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

SYLLABUS BOOK FOR
B.E (CIVIL) V and VI SEMESTER
UNDER CBCS WITH EFFECT FROM 2024–2025
(For the students admitted in 2022-23)

DEPARTMENT OF CIVIL ENGINEERING
+91-40-23146010, 23146011
Fax: +91-40-23146090
Website: www.vce.ac.in

Institution Vision

"Striving for a symbiosis of technological excellence and human values."

Institution Mission

"To arm young brains with competitive technology and nurture holistic development of the individuals for a better tomorrow."

Department Vision

To strive for excellence in order to make the students better citizens with technical knowledge and social awareness

Department Mission

To impart knowledge in the latest technologies to the students of civil engineering to fulfil the growing needs of the society.

Program Educational Objectives (PEOs):

1. To provide a better understanding of basic sciences and fundamentals of civil engineering.

2. To develop competence in latest technologies to serve the industry or pursue higher studies.

3. To inculcate professionalism with effective communication skills and ethical values.

Program Outcomes (POs)
Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

1. Understand various concepts of basic engineering sciences and mathematics to learn advanced concepts of Civil Engineering and apply them to practical problems.

2. Apply principles of various specializations of Civil engineering including structural engineering, transportation engineering, environmental engineering, water resources engineering and Geotechnical engineering to tackle engineering problems.

3. Acquire knowledge of ethical practices, communication skills, technical report writing skills and collaborative effort leading to lifelong learning.

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION (R-22)
BE (CIVIL ENGINEERING) V-SEMESTER ACADEMIC YEAR 2024 - 2025
(Students Admitted in 2022-23)

Course Code	Name of the Course	Scheme of Instruction			Scheme of Examination			
		Hours per Week			Duration	Maximum Marks		Credits
		L	T	P/D	in Hrs	SEE	CIE	
THEORY								
U22HS040EH	Economics and Finance for Engineers	2	-	-	3	60	40	2
U22HS510EH	Skill Development Course-V:(Communication Skills-II)	1	-	-	2	40	30	1
U22PC510CE	Structural Analysis	3	-	-	3	60	40	3
U22PC520CE	Hydraulics and Hydraulic Machinery	3	1	-	3	60	40	4
U22PC530CE	Environmental Engineering	3	-	-	3	60	40	3
U22PC540CE	Reinforced Concrete Design	3	-	-	3	60	40	3
U22PE510CE	Skill Development Course-VI:(Technical Skills-II)	1	-	-	2	40	30	1
U22OEXXXXX	Open Elective-III	3	-	-	3	60	40	3
PRACTICALS								
U22PC511CE	Hydraulics and Hydraulic Machinery Lab	-	-	2	3	50	30	1
U22PC521CE	Environmental Engineering Lab	-	-	2	3	50	30	1
U22PC531CE	Concrete Lab	-	-	2	3	50	30	1
U22PC541CE	Surveying Camp	-	-	-	-	-	50	1
Student should complete one NPTEL (8 weeks) certificate course equivalent to 2 credits by the end of VI semester								
Total		**19**	**1**	**6**		**590**	**440**	**24**
Grand Total		**26**				**1030**		
Note: Surveying Camp will be conducted for one week before the commencement of V-Semester.								
Note: The left over hours are to be allotted to ECA-II / CCA-III/Sports / Library / Mentor Interaction based on the requirement								

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

ECONOMICS AND FINANCE FOR ENGINEERS

SYLLABUS FOR B.E.V SEMESTER

L : T : P (Hrs./week):2:0:0	SEE Marks:60	Course Code: U22HS040EH
Credits : 2	CIE Marks:40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	Upon the completion of this course the students will be expected to:
1. The course will enable the learners to: Understand the concepts and tools of economics, cost and finance that will equip them for decision making.	1. Gain a conceptual understanding of economics as a discipline. 2. Construct a cost sheet and classify costs and make use of break-even analysis in decision making. 3. Evaluate the accounting cycle and explain its importance in recording business transactions 4. Analyze the financial position of business a firm through calculation and interpretation of ratios. 5. Compare and evaluate Long term investment decisions in business

