of Indian Standards, New Delhi
10. IS:4031(Part-2)-1999, Indian Standard Methods of Physical Tests for Hydraulic Cement, Determination of Fineness by Blaine Air Permeability Method, Bureau of Indian Standards, NewDelhi

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE V-SEMESTER
MINI PROJECT: SURVEYING CAMP

Instruction: -	SEE Marks :-	Course Code :**PW519CE**
Credits : 1	CIE Marks: 50	Duration of SEE : -

COURSEOBJE	**COURSEOUTCOMES**
The objectives of the course are to introduce	*Upon the completion of the course, students are expected to*
1. Field exercises with modern surveying equipment including GPS and Total Station. 2. All aspects of executing and plotting of field surveys 3. Capturing topographical features	1. Measure the topographical features using advanced surveying instruments such as total station and GPS 2. Plot the data obtained in the field through mapping software like QGIS / ArcGIS 3. Interpret the need for accurate and thorough note taking process in the field work to serve as a legal record. 4. Practice working as a team member and lead a team 5. Demonstrate professional behaviour in conducting the experiments and presenting the results effectively

Course Content:

A one week (6days, 36hours) surveying camp shall be organized in the intervening period between the completion of the IV semester and the commencement of V semester.

The work has to be graded for 50 Sessional marks by a committee consisting of the Head of the Department and 2-3 senior faculty members.

The surveying camp shall expose the students to all the aspects of planning, organizing and conducting field survey, and plotting of the same.

OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS IN
B.E- V and VI SEMESTER (2018-19)
Engineering Branches

Open Elective IV (Semester - V)			
Dept.	**Title**	**Code**	**credits**
Civil	Environmental Impact Assessment	OE510CE	1
	Remote Sensing	OE520CE	1
CSE	Introduction to Software engineering	OE510CS	1
ECE	Introduction to Telemetry	OE510EC	1
EEE	Basics of power systems	OE510EE	1
IT	Introduction to Linux	OE510IT	1
Mech.	Basics Of 3-D Printing	OE500ME	1
Open Elective V (Semester - V)			
Civil	Global Positioning Systems	OE530CE	2
	Project Management	OE540CE	2
CSE	Introduction to Java Programming	OE520CS	2
ECE	Introduction to Signal Processing	OE520EC	2
EEE	Fundamentals of Power Electronics	OE520EE	2
IT	Introduction to Java Programming Language	OE520IT	2
Mech.	Introduction to Robotics	OE510ME	2
	Basics of Entrepreneurship	OE520ME	2

OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS IN
B.E- V and VI SEMESTER (2018-19)
Basic Sciences and H&SS

Open Elective IV (Semester - V)			
Dept	**Title**	**Code**	**credits**
CHEM	Electronic Engineering Materials	OE400CH	1
	Polymer Technology	OE410CH	1
	Industrial Pollution Prevention and Control	OE420CH	1
	Electrochemical Energy Systems	OE430CH	2
	Corrosion Science and Technology	OE440CH	2
PHY	Display Devices	OE400PH	1
	Fundamentals of Vacuum Technology	OE410PH	1
	Introduction to Non-destructive Testing	OE420PH	1
	Fundamentals of Cryogenics	OE430PH	2
	Smart Materials and Applications	OE440PH	2
	Fundamentals of Thin Film Technology	OE450PH	2
ENG	Technical Writing and Professional Presentations	OE510EH	2

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE V-SEMESTER
ENVIRONMENTAL IMPACT ASSESSMENT (Open Elective – IV)

Instruction: 1 Hr /week	SEE Marks :50	Course Code :OE510CE
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of the course are to introduce	*Upon the completion of the course, students are expected to*
1. The issues, impact and management plan due to Environmental of the project	1. Apprise the need, legal provisions and 2. Enumerate the methods of Environmental Impact Assessment. 3.Predict the impact and prepare the management plan for Environmental issues of the project 4. Issues related to rehabilitation of affected people, Preparation of Environmental impact statement

UNIT-I

Environmental Impact Assessment: Need for environmental impact assessment (EIA), objectives of EIA. EIA capabilities and limitations. Legal provisions of EIA. Methods of EIA, base line data collection required for EIA

UNIT-II

Evaluation of impacts: Prediction of impacts. Preparation of Environmental Management Plan, preparation of EIAs of road project, Industry, and dam. Issues related to rehabilitation of affected people, Preparation of Environmental impact statement and Environment management plan.

Learning Resources:

1.Peavy and Rowe, Environmental Engineering, McGraw Hill Publications.
2.Keiley, Environmental Engineering, McGraw Hill Publishers, 2003.
3.Sincero and Sincere, Environmental Engineering, Prentice Hall of India.

Online Resources

1.http://nptel.ac.in/courses/

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. V-SEMESTER
REMOTE SENSING (Open Elective – IV)
(to other branches)

Instruction: 1 Hr /week	SEE Marks :35	Course Code : OE520CE
Credits : 1	CIE Marks: 15	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
Objectives of this course are to	*Upon the completion of the course, students are expected to*
1.Provide fundamental knowledge on geo spatial technology such as remote sensing	1. Explain the basic principles of remote sensing to analyse the surface features on the Earth. 2. Describe the characteristics of satellites, platforms & sensors used in acquisition of remote sensing data required for further processing. 3. Identify and correct the remotely sensed data for atmospheric, radiometric and geometric errors to produce a high quality image. 4. Apply the principles and techniques of remote sensing to solve various problems in engineering field.

UNIT-I

Introduction: Definition, Elements of remote sensing, Physics of remote sensing, Sources of Energy, Active and Passive Radiation, Types of remote sensing, Electromagnetic spectrum and radiation, Interaction with Atmosphere, Atmospheric windows, Spectral reflectance of Earth's surface features

Data Acquisition: Satellite orbits and characteristics, various types of platforms, sensor types & characteristics, Types of resolution-spatial, spectral, radiometric &temporal

UNIT-II

Data Pre-processing: Atmospheric errors and removal, Radiometric corrections, Geometric corrections, Geo-referencing, re-sampling methods - Basic Principles of Visual Interpretation

Applications: Applications of optical remote sensing techniques in various fields of Engineering

Learning Resources:

1. Anji Reddy M., Remote Sensing and Geographic Information System, 2012
2. John A. Richards, Remote sensing Digital Image Analysis, 2012

DEPARTMENT OF CIVIL ENGINEERING
GLOBAL POSITIONING SYSTEM (Open Elective–V)
(to other branches)

Instruction: 2 Hr /week	SEE Marks :70	Course Code :OE530CE
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
Objectives of this course are to	*Upon the completion of the course, students are expected to*
1.To provide fundamental knowledge on geo spatial technology such as GPS	1. Describe the fundamental theory and concepts of the Global Positioning System to provide 3D positioning with great accuracy. 2. Compute errors and biases in GPS measurements and apply necessary corrections to obtain accuracy as per the user specifications. 3. Describe the differences between point and relative GPS positioning, 4. Analyse DGPS and RTK surveys used to obtain GPS measurements in the field.

UNIT-I

Overview of GNSS and Introduction to GPS, GLONASS, GALILEO, COMPASS, IRNSS systems

GPS: Basic concepts, Functional system of GPS – Space segment, control segment and user segment, Working principle of GPS, Signal structure and code modulation, Pseudo-range measurements and navigation position

UNIT-II

Errors and biases in GPS measurements, Accuracy of navigation position: UERE and DOP, Intentional degradation of GPS signals: Selective availability (SA) and Anti-spoofing (AS)

Differential GPS: Space based augmentation systems (e.g., SBAS, GAGAN) and Ground based augmentation systems (e.g., WASS, EGNOS)

UNIT-III

GPS Carrier Phase measurements: Signal Differencing, Double Differencing and Triple Differencing in GPS measurements.

UNIT-IV

Surveying with GNSS: Point positioning, Relative positioning, Static and Kinematic positioning.

GNSS applications: GIS and GPS integration

Learning Resources:

1. Leick, A., GPS Satellite Survey, John Wiley: NJ, 2015
2. Hofmann, B., Lichtenegger H. and Collins J., Global Positioning System: Theory and Practice, Springer: Berlin, 2011.
3. Hofmann-Wellenh of, Bernhard, Lichtenegger, Herbert, Wasle, Elmar, GNSS – GPS, GLONASS, Galileo and more, 2013.

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE V-SEMESTER
PROJECT MANAGEMENT (Open Elective – V)

Instruction: 2 Hrs /week	SEE Marks :70	Course Code : OE540CE
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of the course are to introduce	*Upon the completion of the course, students are expected to*
1. Learn the concept of project management along with functions and objectives. 2. Understand the various techniques used for project planning such as bar charts, CPM, PERT and crashing of networks. 3. Acquire knowledge on various types of contracts, tenders.	1. Understand the objectives, functions and principles of management in projects. 2. Practice the network techniques like CPM and PERT for better planning and scheduling of engineering works. 3. Analyse the importance of cost and time in network analysis and planning the work accordingly. 4. Knowledge on Contracts, Tenders, and Work orders related to the projects.

UNIT-I

Significance of Project Management: Objectives and functions of project management, management team, principles of organization and types of organisation.

UNIT-II

Project Planning: Planning, bar charts, network techniques in project management - CPM and PERT. Expected likely, pessimistic and optimistic time, normal distribution curve and network problems.

UNIT-III

Contracts: Introduction, types of contracts and their advantages and disadvantages, conditions of contracts, Introduction to Indian contract act.

UNIT-IV

Time Cost Analysis: Cost time analysis in network planning, updating
Tender: Tender form, Tender Documents, Tender Notice, Work Order.

Learning Resources:

1. Srinath L.S., PERT and CPM: Principles and Application, East-West Press, 1975.
2. Peret, F, Construction Project Management an Integrated approach, Taylor and Francis, Taylor and Francis Group, London & New York, 2009
3. Punmia B.C., and Khandelwal, PERT and CPM, Laxmi Publications, 1990.
4. http://nptel.ac.in/courses/

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E V SEMESTER
INTRODUCTION TO SOFTWARE ENGINEERING (Open Elective-IV)

Instruction: 1 Hr /week	SEE Marks :50	Course Code :OE510CS
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

Course Objectives	**Course Outcomes**
Students should be able to	At the end of the course, students will be able to
• Understand the concepts involved in the lifecycle of software development • Learn the best practices to be employed for the design and testing.	1. Explain the various software development lifecycle models for a software system development. 2. Build the prototype for software business case and analyze the requirements of software project. 3. Analyze the different behavioural and structural models for the designed object oriented system. 4. Identify verification and validation methods in a software engineering project and implement testing methods at various phases of SDLC

UNIT-I

Introduction to Software Engineering:

A generic view of Process: Software Engineering, Process Framework CMM Process Patterns, Process Assessment.

Process Models: Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Process.

An Agile view of Process: What is Agility, What is an Agile Process, Agile Process Models.

Requirements Engineering: A bridge to Design and Construction, Requirements Engineering Tasks, Initiating Requirements Engineering Process, Eliciting Requirements, Negotiating Requirements, Validating Requirements.

UNIT-II

Object oriented Modeling & design using UML: Introduction to UML.
Structural Modeling: Classes and Advanced Classes, Relationships and Advanced Relationships, Common Mechanisms, Class Diagrams.

Behavioural Modelling: Interactions, Interaction diagrams, Use Cases, Use Case Diagrams, Activity diagrams, State Machines, State chart Diagrams.
Testing Tactics: Software testing fundamentals, Black box and White box testing.

Suggested Books:

1. Roger S. Pressman, Software Engineering: A Practitioner's Approach, 6th Edition (2005), Tata McGraw Hill.
2. Grady Booch, James Rumbagu, Ivor Jacobson, The Unified Modeling Language-User guide, (Covering UML 2.0) ,2nd Edition (2007), Pearson Education, India.

Reference Books:

1. Shari Lawrence Pfleeger, Software engineering Theory and Practices, 4th Edition (2011), Pearson Education, India.
2. Pankaj Jalote, An Integrated Approach to Software Engineering, 3rd Edition (2005), Narosa Publishing House.

Online Resources:

1. http://nptel.ac.in/courses/106101061/
2. https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-355j-software-engineering concepts-fall-2005/lecture-notes/

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E V SEMESTER
INTRODUCTION TO JAVA PROGRAMMING (Open elective-V)

Instruction: 2 Hrs /week	SEE Marks :70	Course Code :OE520CS
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	At the end of the course, Students will be able to
• Apply object oriented principles for developing an application using Java constructs • Design GUI using existing Java classes and interfaces	1. Apply the object oriented programming (OOP) concepts to design an application. 2. Employ runtime error handling, concurrent programming practices to develop a parallel processing application 3. Read and write the IO operations using console and files streams 4. Design dynamic GUI for a java application using AWT classes

UNIT – I

Java Programming Fundamentals: Introduction, Overview of Java, Data types, Variables and Arrays, Operators, Control Statements, Classes and Methods, Garbage Collection, this keyword, final, Inheritance, Method Overriding.

UNIT – II

Abstract class, Nested class, Interface, Package, Exception Handling, Multithreaded Programming, String Handling.

UNIT - III

Util: String Tokenizer, Date, Calendar, Random, Timer, Observable

IO: Java I/O Classes and Interfaces, Files and Directories, Byte and Character Streams

UNIT – IV

GUI and event Programming: Applet Class, Applet architecture, The Delegation Event Model, Event Classes, Source of Events, Events Listener Interfaces, AWT: Classes, Working with Graphics, Frames, Menu, Layout Managers**.**

Suggested Books:

1. Herbert Schildt, *The Complete Reference Java*, 7th Edition, Tata McGraw Hill 2005.

Reference Books:

1. P. Radha Krishna, *Object Oriented Programming through Java,* Universities Press, 2007.
2. Sachin Malhotra, Saurabh Choudhary, *Programming in Java*, 2nd Edition, Oxford Press, 2014.

Online Resources:

https://docs.oracle.com/javase/tutorial/java

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
SYLLABUS FOR B.E. V-SEMESTER
INTRODUCTION TO TELEMETRY (Open Elective -IV)
(for other Departments)

Instruction: 1 Hrs /week	SEE Marks :50	Course Code :**OE510EC**
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

Course Objective	Course Outcomes
1. To understand the concept of telemetry systems.	**At the end of the course, students will be able to:** 1. Analyze different components of telemetry systems. 2. Acquire knowledge on wired and wireless data acquisition techniques in telemetry systems. 3. Demonstrate the knowledge on satellite telemetry systems. 4. Apply techniques of different telemetry systems in real time applications.

UNIT - I

Introduction to Telemetry Principles: Introduction, the Basic System, Classification, Non-electrical Telemetry Systems, Voltage and Current Telemetry Systems, Local Transmitters and Converters, Frequency Telemetry, Power Line Carrier Communication (PLCC).

Wave Propagation: Space Propagation of Waves, Surface Wave, the Ionosphere, Some Considerations on Space Wave Propagation.

UNIT - II

Basics of Satellite Telemetry, Introduction, General Considerations, TT & C Services, Digital Transmission System in Satellite Telemetry, TDM, Some Aspects of TT&C – Subsystems, Satellite Telemetry and Communications: MA Techniques.

Fiber Optic Telemetry: Introduction, Optic Fiber Cable, Dispersion, Losses, Connectors and Splices, Sources and Detectors, Transmitter and Receiver Circuits, Coherent Optical Fiber Communication System, Wavelength Division Multiplexing.

Suggested Reading:

1. D. Patranabis, Telemetry Principles, Tata McGraw-Hill, 1999
2. Swoboda G., Telecontrol Methods and Applications of Telemetry and Remote Control, Reinhold Publishing Corp., London, 1991
3. Young R.E., Telemetry Engineering, Little Books Ltd., London, 1988
4. Gruenberg L., Handbook of Telemetry and Remote Control, McGraw Hill, New York, 1987.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

SYLLABUS FOR B.E. V-SEMESTER

INTRODUCTION TO SIGNAL PROCESSING (Open Elective -V)

(for other Departments)

Instruction: 2 Hrs /week	SEE Marks :70	Course Code :**OE520EC**
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
1. To Introduce the basics of Signals and Systems, and the principles of Digital Signal Processing (DSP). To design digital filter using frequency domain concepts.	**At the end of the course, students will be able:** 1. To classify discrete time signals as energy and power and to classify discrete time systems as causal-non causal, linear-nonlinear and stable-unstable. 2. To study the properties of discrete time Fourier transform, discrete Fourier transform and z-transform. 3. To implement the DFT using FFT for the given sequence. 4. To realize digital filter structures from their z-transform. 5. To apply DSP techniques to audio, image processing and telecommunication areas.

UNIT – I

Introduction to signals: Definition, Representation, Elementary Signals: Unit Impulse, Unit Step, Unit Ramp, Rectangular and Triangular, Classification of signals: periodic and non-periodic, Energy and Power, even and odd, Basic operations on signals such as shifting, scaling and reversal.

UNIT – II

Introduction to Discrete Time Systems: Definition, Classification of systems: Linear and Non-linear, Time Invariant and Time Variant, Causal and Non-causal, Stable and Unstable, Introduction to LTI systems, Properties of an LTI system and linear convolution.

UNIT – III

Discrete Transform Techniques: Discrete Time Fourier Transform and its properties, Discrete Fourier Transform and its properties, Circular convolution, Twiddled factor and its properties, Introduction to FFT algorithms, Z-transform and its properties, transfer function.

UNIT – IV

A Frame work for digital filter design: Types of digital filters, Ideal filter characteristics, Specification of practical filters, Design of FIR filters using windowing techniques, Design of Digital IIR Low Pass Filter using butter-worth approximation, realization of filter structures. Some Application Areas of DSP.

Suggested Readings:

1. Rao, K. Deergha, Swamy M.N.S., "Digital Signal Processing – Theory and Practice", 1st edition, Springer, 2018.
2. Ifeachor, E.C. and Jerris, B.W., "Digital Signal Processing: A practical Approach," 2nd edition, Pearson Education.
3. Tan, Li, "Digital Signal Processing – Fundamentals and Applications", Academic Press.
4. Mitra, S.K., "Digital Signal Processing – A Computer Based Approach", 3rd Ed., Tata McGraw-Hill.

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
SYLLABUS OF B.E V- SEMESTER
BASICS OF POWER SYSTEMS (Open Elective –IV)

Instruction: 1 Hrs /week	SEE Marks :50	Course Code :OE510EE
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

Course objective:	Course Outcomes:
Electrical Power plays significant role in day to day life of entire mankind. This course gives an over view of electrical power generation and economic aspects of power to all engineers of all disciplines.	**At the end of the course, students will be able to:** 1. **Identify** the various and major ways of generation of Power in India. 2. **Estimate** the Energy generated by Hydel Generating station. 3. **Calculate** the Capacitance value for P.f. improvement. 4. **Assess** the Tariffs of domestic and commercial.

UNIT – I

Thermal Power Station: Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses. Brief description of TPS components-Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and cooling towers.

Hydro Power Stations: Power Generation Principles, Choice of site, layout and various parts of generating stations, Estimation of power in Hydel, flow duration curve, hydrograph, mass curve etc. Types of Hydel stations.

UNIT – II

Nuclear Power Stations: Nuclear Fission and Chain reaction, Nuclear fuels, Principle of operation of Nuclear reactor, Reactor Components-Moderators, Control rods, Reflectors and Coolants, Radiation hazards-Shielding and Safety precautions.

Economics of Power Generation: Load Curve, load demand and diversity factors, base load and peak load operation, types of costs and depreciation fund calculations, Tariffs.

Power Factor: Causes of low P.F, Improving power factor, Methods of power factor improvement, Numerical problems.

Suggested Reading

1. C.L. Wadhwa, Electrical Power Systems, Wiley Eastern Ltd. 5th Edition, 2005
2. C.L. Wadhwa, Generation, Distribution and Utilisation of Electrical Energy, Wiley Eastern Ltd., 5th Edition, 2005
3. S.N.Singh- Electrical Power Generation, Transmission and Distribution-Prentice Hall pvt.ltd. New-2003.

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
SYLLABUS OF B.E V- SEMESTER
FUNDAMENTALS OF POWER ELECTRONICS (Open Elective –V)

Instruction: 2Hrs /week	SEE Marks :70	Course Code :OE520EE
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hrs

Course objective:	Course Outcomes:
To provide fundamentals of power semi-conductor devices and power electronics converters in power electronics.	**At the end of the course, students will be able to:** 1. Categorize and compare power electronic devices. 2. Explain the operation of AC-DC, DC-DC and DC-AC converters. 3. Explain the control strategies of Choppers and PWM techniques in inverters. 4. Analyze and select the appropriate converter for a given application.

Unit – I Power Semi – conductor Switches:
Operation and static characteristics of power diode, SCR, MOSFET and IGBT, applications.

Unit – II AC – DC Converters:
Operation of 1 – ϕ half wave rectifiers with R, R – L and R – L – E loads, operation of 1 – ϕ bride type full and semi – converters with R – L – E load, applications.

Unit – III Choppers:
Operation of step down and step up choppers, control strategies, applications.

Unit – IV DC – AC Converters:
Operation of 1 - ϕ inverters, operation of 3 - ϕ inverters – 180° and 120° mode, pulse width modulation techniques, applications.

Learning Resources:

1. Bimbra.P.S, *Power Electronics*, Third Edition, Khanna Publishers, 2012.
2. Singh, M.D and Khanchandani, K.B, – *Power Electronics*, Tata McGraw Hill, 2nd Edition, 2006.
3. Rashid, M.H – *Power Electronics: Devices, Circuits and Applications,* Pearson, 2003
4. Mohan, Undeland, Robbins, *Power Electronics – Converters, Applications and Design*, Wiley India Pvt Ltd, 2010.

DEPARTMENT OF INFORMATION TECHNOLOGY
Syllabus for B.E V- SEMESTER
INTRODUCTION TO LINUX (Open Elective - IV)

Instruction:1Hrs/ week	**SEE Marks** : 50	**Course Code** :OE510IT
Credits : 1	**CIE Marks**:30	**Duration of SEE** : 2 Hours

Course Objectives	**Course Outcomes**
The course will enable the students to:	**At the end of the course student will be able to:**
Acquire basic skills for using Linux operating system.	1. Install Linux operating system and use desktop environment. 2. Identify and use Linux utilities to create and manage simple file processing operations. 3. Organize directory structures with appropriate security. 4. Configure and use Linux shell.

Unit I

Introduction to Linux, Installing Linux, Running Linux from USB Drive, Understanding X Windows System and Desktop, Navigating through Linux Desktop and Managing files. Understanding Linux file system, listing files and directory attributes, Making files and directories, Listing and changing permissions and ownership.

Unit II

Understanding the Linux Shell, Understanding aliases, Using the shell from console or terminals, Using command history and tab completion, Connecting and expanding commands, Creating aliases, Making shell settings permanent, Using man pages and other documentation.

Learning resources

Introduction to Linux – A Hands On Guide, Machtelt Garrels.
https://linuxjourney.com/

DEPARTMENT OF INFORMATION TECHNOLOGY
Syllabus for B.E V- SEMESTER
INTRODUCTION TO JAVA PROGRAMMING LANGUAGE(Open Elective - V)

Instruction:2Hrs/ week	**SEE Marks** : 70	**Course Code** :OE520IT
Credits : 2	**CIE Marks**:30	**Duration of SEE** : 3Hours

Course Objectives	Course Outcomes
The course will enable the students to:	**At the end of the course student will be able to:**
Acquire skills to write basic Java programs.	1. Use arrays to store multiple data elements. 2. Organize programs logically with the usage of packages. 3. Create, throw and handle exceptions. 4. Perform basic Input Output file operations.

Unit I

Java Programming Fundamentals: Introduction, Overview of Java, structure of a Java program, data types, variables-scope and lifetime, operators, control statements, classes, methods, command line arguments.

Unit II

Arrays: one-dimensional arrays, creating an array, declaration of arrays, initialization of arrays, two dimensional arrays. Inheritance, Interfaces: defining interfaces, extending interfaces, implementing interfaces.

Unit III

Packages: creation, importing a package and user defined packages.

Exception Handling: Introduction, types of exceptions, syntax of exception handling code, multiple catch statements, using finaaly statement, user-defined exceptions.

Unit IV

Basic I/O Streams: Java I/O classes and interfaces, Files, Stream and Byte classes. Character Streams, Serialization.

Exploring java.lang: Object, Wrapper classes, String, String Buffer.

Suggested Reading:

1. Herbert Schildt, The Complete Reference Java, 7th Edition, Tata McGraw Hill, 2006.
2. James M Slack, Programming and Problem solving with JAVA, Thomson Learning, 2002.
3. C Thomas Wu, An Introduction to Object Oriented Programming with Java 5th edition, McGraw Hill Publishing, 2010.
4. Y. Daniel Liang , An Introduction to JAVA Programming, Tata McGraw Hill, 2009.
5. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2012.

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. V-SEMESTER
BASICS OF 3-D PRINTING (Open Elective-IV)

Instruction : 1 Hour/week	SEE Marks : 50	Course Code : OE500ME
Credits : 1	CIE Marks :30	Duration of SEE : 2Hours

Course Objectives	Course Outcomes
The objective of the course is to • understand the fundamentals of various rapid prototyping technologies with emphasis on FDM technology for application to various industrial needs.	After completion of the course, the student will be able to 1. understand the fundamentals of Additive manufacturing Technologies for engineering applications. 2. Understand the methodology to manufacture the products using FDM technology 3. study the applications, advantages and case studies of FDM technology. 4. identify different industrial sectors for application of AMT to reduce manufacturing cost and time.

UNIT-I

Introduction, Reverse engineering and its Methodology, Historical development, Advantages of 3-D printing, 3-D printing process chain, Classification of various 3-D printing processes.

Fused Deposition Modeling (FDM): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies, Practical demonstration

UNIT-II

Applications of 3-D printing in various fields like aerospace, jewellery, medicine, forensic science and anthropology, visualization of bio-molecules, etc.

Learning Resources:

1. C K Chua, K F Leong, C S Lim, "Rapid Prototyping – Principles and applications", 3rd Ed., World Scientific Publishing Co. Pvt. Ltd, 2010
2. Pham, D.T. and Dimov S.S., "Rapid Manufacturing", Springer, 2001
3. Amithaba Ghose, "Rapid prototyping", Eastern Law house, 1997
4. Paul F. Jacobs, "Rapid Prototyping & Manufacturing" ASME Press, 1996

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. V-SEMESTER
INTRODUCTION TO ROBOTICS (Open Elective-V)

Instruction:2Hours /week	SEE Marks : 70	Course Code : OE510ME
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hours

Course objectives	**Course Outcomes**
The objectives of this course are to: Identify robots and its peripherals for satisfactory operation and control of robots for industrial and non-industrial applications.	On completion of the course, the student will be able to 1. list and explain the basic elements of industrial robots 2. analyse robot kinematics and its control methods. 3. Classify the various sensors used in robots for better performance. 4. summarize various industrial and non-industrial applications of robots.