Unit I: Concepts in Economics: Definition of Managerial Economics- Scope of Managerial Economics -Relevance of Economics for Engineers- Law of Demand- assumptions and exceptions - Price elasticity of demand (Application-oriented approach)

Unit II: **Cost Analysis and Profit Planning:** Concept of Cost - Classification of Costs (Fixed Vs Variable, Implicit Vs Explicit, Incremental Vs Marginal)–Preparation of Cost Sheet (Simple Problems)–Breakeven Analysis (Application-oriented approach)

Unit III: **Conceptual Understanding of Accounting:** Accounting Cycle- Journal-Subsidiary Books- Ledger-Trial Balance-Final Accounts (Trading, Profit and Loss Account, Balance Sheet (Theory Only)
Preparation of Trading and Profit and Loss Account and Balance Sheet (Problems without adjustments)

UNIT IV: **Financial Statement Analysis:** Ratio Analysis-uses and limitations- Liquidity, Solvency, Activity & Profitability Ratios (simple problems)

Unit V: **Long Term Investment decisions:** Capital Budgeting –Traditional and DCF Techniques (simple problems)

Learning Resources:

1. S.P.Jain and K.L Narang., "Financial Accounting", Kalyani Publishers – Latest edition.
2. S.P.Jain and K.LNarang., "Cost Accounting", Kalyani Publishers, Latest edition.
3. M.Y.Khan and P.K. Jain., "Financial Management – Text, Problems and Cases", Mc Graw Hill Education Private Limited, New Delhi.Latest edition
4. M. Kasi Reddy &Saraswathi, Managerial Economics and Financial Analysis, PHI New Delhi, Latest edition.
5. Mehta P.L.,"Managerial Economics: Analysis,Problems and Cases", Sultan Chand and Sons. Latest edition.
6. Narayanaswamy, "Financial Accounting: A Managerial Perspective", Prentice Hall India
7. M. L. Seth., "Micro Economics", *Lakshmi Narain Agarwal.* Latest edition
8. Dr. R.P. Rustagi., "Fundamentals of Financial Management"Taxmann Publications. Latest edition

The break-up of CIE: Internal Tests+Assignments + Quizzes

1	No. of Internal Tests	: 2	Max. Marks for each Internal Tests		: 30
2	No. of Assignments	: 3	Max. Marks for each Assignment		: 5
3	No. of Quizzes	: 3	Max. Marks for each Quiz Test		: 5
	Duration of Internal Tests	:	90 Minutes		

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

SKILL DEVELOPMENT COURSE-V (COMMUNICATION SKILL-II)

SYLLABUS FOR B.E.V SEMESTER

L : T : P (Hrs./week):2:0:0	SEE Marks:40	Course Code: U22HS510EH
Credits : 1	CIE Marks:30	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	Upon the completion of this course the students will be expected to:
1. Get students proficient in both receptive and productive skills 2. Enable students to build strategies for effective group interaction and help them in developing decisive awareness and personality while maintaining emotional balance. 3. To introduce students to an ideal structure for a presentation 4. To develop and improve writing and study skills needed for college work.	1. Participate in group and forum discussions by providing factual information, possible solutions, and examples 2. Present a topic by picking up the key points from the arguments placed. 3. Read between the lines and write informed opinions. 4. Prepare, present, and analyze reports

UNIT-1: Delightful Discussions

1.1 Six Thinking Hats
1.2 Group Discussion Techniques (Initiation Techniques, Generating Points, Summarization techniques)
1.3 Case Study Based Group Discussions

UNIT-2: Powerful Presentations

Concise Cogent Presentation
2.1 Persuasion skills
2.2 Toulmin Model
2.3 BikerB - JAM and Extempore