UNIT I - ROBOT BASICS

Robot-Basic concepts, Need, Law, History, Anatomy, specifications.
Robot configurations-cartesian, cylinder, polar and articulate.
Robot wrist mechanism, Precision and accuracy of robot.

ROBOT ELEMENTS

End effectors-Classification, Types of Mechanical actuation, Gripper design, Robot drive system
Types, Position and velocity feedback devices-Robot joints and links-Types, Motion interpolation.

UNIT II - ROBOT KINEMATICS AND CONTROL

Robot kinematics – Basics of direct and inverse kinematics, Robot trajectories, 2D and 3D Transformation-Scaling, Rotation, Translation Homogeneous transformation.
Control of robot manipulators – Point to point, Continuous Path Control, Robot programming

UNIT III - ROBOT SENSORS

Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors. Force sensor-Light sensors, Pressure sensors,
Introduction to Machine Vision and Artificial Intelligence.

UNIT IV - ROBOT APPLICATIONS

Industrial applications of robots, Medical, Household, Entertainment, Space, Underwater, Defense, Disaster management.
Applications, Micro and Nanorobots, Future Applications.

Learning Resources:

1. Mikell P. Groover, Mitchell Weiss, Roger N Nagel, Nicholas G Odrey, "Industrial Robotics Technology, Programming and Applications", Tata – McGraw Hill Pub. Co., 2008.
2. Deb.S.R and Sankha Deb, "Robotics Technology and Flexible Automation", Tata McGraw Hill Publishing Company Limited, 2010.
3. Klafter.R.D, Chmielewski.T.A, and Noggin's., "Robot Engineering: An Integrated Approach"', Prentice Hall of India Pvt. Ltd., 1994.
4. Fu.K.S, Gonzalez.R.C&Lee.C.S.G, "Robotics control, sensing, vision and intelligence", Tata- McGraw Hill Pub. Co., 2008
5. , Yu. "Industrial Robotics", MIR Publishers Moscow, 1985.

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. V-SEMESTER
BASICS OF ENTREPRENEURSHIP

Instruction : 2 Hours / week	SEE Marks : 70	Course Code : OE520ME
Credits : 2	CIE Marks : 30	Duration of SEE : 3 Hours

Course objectives	**Course Outcomes**
The objectives of this course are to : • understand and discover entrepreneurship • build a strong foundation for the students to start, build and grow a viable and sustainable venture • develop an entrepreneurial outlook and mind set, critical skills and knowledge	On completion of the course the student will be able to: 1. understand entrepreneurship as a career option and develop customers, channels and traction 2. Understand the method of creating business model and make a minimum viable product. 3. develop costing and pricing strategies 4. understand team building and its importance 5. create marketing and sales strategies for business and understand business regulations and government schemes.

UNIT-I

Introduction to Entrepreneurship: Define Entrepreneurship, Entrepreneurship as a career option, Benefits and Myths of Entrepreneurship, Characteristics, Qualities and Skills of Entrepreneurship on Economy and Society

Opportunity and Customer Analysis: Identify your Entrepreneurial Style, Identify Business Opportunities, Methods of finding and understanding Customer Problems, Process of Design Thinking, Identify Potential Problems, Customer Segmentation and Targeting, Customer Adoption Process, Craft your Value Proportions, Customer-Driven Innovation.

UNIT-II

Business Model and Validation: Types of Business Models, Lean Approach, the Problem-Solution Test, Solution Interview Method, Difference between Start-up Venture and small Business, Industry Analysis, Identify Minimum Viable Product (MVP), Build-Measure-Lean Feedback Loop, Product-market fit test.

UNIT-III

Economics and Financial Analysis: Revenue sources of Companies, Income analysis and Cost Analysis-Product Cost and Operation Cost, Basics of Unit Costing, Profit Analysis, Customer Value Analysis, Different Pricing Strategies, Investors Expectations, Practice Pitching to Investors and Corporate.

UNIT-IV

Team Building and Project Management: Leadership Styles, Team Building in Venture, Role of good team in Venture, Roles and Respondents, Explore Collaboration Tools and Techniques-brainstorming, Mind Mapping. Importance of Project Management, Time Management, Work Flow, Network Analysis Techniques.

Marketing &Business Regulations: Positioning, Positioning Strategies, Building Digital Presence and Leveraging Social Media, Measuring effectiveness of Channels, Customer Decision-making Process, Sales plans and Targets, Unique Sales Proposition (USP), Follow-up and Close Sales. Business Regulations of starting and operating a Business, Start-up Ecosystem, Government schemes.

Learning Resources:

1. Robert D Hisrich, Michael P Peters, Dean A Shepherd, "Entrepreneurship", Sixth edition, New Delhi, 2006.
2. Thomas W. Zimmerer, Norman M. Scarborough, "Essentials of Entrepreneurship and small business Management", Fourth edition, Pearson, New Delhi,2006.
3. Alfred E. Osborne, "Entrepreneurs Toolkit", Harvard Business Essentials, HBS Press, USA,2005
4. MadhurimaLall and ShikhaSahai, "Entrepreneurship", Excel Books, First Edition, New Delhi,2006

EPARTMENT OF PHYSICS
SYLLABUS FOR B.E. V SEMESTER
DISPLAY DEVICES (Open Elective-IV)

Instruction :1 Hours / week	SEE Marks :50	Course Code : OE400PH
Credits : 1	CIE Marks :30	Duration of SEE : 2 Hours

Course objectives	Course outcomes
Students will be able to learn • Basics of luminescence and display devices	**At the end of the course students will be able to** 1. List out different types of luminescence mechanisms 2. Classify types of display devices 3. Explain working of some display devices 4. Compare the output intensities emitted by LED, OLED et

UNIT-I:

Introduction to Luminescence, fluorescence, phosphorescence, principle and classification, luminescence mechanisms for various types and its applications.

UNIT-II:

Classification of display devices, working of Liquid crystal displays, comparison of LED and LCD, dynamic scattering display, OLEDS and their applications.

SUGGESTED BOOKS:

1. S. W. S. McKeever, Thermo-luminescence of Solids, Cambridge University Press, 1988
2. Adrian Kita, Luminescent Materials and Applications, John Willey & Sons

DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. V SEMESTER
FUNDAMENTALS OF VACCUM TECHNOLOGY *(Open Elective-IV)*

Instruction :1 Hours / week	SEE Marks :50	Course Code : OE410PH
Credits : 1	CIE Marks :30	Duration of SEE : 2 Hours

Course objectives	Course outcomes
Students will be able to learn • Fundamentals of vacuum technology	**At the end of the course students will be able to** 1. Define basic vacuum technology related notations. 2. Enumerate methods production of vacuum. 3. List out different vacuum gauges and their limitations. 4. Identify types of vacuum leaks.

UNIT-I:

Definition of vacuum, units of vacuum, vacuum ranges, evaporation theory- rate of evaporation, Hertz- Knudsen equation, types of evaporation, adsorption, desorption, Production of Vacuum, vacuum measurement, Vacuum pumps: pumping speed, throughput, Rotary oil pump, multi stage rotary pumps, diffusion pump, cryo-pump. Vacuum applications in various areas of engineering.

UNIT-II:

Measurement of vacuum, Vacuum gauges: thermocouple gauge, Pirani gauge, ionization gauge, Penning gauge, leak detection, Leak detection methods

SUGGESTED BOOKS:

1. M. N. Avadhanulu and P.G. Kshirsagar, Textbook of Engineering Physics, Revised Edition, S.Chand, 2015
2. Dr. V.V. Rao, Dr. T.B. Gosh, Dr. K.L. Chopra, Vacuum Science and Technology, Allied Publishers, New Delhi, 2008
3. John F. O'HanlonA User's Guide to Vacuum Technology, Jhon Willey and sons, 2006

DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. V SEMESTER
INTRODUCTION TO NON- DESTRUCTIVE TESTING *(Open Elective-IV)*

Instruction :1 Hours / week	SEE Marks :50	Course Code : OE420PH
Credits : 1	CIE Marks :30	Duration of SEE : 2 Hours

Course objectives	Course outcomes
Students will be able to learn • Basics of acoustics and non-destructive testing	**At the end of the course students will be able to** 1. Illustrate non-destructive testing 2. Explain production mechanisms of ultrasonics 3. Differentiate various methods of non-destructive testing 4. Compare the non-destructive testing methods and identify suitable one for given application.

UNIT-I:

Ultrasonic waves and their properties, Production of ultrasonics by Piezo-electric and magnetostriction methods, Detection of ultrasonics, Acoustic grating: ultrasonic velocity measurement, cavitation, Applications: ultrasonic cleaning, Echo cardiogram (ECG), ultrasonic imaging.

UNIT-II:

Introduction to non- destructive testing (NDT)- objectives of NDT-advantages- types of defects-methods of NDT: Visual inspection, liquid penetration testing, acoustic detection: pulse echo method, ultrasonic inspection methods, Radiography: x-ray and gamma ray, Electromagnetic: eddy current testing, Acoustic Emission, Ultrasonic Testing (UT)

SUGGESTED BOOKS:

1. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage learning, 2014
2. M. N. Avadhanulu and P.G. Kshirsagar, Textbook of Engineering Physics: Revised Edition, S.Chand, 2015
3. R K Gaur and S L Gupta, Engineering Physics, Dhanpat Rai, 2012

DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. V SEMESTER
FUNDAMENTALS OF CRYOGENICS (Open Elective-IV)

Instruction :2 Hours / week	SEE Marks :70	Course Code : OE430PH
Credits : 2	CIE Marks :30	Duration of SEE : 3 Hours

Course objectives	Course outcomes
Students will be able to learn • Liquefaction of gases • Fundamentals of cryogenics	**At the end of the course students will be able to** 1. Define ranges of liquid temperatures 2. Narrate regenerative and cascade cooling processes. 3. Enumerate properties and use of cryogenic fluids. 4. Explore applications and use of cryostats and cryocoolers.

UNIT-I:

Introduction to low temperature Physics- Porous plug experiment: Joule Thomson effect, Theory of porous plug experiment- J-K effect for a Van der Waal's gas. Relation between inversion temperature, Boyle temperature and critical temperature.

UNIT-II:

Gas-Liquefaction-Regenerative cooling and cascade process- Liquefaction of air: Linde Process, Liquefaction of hydrogen, nitrogen, helium and oxygen.

UNIT-III:

Properties of cryogenic helium and Properties of Materials at Cryogenic Temperatures.

UNIT-IV:

Adiabatic demagnetization, practical applications of low temperatures, super fluidity Liquid He-II and He-III cryostat- Cryocoolers, Cryogenic Insulations-applications.

SUGGESTED BOOKS:

1. D.S. Mathur, Heat and thermodynamics, S. Chand & Co, 2008
2. Mamata Mukhopadhyay, Fundamentals of Cryogenic Engineering, PHI, 2010

DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. V SEMESTER
SMART MATERIALS AND APPLICATIONS (Open Elective-IV)

Instruction :2 Hours / week	SEE Marks :70	Course Code : OE440PH
Credits : 2	CIE Marks : 30	Duration of SEE : 3 Hours

Course objectives	**Course outcomes**
Students will be able to learn • Essentials of smart materials • Different types of smart materials	**At the end of the course students will be able to** 1. List out various properties of functional materials 2. Identify smart materials based on properties and their appropriate usage. 3. Write different types of smart materials 4. Categorize suitable alloys for specific application.

UNIT I:

Introduction to functional materials, ferroelectricity, piezo electricity, pyroelectricity, Magnetostriction. Properties of smart materials such as piezo electric, magneto-strictive, electro-strictive, thermos-responsive

UNIT-II:

Electrochromic materials, photochromic materials, thermo-chromic materials, thermoelectric materials, smart gels, electro-rheological (ER) and Magnetorheological MR fluids

UNIT III:

Introduction to metal alloys, classification of metal alloys as ferrous and non-ferrous alloys. Properties and applications of ferrous and non-ferrous alloys.

Introduction to shape memory alloys (SMA)- advantages and disadvantages of SMAs- Austenite, martensite, shape memory effect and types of shape memory effects- temperature transformation

UNIT IV:

Properties and characteristics of engineering SMAs - Ni-Ti shape memory alloy, Cu-based shape memory alloys: Cu-Zn-Al, Cu-Al-Ni, ferromagnetic shape memory alloys Applications of SMAs.

SUGGESTED BOOKS:

1. K. Otsuka and C. M. Wayman, Shape memory Alloys, Cambridge University Press, 1999
2. Dimitris C. Lagoudas Shape Memory Alloys: Modeling and Engineering Applications, Springer, 2013
3. Vijay K. Varadan, K. J. Vinoy, S. Gopalakrishnan, Smart Material Systems and MEMS, John Wiley & Sons, 2006

DEPARTMENT OF PHYSICS
SYLLABUS FOR B.E. V SEMESTER
FUNDAMENTALS OF THIN FILM TECHNOLOGY *(Open Elective-IV)*

Instruction :2 Hours / week	SEE Marks :70	Course Code : OE450PH
Credits : 2	CIE Marks :30	Duration of SEE : 3 Hours

Course objectives	Course outcomes
Students will be able to learn • Fundamentals of thin film technology • Properties and preparation mechanisms	**At the end of the course students will be able to** 1. Differentiate bulk materials and thin films 2. Explore growth process of thin films. 3. List out various thin film preparation techniques. 4. Narrate properties of thin films

UNIT-I:
Classification of films- nucleation and growth- nucleation theories: capillarity and atomistic models, substrate effect, film thickness effect.