UNIT-3: Fact, Observation and Inference

3.1 Discernment of fact and opinion
3.2 Note making and Inference
3.3 Main idea identification
3.4 Logical Conclusions

UNIT- 4: Effective Technical Writing

4.1 Report writing
4.2 Image Writing
4.3 Book Reviews
4.4 Movie Reviews

Learning Resources:

1. How to Win Friends and Influence People by Dale Carnegie. ...
2. Crucial Conversations: Tools for Talking When Stakes Are High by Kerry Patterson, Joseph Grenny, Ron McMillan, and Al Switzler. ...
3. Difficult Conversations: How to Have Conversations that Matter the Most by Douglas Stone, Bruce Patton, Sheila Heen, and Roger Fisher.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	20
2	No. of Assignments	:	2	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	2	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

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IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING
STRUCTURAL ANALYSIS

SYLLABUS FOR B.E. V SEMESTER

L : T : P (Hrs./week):3 : 0 : 0	SEE Marks:60	Course Code: U22PC510CE
Credit: 3	CIE Marks:40	Duration of SEE: 3 Hours

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 the frames subjected to 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 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

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

UNIT-IV: Approximate methods : Portalmethod 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 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. VaziraniV.N.,Ratwani M.M, Duggal S.K.,"Analysisof Structures-Vol.II Theory, Design and Details of Structures",KhannaPublishers, 16th Edition, 2015.
2. ThandavamoorthyT.S.,"StructuralAnalysis",OxfordHigher Education, Second Edition,2012.
3. Ramamrutham. S,Narayan R.,"Theoryof Structures", DhanpathRai publications, 11th edition, 2020
4. DevdasMenon,"Structural Analysis", 2nd Edition, NarosaBook Distributors Pvt Ltd, 2018.
5. Reddy C.S.,"Basic Structural Analysis",3rd Edition, Mc GrawHill, 2017.
6. Junarkar S. B.,Shah,"Mechanicsof Structures", Volume-II, CharotarPub. House, 24th edition, 2015.
7. Chu-KiaWang,"Intermediate Structural Analysis (English)1stEdition", Mc GrawHill Education,2017.
8. HibbelerR.C.,"Structural Analysis",10/E, Prentice Hall, Higher Education, 2018.
9. Louis F. Geschwindner, Harry H.West,"Fundamentalsof 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/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

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IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

HYDRAULICS AND HYDRAULIC MACHINERY

SYLLABUS FOR B.E. V SEMESTER

L:T:P(Hrs./week):2:0:0	SEE Marks: 60	Course Code: U22PC520CE
Credits:4	CIE Marks: 40	Duration of SEE: 3Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of the course are to	Up on 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, Critical depth, Computation 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.

UNIT-III: Impact of Jets: Force exerted by a jet on a stationary and moving plate; Force exerted on a curved plate, Force exerted by a jet of water on a series of straight plates and curved plates.

UNIT-IV: Hydraulic Turbines: Classification, specific speed, unit quantities, velocity triangles, energy equation for hydraulic machine, principles of design of Pelton wheel turbine, Francis turbine and Kaplan turbine, characteristic curves, cavitation in turbines

UNIT-V: Centrifugal Pump: Components, work done, heads and efficiencies, minimum starting speed, specific speed and characteristic curves of centrifugal pump.

Learning Resources:

1. VenTeChow "Open-Channel Hydraulics" International Student Edition, McGraw-Hill, 2009.
2. Modi P.N., Seth S.M., "Hydraulics and Fluid Mechanics including Hydraulics Machines", Standard Book House, 2019
3. Bansal R.K., "A Textbook Of Fluid Mechanics And Hydraulic Machines", Laxmi Publications, 2018
4. Rama Durgaiah D., "Fluid Mechanics and Machinery" New Age International Publishers, 2002
5. Ojha C.S.P., Brendts son R., Chandramouli P.N., "Fluid Mechanics and Machinery", Oxford University Press,2010.
6. K SrinivasaRaju and D Nagesh Kumar, "Fluid Mechanics problem solving using MATLAB" Prentice Hall of India, 2020
7. K. Subrmanya, "Flow in Open Channel", Tata McGraw Hill Publishers, 5th Edition, 2019
8. http://nptel.ac.in/courses/105103096/3, Hydraulic
9. http://nptel.ac.in/courses/105107059/,FluidMechanics