UNIT-II:
Thin film deposition techniques- simple thermal evaporation-electron beam evaporation-sputtering (d.c and a.c), flash evaporation, Laser ablation- spin coating- molecular beam epitaxy- Film thickness measurement- ellipsometry, Fizeu (Tolonsky) technique, quartz crystal oscillator techniques.

UNIT-III:
Electrical conduction in metallic films- Continuous and discontinuous films, electrical, optical and dielectric properties of thin films

UNIT-IV:
fabrication of thin film resistor, capacitor, diode, anti-reflection coatings, gas sensors and temperature sensors.

SUGGESTED BOOKS:
1. Kasturi Chopra Thin Film Device Applications, Mac Graw Hill, New York, 2012
2. A. Goswami, thin film fundamentals, New age international, 2006
3. K.L. Chopra, thin film phenomenon, Mac Graw Hill, New York, 1990

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. V SEMESTER
ELECTRONIC ENGINEERING MATERIALS *(Open Elective-IV)*

Instruction :1 Hours / Week	SEE Marks :50	Course Code : OE400CH
Credits : 1	CIE Marks :30	Duration of SEE :2 Hours

OBJECTIVES	OUTCOMES
The course will enable the students:	**At the end of the course students should be able to:**
1. To familiarize with various types of liquid crystals, their chemical constitution and behavior 2. To acquaint with different types of sensors and chemistry involved in them 3. To discuss the conductance in polymers and mechanism of conductance in undoped and doped polymers	1. Explain the classification, types and applications of liquid crystals 2. Discuss the principles, mechanism and applications of potentiometric and amperometric sensors 3. Explain the principle, mechanism and applications of fluorophore based, chromophore based and enzyme based fibre optic biosensors 4. Discuss the mechanism of conduction in undoped and doped polymers and applications of conducting polymers

UNIT-I: Liquid Crystals

Introduction, Classification: Thermotropic and Lyotropic liquid crystals. Chemical constitution & liquid crystalline behavior. Molecular ordering in liquid crystals: Nematic, Smectic and Cholesteric. Applications.

UNIT-II: Conducting Polymers and Sensors

a)Conducting Polymers: Introduction, Classification: Extrinsic and Intrinsic Conducting Polymers**.** Mechanism of conduction of doped and undoped polyacetylene& Polyaniline. Applications.

b)Sensors: Introduction, Potentiometric sensors, Amperometric sensors, Fluoride-ion-selective electrode. Fluorophore and Chromophore based Fiber-optic Biosensors. Enzyme Based NonmediatedFiber Optic Biosensors.

Suggested Reading:

4. P.C.Jain and Monica Jain, "Engineering Chemistry", DhanpatRai Pub, Co., New Delhi (2002)
5. S.S. Dara "A text book of engineering chemistry" S.Chand&Co.Ltd., New Delhi (2006).
2. Chemistry of Engineering Meterials by R.P Mani and K.N.Mishra, CENGAGE learning
3. A textbook of Polymer Science: Fred, Billmeyer Jr., Wiley India Third edition.

4. Chemistry of Advanced Materials: CNR Rao, RSC Publication
5. Billmeyar F. W., "Text book of Polymer Science", Wiley-Inter Science, New York, 2002.
6. Arora M. G., Singh M and Yadav M.S, "Polymer Chemistry", Anmol Publications, New Delhi, 2003.

Online resources:

1. www.nptel.ac.in
2. http://ndl.iitkgp.ac.in
3. http://ocw.mit.edu

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. V SEMESTER
POLYMER TECHNOLOGY *(Open Elective-IV)*

Instruction :1 Hours / Week	SEE Marks :50	Course Code : OE410CH
Credits : 1	CIE Marks :30	Duration of SEE :2 Hours

OBJECTIVES	OUTCOMES
The course will enable the students:	**At the end of the course students should be able to:**
1. To familiarize with various types of polymers and polymerization methods and effect of their structure on properties. 2. To acquaint with different types of moulding techniques. 3. To discuss the reinforced plastics and biomedical applications of polymers	1. Explain the classification and types of polymerization methods 2. Discuss the moulding constituents and moulding techniques. 3. Discuss the different polymer blends and engineering plastics. 4. Choose the polymers for different applications.

UNIT-I: Introduction, classification of polymers, methods of polymerization-Condensation polymerization (High temperature and low temperature methods), addition polymerization-bulk polymerization, solution polymerization, emulsion polymerization and suspension polymerization. Effect of polymer structure on properties.

UNIT-II: Moulding constituents of plastic, moulding techniques-Compression moulding, injection moulding, and extrusion moulding. Reinforced plastics, polymer blends and alloys, engineering plastics-polyamides, polycarbonates, polyurethanes. Polymers in medicine, biomedical applications of polymers.

Suggested Reading:

1. P.C.Jain and Monica Jain, "Engineering Chemistry", DhanpatRai Pub, Co., New Delhi (2002)
2. Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, NewDelhi (2008).
3. S.S. Dara "A text book of engineering chemistry" S.Chand&Co.Ltd., New Delhi (2006).
4. Chemistry of Engineering Meterials by R.P Mani and K.N.Mishra, CENGAGE learning

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. V SEMESTER
INDUSTRIAL POLLUTION PREVENTION AND CONTROL*(Open Elective-IV)*

Instruction :1 Hours / Week	SEE Marks :50	Course Code : OE420CH
Credits : 1	CIE Marks :30	Duration of SEE : 2 Hours

OBJECTIVES	OUTCOMES
The course will enable the students :	**At the end of the course students should be able to:**
1. An overview of pollution in industries 2. Principles of various processes the treatment of air and water pollution	1. Explain the causes of pollution. 2. Describe the various sources of pollution. 3. Understand the effects of uncontrolled emissions. 4. Apply various methods to dispose the waste and minimize the pollution.

UNIT-I : Introduction, types of industrial waste, definition of pollutant, air pollutants- gases, hydro carbon pollutants, particulates - inorganic and organic particulates- effects of particulate pollutants, chlorofloro carbons(CFC)- cause of ozone depletion- harmful effects of cfc,photo chemical smog, air pollutant control methods: particulate emission control-gravititional setting chambers-cyclone separators, fabric filters, electrostatic precipitators.

UNIT-II: Water pollution: Definition of water pollution, types of water pollutants- Inorganic pollutants, toxic metals, organic pollutants, determental effects of Inorganic pollutants, toxic metals and organic pollutants, water pollution control methods-primary and secondary treatment.
Treatment and disposal of industrial wastes, treatment of wastes or effluents with organic impurities, treatment of wastes or effluents with inorganic impurities, the nature, effect and treatment of some important chemical wastes.Case study.

Suggested Reading:

1. B K Sharma, "Industrial Chemistry", GOEL publishing house, Meerut.
2. Pandey.G.N and Carney.G.C, "*Environmental Engineering"*, Tata McGrawHill, New Delhi,1989
3. Rose.G.R.D, "*Air pollution and Industry"*, Van Nostrand Reinhold Co., NewYork 1972
4. Freeman HM, "Industrial pollution prevention hand book", McGraw Hill.
5. James G Mann and Liu Y A, "Industrial water reuse and waste water minimization, McGraw Hill.

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. V SEMESTER
ELECTROCHEMICAL ENERGY SYSTEMS*(Open Elective-IV)*

Instruction :2 Hours / Week	SEE Marks :70	Course Code : OE430CH
Credits : 2	CIE Marks :30	Duration of SEE : 3 Hours

OBJECTIVES	OUTCOMES
The course will enable the students :	**At the end of the course students should be able to:**
• To introduce the various terms to understand the efficiency of batteries. • To know the relevant materials required for the construction of primary and secondary batteries. • To familiarize with the reactions involved during charging and discharging processes. • To focus on the need of fuel cells and the concept of their construction and functioning • To emphasize on the merits and demerits of each type of battery.	1. Discuss the construction, electrochemistry, technology and applications of selected primary batteries 2. Discuss the construction, electrochemistry, technology and applications of few secondary batteries 3. Explain the working principle, electrochemistry, technology and applications of prominent fuel cells 4. Choose a suitable battery or a fuel cell for a given application 5. Evaluate different batteries or fuel cells in order to select a suitable battery or fuel cell for a given application

Unit-I: Batteries- Fundamentals

Types of cells: Reversible and Irreversible cells, Primary, Secondary and Reserve batteries.

Battery characteristics: Free energy change, Electromotive force of battery, Ampere-Hour, Capacity, Power, Power density, Energy density, Efficiency, Cycle life, Tolerance to service conditions, Performance characteristics.

Unit-II: Primary Batteries

Construction, electrochemistry and technology of Zinc-Air Battery, Nickel metal hydride battery,

Primary lithium batteries: Soluble Cathode Cells, Solid Cathode Cells- Lithium Manganese dioxide, Lithium-Vanadium Pentoxide battery, Solid electrolyte cells- Lithium polymer electrolyte Battery- Applications.

Unit-III: Secondary Batteries

Construction, electrochemistry and technology of Maintenance Free Lead Acid battery (MFLA), Valve Regulated Lead Acid battery (VRLA), Absorbed Glass Mat Lead Acid battery (AGMLA). Nickel-Cadmium battery, Reserve battery.

Secondary Lithium batteries: Liquid organic electrolyte cells, polymer electrolyte cells, lithium ion cells, applications.

Unit –IV: Fuel Cells

Introduction, classification based on temperature and nature of electrolyte. Working principle, components, applications and environmental aspects of Alkaline fuel cell (AFC)- Hydrogen-Oxygen alkaline fuel cell, Methyl alcohol - Oxygen alkaline fuel cell, Phosphoric acid fuel cell (PAFC), Molten carbonate fuel cell (MCFC), Polymer Electrolyte membrane Fuel cell (PEMFC), Solid oxide fuel cell (SOFC).

Suggested Reading

1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002)
2. S.S. Dara "A text book of engineering chemistry" S.Chand&Co.Ltd., New Delhi (2006).
3. Dell R. M. and Rand D. A. J., "Understanding Batteries", Royal Society of Chemistry, UK, 2001.
4. Chemistry of Engineering Meterials by R.P Mani and K.N.Mishra, CENGAGE learning
2. Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, NewDelhi (2008).
3. Dell R. M. and Rand D. A. J., "Understanding Batteries", Royal Society of Chemistry, UK, 2001.
4. Derek Pletcher and Frank C. Walsh, "Industrial Electrochemistry", Chapman and Hall, New York, 1993

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR B.E. V SEMESTER
CORROSION SCIENCE AND TECHNOLOGY *(Open Elective-IV)*

Instruction :2 Hours / Week	SEE Marks :70	Course Code : OE440CH
Credits : 2	CIE Marks :30	Duration of SEE : 3 Hours

OBJECTIVES	OUTCOMES
The course will enable the students :	**At the end of the course students should be able to:**
1. To acquaint with the causes and factors influencing the rate of corrosion 2. To understand the different types of corrosion like dry, wet and galvanic corrosion and their relative impact 3. To familiarize with various preventive methods of corrosion such as cathodic protection, use of inhibitors, coatings, etc. 4. To know various industrial methods like electroplating, electroless plating.	1. Explain different types of corrosion with suitable examples 2. Analyze the given case study and diagnose the type of corrosion in a given corrosion problem 3. Discuss different factors that affect corrosion and passivation of metals 4. Select a suitable metallic coating for corrosion control of the equipment in a given application 5. Explain the mechanism by which organic coatings and inhibitors control corrosion of metals 6. Discuss the principles and application of cathodic protection and surface conversion coatings for corrosion control

UNIT-I: Chemical and Electrochemical Corrosion

Introduction - gravity, **cause, C**hemical and Electrochemical corrosion, **Pilling – Bed worth** rule, effect of nature of oxide layer on rate of chemical corrosion, **Galvanic corrosion**, electrochemical series and galvanic series. **F**ormation of anodic and cathodic areas, Differential aeration corrosion -pitting, water line **corrosion** & crevice corrosion, stress corrosion, corrosion fatigue. Passivation of metals, polarization curve of passivating metals, effect of pH and potential-pH diagram for iron (Pourbaix Diagram) and polarization curve of iron, application of Pourbaix diagram for corrosion mitigation.

Factors influencing corrosion

a. Nature of metal: Relative position of metal in galvanic series, Over voltage, Relative areas of anode & cathode and Nature of corrosion product.

b. Nature of environment: Temperature, pH and Humidity.

UNIT-II: Corrosion Control by Metallic Coatings

Metallic coatings: Types - anodic & cathodic. Pre-treatment of surface of base metal. Methods of application of metallic coatings: Hot dipping-galvanization - applications of galvanized RCC steel bars. Cladding, Electro plating & Electroless plating- Principle and their differences.

Electroplating of Cu coating on Fe, Electroless plating of Ni coating on Insulators, Preparation of PCB using Electroless plating.

UNIT-III: Corrosion Control by Inhibitors and Organic Coatings

Corrosion Inhibitors: Anodic, Cathodic and Vapour phase inhibitors.

Organic Coatings: Paints – constituents and their functions. Vitreous enamel coatings. Varnishes. Super hydrophobic and self healing coatings. Epoxy coatings on RCC steel bars- Impervious coatings.

UNIT-IV: Corrosion Control by Cathodic Protection and Surface Conversion

Cathodic protection: Principle, Sacrificial Anodic Protection (SAP), Impressed Current Cathodic Protection (ICCP). Application of Cathodic protection for bridges, ship hulls and underground pipelines.

Surface conversion coatings: Carburizing, Nitriding, Cyaniding.

Suggested Reading:

1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002)
2. S.S. Dara "A text book of engineering chemistry" S.Chand&Co.Ltd., New Delhi (2006).
3. Chemistry of Engineering Meterials by R.P Mani and K.N.Mishra, CENGAGE learning
4. Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, NewDelhi (2008).
5. Principles and prevention of corrosion: Denny A Jones, Prentice Hall, 1996.
6. Derek Pletcher and Frank C. Walsh, "Industrial Electrochemistry", Chapman and Hall, New York, 1993
7. Fundamentals of Corrosion: Michael Henthorne, Chemical Engineering
8. Corrosion Engineering: Mars G Fontana, Mc Graw Hill, 1987

Online resources:

1. www.nptel.ac.in
2. http://ndl.iitkgp.ac.in
3. http://ocw.mit.edu

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES
SYLLABUS FOR B.E. V SEMESTER
TECHNICAL WRITING AND PROFESSIONAL PRESENTATIONS
(Open Elective-IV)

Instruction :2 Hours / week	SEE Marks :70	Course Code : OE510EH
Credits : 2	CIE Marks :30	Duration of SEE : 3 Hours

OBJECTIVES	OUTCOMES
The course will enable the student:	**At the end of the course students should be able to:**
• This course introduces the principles and mechanics of technical writing for students of engineering. • specific communications skills associated with reporting technical information and will write a series of papers ranging from process description and feasibility reports to research projects, project proposals, and statement of purpose, which are pre-requisites for start-up companies and getting into foreign universities as well. • how to make effective presentations as part of today's workplace demands.	1. write effective reports 2. research and write project proposals and SOPs 3. make persuasive presentations

UNIT I

A. **TECHNICAL REPORTS- INFORMAL**

Informal report formats, project and research reports

B. **TECHNICAL REPORTS-FORMAL**

Formal report components, feasibility reports, evaluation reports, Analytical and informational reports, executive summaries.

UNIT II

TECHNICAL WRITING IN BUSINESS CORRESPONDENCE

Components of a letter, forms of electronic communication, effective emails, instant and text messaging guidelines.

UNIT III

TECHNICAL RESUMES

Parts of a resume, letters of employment, resume format and distribution, cover letter writing, the curriculum vitae.

UNIT IV

a) **PROFESSIONAL PRESENTATIONS**

Personal presentations, Paper presentations, Poster presentations, Power point presentations

b) **HOW TO WRITE PROPOSALS AND STATEMENT OF PURPOSE**

Types of proposals, persuasive elements, requests for proposals, stating your objective

Learning Resources:-

1. Effective Technical Communication, M Ashraf Rizvi, Tata McGraw-Hill Education, 2005
2.Raman, Meenakshi & Sangeeta Sharma. Technical Communication: Principles and Practice. Second Edition. New Delhi: Oxford University. Press, 2011.
3. Hacking Your Statement of Purpose: A Concise Guide to Writing Your SOP,Milena Young, 2014.
4. How to prepare a *feasibility study*: a step-by-step guide including 3 model *studies*. Front Cover. Robert E. Stevens, Philip K. Sherwood. Prentice-Hall, 1982.
5. Successful Presentations (with DVD): John Hughes & Andrew Mallett. Oxford university Press.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION FOR BE VI-SEMESTER w.e.f. 2018-19under CBCS
(Students admitted in 2016-17)

Course Code	Course Name	Scheme of Instruction Hours /week				Scheme of Examination			
		L	T	D	P	Duration	Max. Marks		
Theory						Hours	SEE	CIE	
PC610CE	Reinforced Concrete Design – II	3	1	0	0	3	70	30	3
PC620CE	Theory of Structures-II	3	1	0	0	3	70	30	3
PC630CE	Highway Engineering	3	1	0	0	3	70	30	3
PC640CE	Design of Steel Structures	3	1	0	0	3	70	30	3
PC650CE	Hydrology and Water Resources Engineering	3	0	0	0	3	70	30	3
OEXXXX	Open Elective – VI	1	0	0	0	2	35	15	1
OEXXXXX	Open Elective – VII	2	0	0	0	3	70	30	2
MC600EH	FS : IV - Soft Skills	1	1	0	0	2	50	30	1
MC600CE	FS : IV –Campus Recruitment Training	1	1	0	0	2	50	30	1
LABS									
PC661CE	Transportation Engineering Lab	0	0	0	2	3	50	25	1
PC671CE	Computer Applications-I Lab	0	0	0	2	3	50	25	1
PC681CE	Environmental Engineering Lab	0	0	0	2	3	50	25	1
	Total	**20**	**6**	**0**	**6**		**705**	**330**	**23**
	Grand Total	**32**					**1035**		

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE VI-SEMESTER
REINFORCED CONCRETE DESIGN – II

Instruction: 3+1 Hrs /week	SEE Marks :70	Course Code :**PC610CE**
Credits : 3	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of the course are to introduce	*Upon the completion of the course, students are expected to*
1. Design codes of practice for Reinforced Concrete 2. Design of concrete structures viz., combined footing, retaining walls, water tanks and bridges as per standard codes of practice	1. Design rectangular combined footing and understand the principles of design of trapezoidal footing with limit state method according to IS456: 2000. 2. Analyse and design cantilever and counter fort retaining walls for different load conditions with limit state method according to IS456: 2000. 3. Analyse and design water tanks, resting on ground and overhead water tanks according to IS3370: 2009. 4. Understand IRC loadings for the analysis of bridges according to IRC5: 2000 and IRC6: 2000. 5. Design Slab bridge and T-beam bridge with IRC loadings according to IRC21: 2000.

UNIT-I
Introduction : Principles of slender columns and Flat slabs

Combined Footing and Retaining walls: Limit state design & detailing of combined rectangular footing and principles of design of trapezoidal footing. Limit state design & detailing of cantilever and counter fort retaining walls subjected to different earthpressureconditions.

UNIT-II
Water Tanks: Elastic Design & Detailing for RCC circular and rectangular ground level and over-head water tanks-Design of staging. Principles of Design of Intze tanks.

UNIT-III
Bridges: IR Cloadings; Elastic design and detailing of two lane, simply supported RCS lab Bridge using effective width method. Elastic design and detailing of two lane, simply supported RCT-beam bridge using effective width method, Pigeaud's method and Courbon's method.

Learning Resources:

1. Krishna Raju N., "Structural Design and Drawing–Reinforced Concrete and Steel",Orient Black Swan Pvt Ltd, 2009
2. Krishna Raju N., "Design of Bridges", Oxford & IBH Publication Company, 2008.
3. JagadeeshT.R. and Jayaram M.A, "Design of Bridge Structures", PHI Learning Private Limited,2014
4. Bhavikatti S.S.,"Advanced R.C.C. Design", Volume-II, New Age International,2016.
5. ShahH.J.,"Reinforced Concrete", Volume-II, Charotar Publishing House,2012.
6. Punmia B.C., Ashokk Jain, ArunK Jain,"Limit State Design of Reinforced Concrete", Laxmi Publications, 2012.
7. Krishna Raju N., "Advanced Reinforced Concrete Design", CBS Publishers,2016.
8. IS:456-2000, Code of Practice for Plain and Reinforced concrete, Bureau of Indian Standards, New Delhi, India.
9. IS:3370-2009, Part I and Part II Code of Practice for Concrete Structures for Storage of Liquids, Bureau of Indian Standards, New Delhi, India.
10. IRC5-2000, Standard specification and code of practice for road bridges, Section-I, General Features of Design, IRC, NewDelhi,India.
11. IRC6-2000, Standard specification and code of practice for road bridges, Section II, Loads and Stresses, IRC,New Delhi, India.
12. IRC21-2000, Standard specification and code of practice for road bridges, Section III, Cement Concrete (Plain and Reinforced), IRC, New Delhi, India.
13. SP34:Handbook on Concrete Reinforcement and Detailing (With Amendment1), Bureau of Indian Standards, New Delhi, India
14. IS:875-1987 Code of Practice For Design Loads (Other Than Earthquake) For Buildings And Structures Parts (1,2,3,4 & 5),Bureau of Indian Standards, New Delhi,India

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE VI-SEMESTER
THEORY OF STRUCTURES – II

Instruction: 3+1 Hrs /week	SEE Marks :70	Course Code :**PC620CE**
Credits : 3	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1. Explain the use of influence line diagrams in the analysis of simply supported beams and trusses subjected to moving loads. 2. Analyze beams and frames using flexibility method and stiffness method, and to develop element stiffness matrices and assembly of global stiffness matrices.	1. Perform analysis of simply supported beam subjected to moving loads using influence line diagrams 2. Compute forces in the members of the trusses subjected dead load & live load using influence line diagrams 3. Apply flexibility method for analysis of beams and frames with degree of indeterminacy not exceeding three 4. Explain the principles of analysis of structures subjected to external forces using stiffness method. 5. Analyse the structures subjected to external loads by developing element stiffness matrices, assembly of global stiffness matrices and load matrices.

UNIT-I

Moving loads and influence line diagrams: Influence lines for reaction, bending moment and shear force. Determination of maximum bending moment and shear force for moving load systems on simply supported girders, Curves of maximum bending moment and shear force for simply supported girder traversed, by (i) single point load,(ii) two point loads, (iii)uniformly distributed load longer than span, and (iv) uniformly distributed load shorter than span, enveloping parabola and EUDLL.

UNIT-II

Moving loads on trusses and arches: Influence lines for forces in members of statically determinate trusses under moving loads (warren truss and Pratt truss). Influence line diagrams for three hinged parabolic arches.

UNIT-III

Flexibility & Stiffness Methods of Analysis: Analysis of continuous beams, pin jointed plan etrusses, rigid jointed plane frames with static in

determinacy not exceeding three with flexibility method. Introduction to stiffness method

UNIT-IV

Direct Stiffness Method - I: Development of element stiffness matrices forbar and truss elements Transformation matrices, assembly of global stiffness matrices and load matrices. Finding displacements and member end action matrices. Initial stresses and strains.

UNIT-V

Direct Stiffness Method-II: Development of element stiffness matrices for beam and plane frame elements. Transformation matrices, assembly of global stiffness matrices and load matrices. Finding displacements and member end action matrices.

Learning Resources:

1. Vazirani V.N., Ratwani M.M,Duggal S.K.,"Analysis of Structures-Vol.IITheory,DesignandDetailsofStructures",KhannaPublishers,16th Edition, 2015.
2. Thandava Moorthy T.S., "Structural Analysis", Oxford Higher Education, Second Edition,2012.
3. Weaver and Gere, "Matrix Analysis of Framed Structures", CBS Publisher,2004
4. Ramamrutham S., Narayan R.,"Theory of Structures", Dhanpath Rai publications,2014
5. Devdas Menon, "Structural Analysis",1st Edition, Narosa Book Distributors Pvt Ltd, 2014.
6. Reddy C.S.,"Basic Structural Analysis",3rd Edition, McGrawHill, 2010.
7. Junarkar S.B.,Shah,"Mechanics of Structures",Volume-II, CharotarPub. House, 2010.
8. Chu-Kia Wang, "Intermediate Structural Analysis (English)1stEdition", McGrawHillEducation,2010.
9. Hibbeler R.C., "Structural Analysis", 8th Ed, Prentice Hall Higher Education, 2012.
10. Louis F.Geschwindner, Harry H.West," Fundamentals of Structural Analysis", 2ndEdition,WileyIndia Pvt.Ltd.,2011.
12. Stephen P. Timoshenko and Donovan H. Young " Theory of Structures" McGraw Hill International Edition, 1968
13. http://nptel.ac.in/courses/105101086/

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE VI-SEMESTER
HIGHWAY ENGINEERING

Instruction: 3+1 Hrs /week	SEE Marks :70	Course Code :**PC630CE**
Credits : 3	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1.To provide basic knowledge in transportation so that students can understand and solve transportation related problems and design for highway mode of transportation with focus on highway users' characteristics, geometric and pavement design, traffic engineering, and pavement construction / maintenance 2.Evaluate the fundamental theories and methods of traffic and transportation engineering, including traffic flow fundamentals, geometric design of highways, and pavement design.	1. Given the basic information on geometrical features, design horizontal and vertical alignment of highways/roads complying with IRC standards. 2. Compute key elements of traffic, present and analyse traffic data for solving mobility issues 3. Develop a survey plan for a transportation problem and identify the traffic studies to be carried out to solve urban traffic problems. 4. Characterize the highway materials used for road construction based on quality control tests and develop a job mix formula for the given materials in field using Roth fuch method. 5. Design flexible and rigid pavements for National highways as per IRC guidelines 6. Employ various construction techniques adopted in field, identify the causes of various pavement failures and suggest remedies.

UNIT-I:HIGHWAY CLASSIFICATION, ALIGNMENT AND GEOMETRIC DESIGN

Introduction, Highway development in India, Functional classification of roads as per IRC, Road patterns,

Highway alignment–Requirements and factors controlling alignment of roads–Factors governing geometric design,

Highway cross-sectional elements–Carriageway, Shoulders, Medians, Right of way, Footpaths, Busbays, Cycletracks, Service roads, Camber. Sight distances–Stopping and over taking sight distance.

Design of horizontal alignment–Speed, radius, super elevation, extra widening, transition curves.

Design of vertical alignment–gradient, grade compensation, summit

curves and valley curves

UNIT-II : TRAFFICENGINEERING

Basic traffic characteristics–Volume, speed, density, headways and relationships amongst them.

Traffic studies-Objectives of traffic studies, Methods of data collection and presentation of various traffic studies such as volume studies, speed studies, speed and delay studies, origin destination studies, intersection delay studies, parking studies, accident studies. Highway capacity and Level of service concepts as per HCM.

Traffic regulation and control–Traffic signs, signals, markings and channelization. Principles of design of at-grade inter sections– Simple layouts. Design of isolated signal by Webster and IR Cmethod. Introduction to grade separated interchanges.