The break-up of CIE: Internal Tests+Assignments + Quizzes

1	No. of Internal Tests	: 2	Max. Marks for each Internal Tests		: 30
2	No. of Assignments	: 3	Max. Marks for each Assignment		: 5
3	No. of Quizzes	: 3	Max. Marks for each Quiz Test		: 5
	Duration of Internal Tests	:	90 Minutes		

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IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING
ENVIRONMENTAL ENGINEERING

SYLLABUS FOR B.E. V SEMESTER

L : T : P (Hrs./week):3 : 0 : 0	SEE Marks:60	Course Code: U22PC530CE
Credits : 3	CIE Marks:40	1. 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 and air pollution.	1. Assess the water demand and understand the concept of water and wastewater conveyance. 2. Apprehend water quality, unit operations and processes involved in water treatment. 3. Understand the characteristics of domestic sewage and stages of sewage treatment. 4. Understand the biological methods of sewage treatment and natural sewage disposal methods. 5. Understand the concepts of sludge, solid waste management and air pollution.

UNIT-I: Water Demand and Forecasting Methods: Water demand and per capita consumption, population forecasting approaches.
Water distribution: Water distribution systems and solution of a simple network using hardy cross method.
Sewage conveyance: Dry and wet weather flow, types of sewerage networks, sewer appurtenances, Velocity in sewers, Rational method for storm water estimation.

UNIT-II: Water Quality: Standards of potable water, Drinking water quality parameters.
Treat**ment of Water:** Introduction to unit operation and unit processes, 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, Disinfection – necessity and methods, chlorination of water supplied, advanced water treatment methods.

UNIT-III: Wastewater Characteristics: Waste water sampling-significance and techniques; significance of sample preservation, physical, chemical and biological characteristics of wastewater; Population equivalent; Relative Stability.

Waste Water Treatment: Stages of wastewater treatment, Preliminary and primary treatment: Screens: types, disposal. Grit chamber, oil and grease removal, primary settling tanks, Equalization.

UNIT-IV:Biological Treatment Process: Suspended growth system - conventional activated sludge process and its modifications, Principle of stabilization ponds, oxidation ditch. Attached growth system – trickling filter, bio-towers and rotating biological contactors, secondary settling tank. Introduction to Sequential Batch Reactor (SBR) and Up flow Anaerobic Sludge Blanket (UASB) treatment methods.

Natural Methods of sewage disposal: Self-purification of streams, Oxygen sag Analysis, Dilution into sea, disposal by land treatment.

UNIT-V: Sludge management: Introduction to sludge management-characteristics, treatment and disposal methods. Working principal and design of septic tanks for small community.

Learning Resources:

1. S.K.Garg, "Environmental Engineering vol-II, Water supply Engineering", Khanna Publishers, – New Delhi, 35th edition and 2022
2. S.K.Garg, "Environmental Engineering vol-I, Water supply Engineering Sewage Disposal and Air pollution engineering", Khanna Publishers, – New Delhi, 40th edition and 2022
3. B C Punmia, "Environmental Engineering vol-I& II", Laxmi Publications, 1st edition, 2021 (E-book).
4. Karia G.L., and Christian R.A, "Wastewater Treatment Concepts and Design Approach", Prentice Hall of India Pvt. Ltd., New Delhi. 3rd, Edition, 2017
5. Birdi G.S, "Water Supply and Sanitary Engineering", DhanpatRai& Sons, 2014
6. Peavy H.S., Rowe D.R., Tchobanoglous G., "Environmental Engineering", Tata McGraw Hills, New Delhi, 2017 Page | 16 \With effect from the Academic Year 2023-24 (R21)
7. Metcalf & Eddy M.C., "Waste Water Engineering – Treatment & Reuse", Tata McGraw Hill Publications, New Delhi, 2003 8. http://nptel.ac.in/courses/105106119/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests		:	90 Minutes		