UNIT-III : PAVEMENTMATERIAL CHARACTERISATION

Types of pavements and materials for pavements.

Aggregates – characterizing the physical, mechanical and shape related properties of aggregate particles, durability tests and stripping tests, Blending of aggregates and job mix formula by Rothfuch method and 0.45 power gradation.

Binders– Types of paving binders–bitumen, cutbacks and emulsions, modified binders, characterization of bituminous binders : flash and fire point test, penetration test, softening point test, ductility test, Fraass breaking point test, viscosity test ,Specific gravity test, elastic recovery test, separation test, simulation of short term aging using RTFOT, simulation of long term aging using PAV. Gradation of bitumen - penetration grading, Viscosity grading and performance grading. Bituminous mixture design by Marshall / Modified Marshall stability test, MS-2 procedure of computing volumetric.

UNIT-IV : PAVEMENTDESIGN

Factors affecting pavement design –Traffic, soils and materials

Flexible pavement design using IRC 37:2012.

Rigid pavement design using IRC58:2015, Introduction to expansion , contraction, construction and longitudinal joints for jointed plain cement concrete pavements

UNIT-V: PAVEMENTCONSTRUCTIONANDMAINTENANCE

Pavement construction-Construction of Water bound Macadam, Wet Mix Macadam and Granular sub base layers. Construction of Dense Bituminous macadam, Bituminous Macadam, Bituminous Concrete, Open Graded Premix Carpet, Mix Seal Surfacing, prime coat, tack coat, seal coat

as per MORTH specifications, Introduction to recycled pavements.
Pavement failures and maintenance – Pavement failures–types, causes and remedies, Maintenance of bituminous pavements.

Learning Resources:

1. Khanna S.K., Justo C.E.G.,Veeraraghavan A., "Highway Engineering",10th Edition,Nem Chand & Bros,2015
2. KadiyaliL.R.,Traffic Engineering and Transportation Planning, Khanna Publishers,2016.
3. Nichol as J.Garber Lester A.Hoel, Traffic and Highway Engineering-III edition, Cengage publication Indian edition2006.
4. YoderE.J.,WitczakM.W.,Principles of Pavement Design, John Wiley & Sons–Indian edition.2008
5. Srinivasa Kumar R., Pavement design, Orient Blackswan Pvt. Ltd., New Delhi,2013
6. IRC:37:2012:Tentativeguidelines for the design of flexible pavements
7. IRC58 :2015:Guidelines for the design of plain jointed rigid pavements
8. IRCMORT&H-Specifications for road and bridge works, 2013 (Fifth Revision)
9. IRC35 -2015 (Road markings), IRC38-1988 (Horizontal curves),IRC53-2012 (Accident forms), IRC67-2012 (Road signs), IRC:82-2015 (Maintenance of BT roads), IRC:86-1983 (geometric design standards), IRC:93-1985 (traffic signals), IRC:106-1990 (capacity), IRC:SP:23-1983 (vertical curves), IRC:SP:41-1994 (at-grade intersection)
10. MS-2 Manual by Asphalt institute
11. www.pavementinteractive.org
12. http://nptel.ac.in/courses/105105107/

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE VI-SEMESTER
DESIGNOF STEEL STRUCTURES

Instruction: 3+1 Hrs /week	SEE Marks :70	Course Code :**PC640CE**
Credits : 3	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1. Understand the design philosophies of steel structures. 2. Design the bolted connections, welded connections including detailing, tension members, compression members and beams by limits that design as perIS:800- 2007. 3. Estimate the loads on roof trusses and design the members of roof truss.	1. Compare the different design philosophies and employ limit state design in the design of structural elements using appropriate rolled steel sections like I-Section, channel sections, Angle sections and built up sections according to IS: 800-2007 2. Design bolted connection using black bolts and welded connections using fillet welds, groove welds subjected to concentric tensile loads by limit state method according to IS:800-2007 3. Design Tension members, compression members, and beams, using limit state design according to IS:800-2007 4. Estimate loads on roof trusses subjected to different load combinations and design purlins, members of truss using angle sections by limit state according to IS: 800-2007

UNIT-I

Materials and Specifications (Limit State Design): Chemical composition of steel, types of Structural Steel– classification of Rolled Steel Sections.

Design Philosophies: Elastic or working stress design, plastic or limit design and limit state design

Introduction to Limit State Design: Loads & load combinations, characteristic loads, design loads, design strength, partial safety factors for materials and loads.

Bolted Connections: Types of bolts, types of bolted joints, load transfer mechanism, modes of failure of bolted joints, design of bolted joints using ordinary black bolts for concentric loads. High strength friction gripbolts.

Welded Connections: Types of welds, types of welded joints, design of welded joints for concentric loads using fillet welds and buttwelds.

UNIT-II

Design of Tension Members (Limit State Design): Introduction to tension members –applications of tension members, modes of failure, design of tension members–design of lug angles, tension splices- stagge red bolting

Design of Compression Members (Limit State Design): Introduction, sections used for compression members. Effective length of compression members, slenderness ratio, types of buckling, design of compression members for axial loads with single section and built-up sections (symmetric in both directions),lacing and battening

UNIT-III

Design of Columns under combined axial load and moment. Design of Column splices.

Design of Column Bases: Design of slab base and gusseted base for axial load

UNIT-IV

Design of Beams (Limit State Design): Introduction to plastic analysis-plastic hinge, plastic moment, shape factor. Classification of cross sections, phenomenon of lateral tensional buckling; design of laterally restrained beams.

Secondary considerations: Check for web crippling, web buckling &deflection.

Introduction to Design of laterally unrestrained beams.

UNIT-V

Design of Roof trusses (Limit State Design): Types of trusses, estimation of loads-dead load, live load and wind load, design of purlins, analysis of roof trusses and design of its members with angle sections. Bracings of roof trusses.

Learning Resources:

1. Duggal S.K.,"Design of Steel Structures", 2ndEdition,Tata McGraw Hill Publishing,2014
2. Gambhir M.L., "Fundamentals of Structural Steel Design",McGrawHill Education (India) Pvt. Ltd., New Delhi,2013
3. Bhavikatti S.S., "Design of steel Structures",4th Edition, I.K.International Publishing House Pvt.Ltd. 2014.
4. Subramanian N, "Design of Steel Structures", Oxford University Press,2011.
5. IS: 800-2007: Code of Practice for General Construction in Steel, Bureau of Indian Standards, New Delhi
6. IS: 875-1987: Code of Practice for Design loads for buildings and structures, Bureau of Indian Standards, New Delhi
7. ISI HandbookNo.1or Steel Tables by Bhavikatti S.S.
8. http://nptel.ac.in/courses/105103094/
9. www.steel-insdag.org

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE VI-SEMESTER
HYDROLOGY AND WATER RESOURCES ENGINEERING

Instruction: 3 Hrs /week	SEE Marks :70	Course Code :**PC650CE**
Credits : 3	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1. Describe the various aspects of reservoirs, types and functions of spillways and energy dissipaters. 2. Learn issues related to ground water flow 3. Compute rainfall, run off and estimate floods in a catchment area.	1. Estimate floods, rainfall and runoff using different methods for peak flow estimation and plotting hydrograph 2. Explain parameters related to ground water flow and derive equations for steady, unsteady flow and yield of well 3. Estimate the capacity of reservoir incorporating sedimentation for computing life of reservoir. 4. Perform stability analysis on gravity dam for evaluating safety of the dam. 5. Evaluate the factors leading to the assessment of water power potential and layout of a hydel plant

UNIT-I

Precipitation: Hydrologic cycle, measurement of rainfall, estimation of mean rain fall over a catchment, infiltration, evaporation, run off, factors affecting runoff, peak flow estimation, Unit Hydrograph, S-Hydrograph and variations.

UNIT-II

Ground Water Hydrology: Zoning of subsurface, Aquifer properties affecting ground water, well Hydraulics – Steady radial flow in to a well in confined and un confined aquifers, Unsteady flow into a confined aquifer, spacing of wells, well loss, yield of a well, Constant level pumping and recuperation test.

UNIT-III

Reservoir Planning: Selection of site, zones of storage in a reservoir, storage capacity analysis, Reservoir sedimentation, Flood routing through retarding basin, Estimation of life of a reservoir

UNIT-IV

Storage Head Works: Types of dams, advantages & disadvantages, selection criteria, economical height of the dam, gravity dam, forces acting on dam, stability analysis, elementary profile and practical profile, low and high gravity dams.

UNIT-V

Water Power Engineering: Demand and generation, different heads, load factor, capacity factor and utilization factor , Assessment of water power potential, primary and secondary power, components and types of Hydel plants, Pen stocks & Surge Tanks, Power house layout, components and their functions.

Learning Resources:

1. Modi P.N. "Irrigation Water Resources and Water Power Engineering", standard Book house, New Delhi, 2008
2. Garg S.K., "Irrigation Engineering & Hydralic Structures", Khanna Publishers, 2009
3. Dandekar & Sarma, Water Power Engineering, Vikas Publishers, 2009
4. http://nptel.ac.in/courses/105104103/

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE VI-SEMESTER
FINISHING SCHOOL-IV (SOFT SKILLS)

Instruction: 1+1 Hrs /week	SEE Marks :50	Course Code :**MC600EH**
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

Course Objective:	**Course Outcomes**
The objectives of the course are to	*Upon the completion of the course,*
This course aim sat enhancing the employability skills. Students will be trained in higher order thinking skills Including analytical skills, problem solving skills and critical & logical reasoning skills. Students will be trained to work systematically and develop logical and analytical thinking. Students will be trained in the following areas 1. Critical and Non verbal reasoning 2. Pure Maths 3. Verbal ability 4. Logical reasoning 5. Data Interpretation and Analysis	1. Understand the fundamentals concepts of Aptitude and verbal skills 2. Solve questions using short cuts and smart methods 3. Perform calculations with speed and accuracy 4. Develop Analytical thinking and problem solving skills

UNIT1 VERBALABILITY Finding errors

- Vocabulary
- Synonyms
- Antonyms
- Idioms and Phrases
- Fill in the blanks and sentence Jumbles
- Reading comprehension

UNIT2 LOGICAL REASONING

- Logical Reasoning
- Assignments
- Puzzles
- Blood relations
- Syllogisms

UNIT3 CRITICAL AND NON- VERBAL REASONING

- Critical Reasoning
- Non verbal reasoning
- Figure series and completions

UNIT4 QUANTITATIVE APTITUDE -PUREMATHS

- Pure maths
- Algebra
- Probability
- Permutations and combinations

UNIT5 DATAINTERPRETATION AND ANALYSIS

- Data Interpretation
- Line graph
- Pie chart
- Tabulation

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE VI-SEMESTER
FINISHING SCHOOL-IV (CAMPUS RECRUITMENT TRAINING)

Instruction: 1+1 Hrs /week	SEE Marks :50	Course Code :**MC600CE**
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to introduce	*Upon the completion of the course, students are expected to*
1. Software package on construction management technology 2. Element wise assembling the parts of a building.	1. Plan, execute and monitor large scale projects execution using Oracle Primavera. 2. Execute Exterior designing plans and graphs of building by using Revit Architecture

Primavera	**Revit Architectures**
UNIT-I	
• Training on Installation and setup • Introduction to project management • Introduction to primavera • Enterprise project structure (EPS)	• Project Units • Levels • Walls • Basic Wall creation • Basic creation of Plan
UNIT-II	
• Organisational breakdown structure • Project codes and values • Global and project calendars • Adding a project (W/O project architect) • Work breakdown structure (WBS)	• Wall • Compound Wall • Modify Wall • Stacked Wall • Wall Opening
UNIT-III	
• Budget and establishing spending plan • Activity codes and values • Work products and documents • Activities, relationships and scheduling • Constraints	• Door • Window • Floor • Ceiling • Roof • Components

UNIT-IV

- Grouping and filtering activities
- Bars and layouts
- Resources, roles and costs
- Baseline plan
- 3D modelling
- Stair
- Railing

UNIT-V

- Monitoring the current schedule
- Threshold monitoring and issues
- Project tracking and reports
- Role plays and Use cases discussion
- Views
- Section View
- Elevation View
- Camera View
- Visualization
- Rendering
- Walkthrough
- Print

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE VI-SEMESTER
TRANSPORTATION ENGINEERING LAB

Instruction: 2 Hrs /week	SEE Marks :50	Course Code :**PC661CE**
Credits : 1	CIE Marks: 25	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1. Impart basic knowledge to carry out quality control lab tests for roads in highway engineering practice. 2. Conduct quality control in road construction as per standards and introduce the concepts of design mix 3. Conduct traffic studies and present the data for transportation engineering applications	1. Perform experiments on aggregates and bitumen on their suitability for road construction 2. Understand the basic traffic studies for transportation planning and design. 3. Conduct tests on job mix formula and Marshall stability 4. Practice working as a team member and lead a team 5. Demonstrate professional behaviour in conducting the experiments and p resenting the results effectively

LIST OF EXPERIMENTS

A) Tests on road aggregates

1. Aggregate crushing value test
2. Los Angeles abrasion test
3. Aggregate impact value test
4. Aggregate shape test (flakiness & elongation)
5. Water absorption & Specific gravity of Aggregate
6. Job mix formula by Roth fuch Method

B) Tests on bitumen

7. Penetration Test
8. Ductility Test
9. Elastic Recovery Test
10. Softening point Test
11. Specific gravity Test
12. Viscosity Test
13. Flash and fire point Test

C) Traffic Studies

14. Classified Traffic volume study at mid blocks
15. Spot Speed Study
16. Origin & Destination studies

D) Miscellaneous Tests (demonstration only)

18. Bitumen extraction test
19. Design of Bitumen mixture by Marshall stability test

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE VI-SEMESTER
COMPUTER APPLICATIONS -I LAB

Instruction: 2 Hrs /week	SEE Marks :50	Course Code :**PC671CE**
Credits : 1	CIE Marks: 25	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1. Use structural Design software for analysis and design of RCC and Steel Structures.	1. Perform analysis and design of RCC beams and frames subjected to various loads using structural design software. 2. Design of G + 2 residential building subjected to dead load and live load combination using software. 3. Design an RCC multi-storeyed building subjected to DL, LL and wind load combination using software. 4. Perform analysis and design of an RCC multi-storeyed building subjected to DL, LL, WL and seismic load combination using software 5. Perform analysis and design of steel trusses and frames subjected to various loads using software.

LISTOF EXPERIMENTS

Introduction of a structural analysis and design software for the design of RCC and Steel structures:

RCC Design:

Perform analysis and design of:

1. Beams
2. Plane frames
3. Space frames
4. G+2 residential building
5. Wind analysis of multistoried structures
6. Seismic analysis of multi- storied structures

Steel Design:

Perform analysis and design of:

7. Trusses

8.Frames

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE VI-SEMESTER
ENVIRONMENTAL ENGINEERING LAB

Instruction: 2 Hrs /week	SEE Marks :50	Course Code :**PC681CE**
Credits : 1	CIE Marks: 25	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course are to	*Upon the completion of the course, students are expected to*
1. Familiarize with the procedures of water quality analysis. 2. Estimate the Biochemical Oxygen Demand (BOD)and Chemical Oxygen Demand(COD) for sewage samples. 3. Calculate the coagulant Dosage for reduction of turbidity and disinfection dosage. 4. Practice working of flame photometer.	1. Analyse the water samples for the determination of alkalinity, hardness, chlorides, calcium, pH, contents of sodium and potassium in water using flame photometer, total dissolved solids and turbidity. 2. Estimate the Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) in sewage samples. 3. Calculate the coagulant dosage for reducing the turbidity and disinfection dosage. 4. Practice working as a team member and lead a team 5. Demonstrate professional behaviour in conducting the experiments and presenting the results effectively

LISTOF EXPERIMENTS

1. Determination of Alkalinity.
2. Determination of Hardness.
3. Determination of Chlorides.
4. Determination of Acidity.
5. Determination of Variation of pH.
6. Determination of Dissolved Oxygen
7. Determination of Biochemical Oxygen Demand (B.O.D.)
8. Determination of total dissolved solids
9. Determination of residual chlorine.
10. Determination of turbidity
11. Determination of coagulant dose –Jar test.
12. Determination of Chemical Oxygen Demand (C.O.D.)
13. Determination of Sodium &Potassium present in water using flame photometer (Demonstration).

OEPN ELECTIVE COURSES

Civil	Intelligent Transportation System	OE610CE	1
CSE	Introduction to Operating Systems	OE610CS	1
ECE	Consumer Electronics	OE610EC	1
EEE	Solar Power and Applications	OE610EE	1
IT	Introduction to Web Technologies	OE610IT	1
Mech.	Basics of Mechatronics	OE600ME	1
Open Elective VII (Semester - VI)			
Civil	Integrated Solid Waste Management	OE620CE	2
CSE	Introduction to Databases	OE620CS	2
ECE	Electronics for Automotive Applications	OE620EC	2
EEE	Programming For Engineers	OE620EE	2
IT	Statistical Programming using R	OE620IT	2
Mech.	Optimization Methods for Engineers	OE610ME	2
	Advances in Entrepreneurship	OE620ME	2

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR B.E. VI SEMESTER
INTELLIGENT TRANSPORTATION SYSTEMS (OPEN ELECTIVE – VI)

Instruction:	1 hr/ Week	SEE marks:50	Course Code	:	OE610CE
Credits:	1	CIE marks:30	Duration of SEE	:	2 hrs

COURSE OBJECTIVES	**COURSE OUTCOMES**
Objectives of this course are to:	*Upon the completion of this course the students will be expected to:*
1. Impart knowledge on advanced transportation concepts in the field of ITS. 2. Introduce the technologies of ITS in solving transportation problems	1. Explain the concepts of ITS data collection techniques and its architectural framework. 2. Characterize ITS functional areas for transportation planning. 3. Describe the range of technologies involved in the delivery of ITS systems 4. Investigate and analyse the current applications and trends in the context of ITS 5. Present practical examples of ITS

UNIT 1:

Introduction to Intelligent Transportation Systems (ITS): Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection, ITS architecture framework.

UNIT 2:

ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS)

Suggested Books:

1. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.
2. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.

DEPARTMENT OF CIVIL ENGINEERING
SYLLABUS FOR BE VI-SEMESTER
INTEGRATED SOLID WASTE MANAGEMENT (Open Elective – VI)

Instruction: 2 Hrs /week	SEE Marks :70	Course Code : OE620CE
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of the course are to introduce	*Upon the completion of the course, students are expected to*
1. Integrate technical solid waste management options and imposed environmental legislation for the guidance to the safe solutions.	1. Assess the implications of production, characteristic and environmental impact of Solid Waste Management based on its sources. 2. Assess the components of Biomedical and Radioactive wastes. 3. Narrate the management methods based on standards. 4. Outline the phases of generation to disposal of E-waste with the global strategic terms of Recycling

UNIT-I

Solid Waste and their Handling: Definition of solid wastes — types of solid wastes — Sources – Industrial, mining, agricultural and domestic — Characteristics. Solid waste Problems – impact on environmental health

UNIT-II

Biomedical Waste Management: Classification, collection, segregation Treatment and disposal.

UNIT-III

Radioactive waste: Definition, Low level and high level radioactive wastes and their management, Radiation standards.

UNIT-IV

E-Waste Management: Waste characteristics, generation, collection, transport and disposal, regulatory aspects of e waste, global strategy, recycling.

Learning Resources:

1. Hazardous waste management by Prof. Anjaneyulu.
2. Standard handbook of Hazardous waste treatment and disposal by Harry M. Freeman, McGraw Hill 1997.
3. Management of Solid waste in developing countries by Frank Flintoff, WHO regional publications 1976.
4. http://nptel.ac.in/courses/

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR B.E VI SEMESTER
INTRODUCTION TO OPERATING SYSTEMS (Open Elective-VI)

Instruction: 1 Hr /week	SEE Marks :50	Course Code :OE610CS
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

Course objective	**Course outcomes**
At the end of the Course students should be able to:	At the end of the Course students will be able to:
• Understand different Operating system Structures, Services and threading models	1. Differentiate Operating system structures to show the evaluation of an operating system 2. Analyze the role of an Operating system in executing tasks on a system 3. Distinguish single threaded and multi-threaded models of execution 4. Compare CPU scheduling algorithms to find effective algorithm for a given instance of process

UNIT-I

Introduction to operating systems: Definition, Mainframe, Multiprocessor, Clustered and Real time systems, Distributed, OS System structure, Unikernel, OS Services, Virtual machines, Containers, System calls.

UNIT-II

Process: Process concept, Process Scheduling, Inter-process communication, Threads, Multithreading Models.

CPU Scheduling: Scheduling Criteria, Scheduling Algorithms, Multiprocessor scheduling.

Suggested Books:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 9th Edition (2016), Wiley India.

Reference Books:

1. Andrew S. Tanenbaum, Modern Operating Systems, 2nd Edition (2001), Pearson Education, Asia.
2. Dhananjay, Dhamdhere.M, Operating System-concept based approach, 3rd edition (2009), Tata McGraw Hill, Asia
3. Robet Love, Linux Kernel Development, (2004)Pearson Education
4. Richard Stevens, Stephen Rago, Advanced Programming in the UNIX Environment, 3rd Edition (2013), Pearson Education

Online Resources:

https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-828-operating-system-engineering-fall-2012/

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SYLLABUS FOR BE VI SEMESTER
INTRODUCTION TO DATABASES (Open Elective-VII)

Instruction: 2 Hrs /week	SEE Marks :70	Course Code : OE620CS
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hrs

Course Objectives	**Course Outcomes**
Students should be able to	At the end of the course, students will be able to
• Identify different issues involved in the design and implementation of a database system. • Understand transaction processing.	1. Identify the functional components of database management system. Create conceptual data model using Entity Relationship Diagram 2. Transform a conceptual data model into a relational model 3. Design database using normalization techniques 4. Apply indexing and hashing techniques for effective data retrieval

UNIT-I

Introduction: Database System Application, Purpose of Database Systems, View of Data, Database Languages, Relational Database, Database Architecture, Database Users and Administrators.

Database Design and E-R Model: Overview of the Design Process, the E-R Model, Constraints, E-R Diagrams.

UNI-II

Relational Model: Structure of Relation Database, Relational Algebra Operations, Modification of the Database.

Structured Query Language: Introduction, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Views, Join Expressions.

UNIT-III

Relational Database Design: Features of Good Relational Designs, Atomic Domains and first Normal form, Decomposition Using Functional Dependencies, functional Dependency Theory.

UNIT-IV

Indexing and Hashing: Basic Concepts, Ordered Indices, B+ Tree Index Files, B-Tree Files, Multiple – Key Access, Static Hashing, Dynamic Hashing.

Transaction Management: Transaction concept, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation and Atomicity, Serializability, Recoverability.

Suggested books:

1. Abraham Silberschatz, Henry F Korth, Sudharshan S, Database System Concepts, 6th Edition(2011), McGraw-Hill International Edition.

Reference Books:

1. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System , 8th Edition(2006) Pearson Education.
2. Raghu Ramakrishna, and Johannes Gehrke, Database Management Systems, 3rd Edition(2003), McGraw Hill.
3. Ramez Elmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems, 4th Edition(2006), Pearson Education.
4. Peter rob, Carlos coronel, Database Systems, (2007), Thomoson.

Online resources:

1. http://nptel.ac.in/courses/106106093/

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

SYLLABUS FOR B.E. VI-SEMESTER

CONSUMER ELECTRONICS (Open Elective -VI)

(for other Departments)

Instruction: 1 Hrs /week	SEE Marks : 50	Course Code :**OE610EC**
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

Course Objective	Course Outcomes
1. Upon completion of the subject, the student shall know the basics of Electronics, operations of various Audio & Video Systems, Office & Home appliances and advance consumer electronic gadgets used in our day-to-day actives.	**At the end of the course, students will be able to:** 1. List technical specification of electronics Audio / Video systems. 2. Understand the working of microphones and speakers and their application in Audio systems. 3. Understand the basic functions of consumer electronic goods like cell phones, ATMs. 4. Troubleshoot consumer electronic products like TV, Washing machine and AC.

UNIT - I

Brief history and development of Electronics – Basic Electronic Components - DC & AC –Sources, Kirchhoff's Laws, ADCs, Frequency spectra - Ranges (Audio, Video, RF UHF, VHF, Microwave), Audio System - working principles, components - Microphones and Speakers, Principles of Video Processing and Displays (LCD, LED displays), Analog and Digital Video standards.

UNIT - II

Telecommunication Systems: Basics of Telephone system, Caller ID Telephone, Intercoms, Cordless Telephones, Cellular mobile systems, Basics of satellite communication.

Office Electronics: Automatic Teller Machines, Facsimile machines, Digital Diaries, Safety and security systems.

Home Electronics: Digital Camera system, Microwave ovens, Washing Machines, Air Conditioners and Refrigerators, Troubleshooting.

Suggested Reading:

1. Mitchel Schultz 'Grob's Basic Electronics', Mc Graw Hill Publishers, 12/e, 2016.
2. A.M. Dhake 'Television and Video Engineering', McGraw Hill Education, 2/e, 2014.
3. B.R. Gupta and V. Singhal, "Consumer Electronics", S.K. Kataria& Sons, 2013.
4. R.R.Gulati. 'Monochrome and Color Television' New Age International Publisher, 2/e, 2010.
5. S.P. Bali, 'Consumer Electronics', Pearson Education, 2008.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

SYLLABUS FOR B.E. VI-SEMESTER
ELECTRONICS FOR AUTOMOTIVE APPLICATIONS
(Open Elective-VII)

(for other Departments)

Instruction: 2 Hrs /week	SEE Marks : 70	Course Code :**OE620EC**
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hrs

Course Objectives	Course Outcomes
1. The student shall know the basics of Electronics for Automotive Applications, operation of various electronics modules 2. The student shall know the various transducers and sensors used in automotive environment 3. The student shall acquire good knowledge about various electronic modules	**At the end of the course, students will be able to:** 1. Appreciate the operation of various electronic modules, their functionality 2. Understand various functions of modules like EBD, ABS, cruise control etc 3. Understand the Advanced Driver Monitoring Systems (ADMS) and safety sensors in automotive environment 4. Appreciate the advances in automotive electronic systems like driverless cars, collision avoidance systems etc.

UNIT – I

Introduction to sensors and transducers: displacement, position, proximity, acceleration, velocity, motion, rotation, force, fluid pressure, liquid flow, liquid level, temperature, light, smoke, and gas sensors. Selection of sensor.

UNIT – II

Data acquisition and Signal conditioning: various signal conditioning modules. Use of data acquisition. Fundamentals of Analog to digital conversion, sampling, amplifying, filtering, noise reduction. Criteria to choose suitable data acquisition equipment.

UNIT – III

Introduction to systems: Measurement and control. Basic system models. Mathematical models. Mechanical system building blocks, Electrical system building blocks, Fluid system building blocks and Thermal system building blocks. Engineering systems: Rotational – translational, Electromechanical, hydraulic-mechanical.