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING
REINFORCED CONCRETE DESIGN

SYLLABUS FOR B.E. V SEMESTER

L : T : P (Hrs./week):3 : 0 : 0	SEE Marks:60	Course Code: U22PC540CE
Credits : 3	CIE Marks:40	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. 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. 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 RC Structure-stability, Strength, Service ability 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 RC beams, Balanced, under-reinforced and over reinforced sections; Analysis and desing 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 Service ability: 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 load. Design of solid rectangular slabs.

UNIT-V: Analysis and Design of Columns: Assumptions, axilly 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. Pillai and menon, Reinforced Concrete Design,Narosha publications,4th edition,2021
2. Unni krishna Pillai S and Devdas Menon,"Reinforced Concrete Design",Mc Graw Hill EducationIndia Pvt Ltd.,2017.
3. Varghese P.C,"Limit State Design of Reinforced Concrete",Prentice Hall of India,2008.
4. Subramanian N.,"Design of Reinforced Concrete Structures",Oxford University Press,2013.
5. Robert Park and Thomas Paulay, "Reinforced Concrete structure", Wiley India Pvt. Ltd, 2013.
6. Shah H.J.,"ReinforcedConcrete",Vol.1,CharotarPublishingHouse,2016.
7. Punmia B.C., Ashok K.Jain, Arun K.Jain,"Limit State Design of Reinforced Concrete", Laxmi Publications(P) Ltd.2016.
8. Ramamrutham,"Design of Reinforced Concrete Structures", Dhanpat Rai Publishing Co.,2016.
9. Nptel.ac.in /courses/105105105, Design of Reinforced Concrete Structures.

10. IS:456-2000, Code of Practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, India.
11. SP16:Design Aids for Reinforced Concrete to IS456:1978,Bureau of Indian Standards, New Delhi, India
12. SP24:Explanatory Hand book on Indian Standard Code of Practice for Plain and Reinforced Concrete to IS456:1978, Bureau of Indian Standards, New Delhi, India
13. SP34:Hand bookon Concrete Reinforcement and Detailing (With Amendment1), Bureau of Indian Standards, NewDelhi, India
14. IS:875-1987 Code of Practice For Design Loads (Other Than Earth quake) For Buildings And Structures Parts (1,2,3,4&5), Bureau of Indian Standards, New Delhi, India

The break-up of CIE: Internal Tests+Assignments + Quizzes

1	No. of Internal Tests	: 2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

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IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

SKILL DEVELOPMENT COURSE-VI (TECHNICAL SKILL-II)

SYLLABUS FOR B.E.V SEMESTER

L : T : P (Hrs./week):1:0:0	SEE Marks:40	Course Code: U22PE510CE
Credits : 1	CIE Marks:30	Duration of SEE: 3 Hrs

BIM concepts / Industry standard coding practices through C or other programming languages / Applications of spread sheets in engineering

Introduction to BIM Concepts

1. Introduction to BIM
2. Draw and modify walls & Complex Walls
3. Add and modify wall profiles
4. Place Doors, windows & Components
5. Dimensions and Constraints
6. Create Floor, roofs and Ceilings
7. Curtain walls, grids and mullions
8. Railing, Stairs & Ramps
9. Conceptual models
10. Annotations, legends and Schedules
11. Sheets and Title Blocks
12. Materials and lighting
13. Views, camera, Walk – through, Render & Solar study
14. In place families and families creations
15. Massing and Site Design
16. Link projects & collaboration
17. Realistic presentations
18. Import & Export

The content of technical skills may be altered based on the industry requirements and third party technical expertise available.