UNIT – IV

Engine management systems – Various sensors used in system – Electronic transmission control vehicle safety system – Electronic control of braking and traction.

Body electronics–Infotainment systems – Navigation systems – Application of Control elements and control methodology in automotive System.

Suggested Reading:

1. Tom Denton "Automobile Electrical and Electronic Systems" 5/e, Routledge, 2017.
2. De Silva, " Mechatronics", First Indian Reprint, (Taylor & Francis), Yesdee Publications, 2013.
3. William B. Ribbens, "Understanding Automotive Electronics: An Engineering Perspective" 7/e, Butterworth–Heinemann, 2012.
4. W. Bolton, "Mechatronics: Electronic control systems in mechanical and electrical Engineering", 3/e, Pearson Education, 2008.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SYLLABUS OF B.E VI- SEMESTER
SOLAR POWER AND APPLICATIONS (Open Elective – VI)

Instruction: 1 Hr /week	SEE Marks :50	Course Code :OE610EE
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

Course objective:	Course Outcomes:
To impart the basics of solar energy harnessing and solar panel and array.	A student will be able to 1. Identify and choose proper type of meter for solar radiation measurement. 2. Use proper solar PV system according to the load requirements. 3. Categorize and compare photovoltaic cells. 4. Apply the knowledge of solar energy.

UNIT – I

Solar Energy Basics: Sun as a source of energy, the Earth, Radiation Spectrums, Extra-terrestrial and Terrestrial Radiations, Depletion of solar Radiation, Pyranometer, Pyrheliometer, Sunshine Recorder, Solar Collectors, Solar Water Heater, Solar Cookers and Solar Thermo-Mechanical Systems.

UNIT – II

Solar Photovoltaic Systems: Solar Cell fundamentals, Cell characteristics, Cell classification, Module, Panel and Array, Maximizing the Solar PV output and load matching, MPPT, Stand-Alone Solar PV system, Grid-Interactive Solar PV system, Water Pumping and lighting.

Suggested Reading:

1. B H Khan, Non-Conventional Energy Resources, 2nd Edition, Tata McGraw Hill.
2. G. D. Rai, Non-Conventional Energy Sources, 13th Reprint 2014, Khanna Publications.

Online Resource:

1. https://drive.google.com/file/d/
2. www.pdfdrive.net
3. www.edx.org

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SYLLABUS OF B.E VI- SEMESTER
PROGRAMMING FOR ENGINEERS (Open Elective – VII)

Instruction: 2 Hrs /week	SEE Marks :70	Course Code : **OE620EE**
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hrs

Course objective:	**Course Outcomes:**
To provide fundamental knowledge of programming language for solving problems.	A student will be able to 1. Use arrays and matrices for numerical problems solving. 2. Represent data and solution in graphical display. 3. Create easily programmable graphical user interface. 4. Write scripts and functions to easily execute series of tasks in problem solving.

UNIT – I
Working with matrices and arrays:
Generating matrices, load functions, M-files, Concatenation, deleting rows and columns, linear algebra, arrays, multivariate data, scalar expansion and logic scripting.

UNIT – II
MATLAB Plotting:
Plotting process, graph components, figure tools, arranging graphs, select plot types, editing plots and basic plotting functions.

UNIT – III
Graphics:
Printing Graphics, Handle Graphics and animations.
Creating GUI:
Layout of GUI and programming a GUI.

UNIT – IV
Programming:
Flow control, other data structures, scripts and functions.

Suggested Regarding:
1. Getting started with MATLAB (Version 7) The Math works.
2. Getting started with MATLAB "A quick introduction for scientist and engineers by Rudra Pratap, Oxford publications.

DEPARTMENT OF INFORMATION TECHNOLOGY
SYLLABUS OF B.E VI- SEMESTER
INTRODUCTION TO WEB TECHNOLOGIES (Open Elective-VI)

Instruction: 1 Hrs /week	SEE Marks :50	Course Code :OE610IT
Credits : 1	CIE Marks: 30	Duration of SEE : 2 Hrs

Course Objectives	**Course Outcomes**
The course will enable the students to:	**At the end of the course student will be able to:**
Acquire basic skills for designing static and dynamic Web Applications using HTML, CSS and Javascript.	1. Develop and publish Web pages using Hypertext Markup Language. 2. Optimize page styles and layout with Cascading Style Sheets. 3. Make use of concepts in Java script for creating a dynamic web application. 4. Implement event handlers to respond to various events.

UNIT-I:

Introduction: World Wide Web, Web Browsers, Web Servers, URL, HTTP. HTML: Standard HTML document structure, Basic Tags, Images, Hypertext Links, Lists, Tables, Frames. CSS: In-line style sheets, Internal Style sheets and External Style sheets.

UNIT-II

JavaScript: Introduction, Basics of java script-variables, data types and operators, Control Structures, Arrays, Functions, HTML Forms, Events and event handling.

Learning Resources:

1. "Web Technologies", 7th Edition, Uttam K.Roy,2012.
2. "Internet & World Wide Web How to Program", 5/e, Paul J. Deitel, Harvey M. Deitel, Abbey Deitel,2012.

DEPARTMENT OF INFORMATION TECHNOLOGY
SYLLABUS OF B.E VI- SEMESTER
STATISTICAL PROGRAMMING USING R (Open Elective-VI)

Instruction: 2 Hrs /week	SEE Marks :70	Course Code :OE620IT
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hrs

Course Objectives	**Course Outcomes**
The course will enable the students to:	**At the end of the course student will be able to:**
The course will enable the students to apply the R programming language in the analysis of Statistical data.	1. Write simple programs in R language to manipulate and visualize the data. 2. Write complex program using different constructs of R language to solve simple problems. 3. Use R programming language in the simulation of different types of random variables. 4. Write programs using R language in the analysis and computation of different matrix operations.

Unit I: Introduction to R Language
Basic features of R, Built-in functions, logical vectors and relational operators, Data input and output, programming statistical graphs- High-level plots, low level graphic functions.

Unit II: Programming with R
Flow control, Managing complexity through functions, Miscellaneous programming tips, Debugging and maintenance, Efficient programming.

Unit III: Simulation
Montecarlo simulation, Generation of pseudo random numbers, Simulation of other random variables-Bernouli, Binomial, Poisson, Exponential and Normal random variables.

Unit IV: Computational Linear Algebra
Vectors and matrices in R, Matrix multiplication and inversion, Eigen values and Eigen vectors

Suggested Reading:

1. A first Course in Statistical Programming with R, W. John Braun, Duncan J. Murdoch, Cambridge University Press, 2007.
2. https://cran.r-project.org/manuals.htm

DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS FOR B.E. VI-SEMESTER

BASICS OF MECHATRONICS (OPEN ELECTIVE -VI)

Instruction:1Hrs /week	SEE Marks : 50	Course Code : OE600ME
Credits : 1	CIE Marks: : 30	Duration of SEE : 2Hrs

Course objectives	**Course Outcomes**
The objectives of this course are to: 1. identify the need for mechatronics and its applications 2. study various fluid power systems 3. access various electronic components and devices anddesign mechatronic systems	On completion of the course, the student will be able to: 1. interpret the importance of mechatronics and elements involved 2. design various fluid power systems for mechatronics applications. 3. Study various industrial electronic devices and integrated circuits. 4. analyze various measurement systems and and to study micro controller based CNC machines.

UNIT – I

Introduction to mechanization & automation.

Concept of Mechatronics: Flow chart of mechatronics systems, Actuators and control system, Application in industries.

Introduction to drive mechanisms and electrical actuators: servo motors and stepper motors.

Introduction to fluid power systems: Industrial pneumatics and hydraulics, Merits of fluid power systems, Pneumatic and hydraulic elements and their symbols, Study of hydraulic control values, pumps & accessories, Hydraulic circuits and electro – hydraulic circuits.

UNIT – II

Introduction to industrial electronic devices: Diodes, Transistors, Silicon controlled Rectifiers (SCR), Integrated Circuits (IC)

Measurement systems: sensors, digital-to-analog and analog–to–digital conversion.

Introduction to microprocessor & micro controller: Applications of mechatronics in the design of modern CNC machines.

Learning Resources:

1. W. Bolton, "Mechatronics", 3rd Ed., Pearson Education, India, 2007
2. HMT Limited, "Mechatronics, Tata Mc.Graw– Hill Publishing Company Limited; New Delhi, 1998.
3. Michael B Histand& David G. Alciatore, "Introduction to Mechatronics and Measurement systems", 4th Ed., Tata McGraw-Hill International edition, 2012

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. VI-SEMESTER
OPTIMIZATION METHODS FOR ENGINEERS (OPEN ELECTIVE -VII)

Instruction : 2 Hours /week	SEE Marks : 70	Course Code : OE610ME
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hours

Course objectives	**Course Outcomes**
The objective of this course is to: understand Linear & non-linear programming, transportation modeling , CPM & PERT for project scheduling and control.	On completion of the course, the student will be able to: 1. explain simplex, dual simplex, revised simplex and sensitivity analysis for shop floor problems. 2. Solve transportation model problems and their optimization using Modi method. 3. apply unconstrained and constrained methods like Univariate, steepest descent, Newton etc. for Non linear programming. 4. apply the techniques like CPM and PERT for project management.

UNIT-I
Optimization-An overview
Meaning of Optimization-Origin of Optimization-Introduction to Linear programming problems (LPP) -Formulation of LPP- Graphical method, simplex method

UNIT-II
Advanced topics in Linear programming
Duality in LPP, Differences between primal and dual, Dual simplex method, Revised simplex method, sensitivity analysis

UNIT-III
Transportation Model
Definition of the transportation model-matrix of Transportation model-Formulation and solution of transportation models- Methods for calculating Initial basic feasible solution-Optimization of transportation model using MODI method.

UNIT-IV

Non-linear programming problems

Optimization methods for single variable, multivariable functions, Maxima-Minima; Non-linear programming unconstrained optimization: Random search, Univariate model; Non-linear programming constrained optimization: Steepest descent, Conjugate Gradient, Newton.

Project Scheduling

Introduction to network analysis, Rules to draw network diagram, Fulkerson rule for numbering events, Critical path method, PERT.

Learning Resources:

1. ErPrem Kumar Gupta and Dr. DS Hira, "Operations Research ", S.Chand& Company Pvt. Ltd., 2014.
2. NVS Raju, "Optimization methods for Engineers ", PHI Learning Pvt. Ltd. ., 2014
3. SingiresuS.Rao, "Engineering optimization- Theory and Practice", 4th Edition, John Wiley and Sons, 2009.
4. R. Paneerselvam, "Operations Research", PHI Learning Pvt Ltd., 2009.

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. VI-SEMESTER
ADVANCES IN ENTREPRENEURSHIP (OPEN ELECTIVE -VII)

Instruction : 2 Hrs/week	SEE Marks : 70	Course Code : OE620ME
Credits : 2	CIE Marks: 30	Duration of SEE : 3 Hours

Course Objectives	**Course Outcomes**
The objectives of the course is to 1. understand how to expand business and increase revenues. 2. understand various aspects of finance. 3. understand legalities of running a business.	After completion of the course, the student will be able to 1. understand growth strategies of a start-up & to identify ways and means of expanding customer base. 2. understand customer retention strategies. 3. develop ways and means of growing revenues and develop financial modelling. 4. understand legal formalities and IPR.

UNIT-I

Orientation to Growth: Stages of a Start-up Company, Infant Mortality of Start-up's, Sustaining the Phase of Launching, Growth Opportunities, Diversification and Expansion of Business, Growth Assessment, SWOT Analysis, Growth strategies adopted by Ideal Start-up, Ansoff Growth Matrix, Six ways of Adjacencies for Growth. Case Study of Nike.

Expanding Customer Base: Customer Segmentation: Division of market into segments, Evaluating the Profitability of Segments. Developing Business Model in relation to the current customers. Changing customer segments and revisit of Business Models. Evaluation of Business Models for new customer segments. Critical evaluation of Business Models Old Vs New. Risk of changing the Business Models. Analyzing the scalability of business model using Break Even Analysis.

UNIT-II

Traction and Business: Meaning of Business Traction Process, and Metrics to Measure Business Traction, Customer Retention, Customer Churning, Relationship Business, Customer Life Time Value. Identifying the unnecessary moves in business traction. Traction of business model using Bull's-eye framework. Measuring the effectiveness of selected channels. Budgeting and Planning.

UNIT-III

Growing Revenues: Identifying Growing Revenues, Stabilising growing revenues, Developing additional revenues (licensing and franchising). Exploring New channels and Partnerships for growth revenues. Evaluating the Growth streams based on longevity. Lean Start-up Canvas.

Sales Planning & Financial Modelling: Understanding the customer buying decision behaviour, setting sales plans, sales targets, Art of Pitching the sales, Selling Process, Building a professional sales team, Sales management. Price Sensitivity of Market. Optimisation of cost and operational expenses. Financial modelling of the Venture, Assessment of competitors and Peer's financial models.

UNIT-IV

Support System: Legal Management in Start-ups: Issues and Legal constraints effecting the business. Need for professional services: Legal consultancy and Accounting. Need for proper documentation for fool-proof administration of business. Intellectual Property rights and their importance. Business Mentoring, role of experts in managing business.

Learning Resources:

1. Entrepreneurship Rajeev Roy "”oxford,2012
2. Fundamentals of Entrepreneurship Nandan H,PHI,2013
3. Robert D Hisrich, Michael P Peters , Dean A Shepherd, Entrepreneurship , Sixth Edition, New Delhi, 2006.
4. S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi,2001