The break-up of CIE: Internal Tests+Assignments + Quizzes

1	No. of Internal Tests	: 1	Max. Marks for each Internal Tests	: 30
2	No. of Assignments	: -	Max. Marks for each Assignment	: 5
3	No. of Quizzes	: -	Max. Marks for each Quiz Test	: 5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

HYDRAULICS & HYDRAULIC MACHINERY LAB

SYLLABUS FOR B.E. V SEMESTER

L : T : P (Hrs./week):0:0:2	SEE Marks:50	Course Code: U22PC511CE
Credits: 1	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. Manning's rugosity coefficient and super elevation in open channels. 2. Impact coefficient on different types of vanes and drag and lift force in wind tunnel 3. Pre and post jump depths and calculate loos 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 Flow	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 (Virtual Mode) https://eerc03-iiith.vlabs.ac.in/exp/jets/

4	Centrifugal pump	Determination of efficiency and performance characteristics.
5	Centrifugal pump testing	Determination of efficiency and performance Characteristics under varying loads
6	Pelton Wheel Turbine	Determination of efficiency and Performance characteristics
7	Francis Turbine	Determination of efficiency and Performance characteristics
8	Kaplan Turbine	Determination of efficiency and Performance characteristics
9	Self primingpump	Determination of efficiency and performance characteristics
10	Hydraulic Jump	Determination of pre and post jump depth in channel flow

Learning Resources:

http://eerc03-iiith.virtual-labs.ac.in/ index.php? section=List%

No. of Internal Tests: 01 Max. Marks for Internal Test: 12

Marks for day-to-day laboratory class work 18

Duration of Internal Test: 2 Hours

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

ENVIRONMENTAL ENGINEERING LAB

SYLLABUS FOR B.E. V SEMESTER

L : T : P (Hrs./week):0:0: 2	SEE Marks:50	Course Code: U22PC521CE
Credits: 1	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. 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

LIST OF EXPERIMENTS

1. Determination of Variation of pH.
2. Determination of Chlorides.
3. Determination of Acidity.
4. Determination of Dissolved Oxygen
5. Determination of Biochemical Oxygen Demand (B.O.D.)
6. Determination of total solids and Sludge Volume Index (SVI)
7. Determination of residualchlorine.
8. Determination of turbidity

9. Determination of Nitrates and Sulphates using UV Spectrophotometer
10. Determination of coagulant dose –Jar test.
11. Determination of Chemical Oxygen Demand (C.O.D.)
12. Determination of Sodium &Potassium present in water using flame photometer (Demonstration).
13. Determination of total Iron in water. (Virtual)

No. of Internal Tests: 01 Max. Marks for Internal Test: 12

Marks for day-to-day laboratory class work 18

Duration of Internal Test: 2 Hours

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING
CONCRETE LAB

SYLLABUS FOR B.E. V SEMESTER

L : T : P (Hrs./week):0:0 : 2	SEE Marks:50	Course Code: U22PC531CE
Credits:1	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. Determine the physical properties of cement fine aggregate and coarse aggregate. 2. Determine workability 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 work ablility 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 the experiments and presenting the results effectively.

LIST OF EXPERIMENTS:

I TESTS ON CEMENT

1 (a). Specific gravity of cement
(b). Unit weight or 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 TEST ON AGGREGATE:

5 (a) Specific gravity of fine aggregate.
(b) Bulk density of fine aggregate
(c) Bulk density of fine aggregate

6 (a) Specific gravity of coarse aggregate
(b) Bulk density of coarse aggregate

7 Bulking of sand by laboratory method.

8 Bulking of sand by field method.

9 Fineness modulus of fine aggregate

10 Fineness modulus of coarse aggregate.

III TEST ON CONCRETE

11 Workability of concrete by slump test

12 Workability of concrete by compacting factor test

13 Compressive strength of concrete

14 Flexural strength of concrete

15 A Concrete Mix Design using IS Code 10262

IV EXPERIMENTS FOR DEMONSTRATION ONLY

16 Non – Destructive Testing of Concrete Structures.

17 Workability of concrete by Flow test

18 Workability of concrete by Vee-Bee test.

Learning Resources:

1. IS: 269-2013, Indian Standard Code of Practice for Ordinary Port land Cement, 33 Grade-Specifications (Fourth Revision), Bureau of Indian Standards, New Delhi.
2. IS: 8112-2013, Indian Standard Code of Practice for 43 Grade Ordinary Portland Cement-Specifications (First Revision), Bureau of Indian Standards, New Delhi.
3. IS: 12269-2013, Indian Standard Code of Practice for ordinary Port land Cement, 53 Specifications, Bureau of Indian Standards, New Delhi.
4. IS: 650-2008, Indian Standard Code of Practice for Standards and for Testing Cement-Specifications (Second Revision), Bureau of Indian Standard, New Delhi.
5. IS: 2386 (Part-III) – 2002, Indian Standard Methods of Test for Aggregates for Concrete, Bureau of Indian Standards, New Delhi.
6. IS:1199-2002, Indian Standard Methods of Sampling and Analysis of

Concrete, bureau of Indian Standards, New Delhi.
7. IS: 516-2004, Indian Standard Methods of Tests for Strength of Concrete, Bureau of Indian Standards, New Delhi.
8. IS: 13311 (Part-1)-1992 (Reaffirmed-2004), 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 (Reaffirmed-2004), 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 (Reaffirmed-2004), Indian Standard Methods of Physical Tests for Hydraulic Cement, Determination of Fineness by Blaine Air Permeability Method, Bureau of Indian Standards, New Delhi.
11. IS10262-2019-Indian Standard Concrete Mix Proportioning – Guide lines

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18

Duration of Internal Test: 2 Hours

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

SURVEYING CAMP

SYLLABUS FOR B.E. V SEMESTER

L : T : P (Hrs./week):0:0:0	SEE Marks: - - -	Course Code: U22PC541CE
Credits: 1	CIE Marks: 30	Duration of SEE: ---

COURSEOBJECTIVES	COURSEOUTCOMES
The objectives of the course are to	Upon the completion of the course, students are expected to
1. Field exercise with modern surveying equipment including GPS and Total Station. 2. All aspects of executing and plotting of field surveys. 3. Capturing top of graphical 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 team member.

Course Content:

A one week (6 days, 36 hours) 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 30 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 a field survey, and plotting of the same.

OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS IN BE V-SEMESTER

Dept	Course Code	Name of the Course	Stream Type	Stream Name	Credits
Civil	U22OE510CE	Spatial Information Technology	General	-	3
CSE	U22OE510CS	Introduction to Operating Systems	General	-	3
CSE	U22OE520CS	Fundamentals of Artificial Intelligence	Stream	AI&ML	3
ECE	U22OE510EC	Introduction to Biomedical Electronics	General	-	3
EEE	U22OE510EE	Modelling and Simulation of Basic Photovoltaic Systems	General	-	3
Mech.	U22OE520ME	Introduction to Robotics	General	-	3
Mech.	U22OE510ME	Drives and Control Systems for Robotics	Stream	Robotics	3
IT	U22OE510IT	Essentials of Operating Systems	General	-	3
IT	U22OE520IT	Introduction to Artificial Intelligence	Stream	AI&ML	3
Phy.	U210E51OPH	Thin Film Technology and Applications	General	-	3
H&SS	U21OE530EH	Design Thinking	General	-	3
HSS	U21OE020EH	Technical Writing and Professional Presentations	General	-	3

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

SPATIAL INFORMATION TECHNOLOGY
(Open Elective-III)

SYLLABUS FOR B.E. V SEMESTER

L : T : P (Hrs./week):3:0: 0	SEE Marks:60	Course Code:U22OE510CE
Credits : 3	CIE Marks:40	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 Remote sensing GPS and GIS.	1. Select the type of remote sensing technique/data, identify and analyze the earth surface features from the satellite images. 2. Identify GPS components, interpret the navigational message and signals received by the GPS satellites, Identify the error sources and apply corrections for accurate positioning. 3. Analyse the basic components of GIS, process spatial and attribute data, identify and rectify mapping inaccuracies and prepare thematic maps

UNIT-I: Introduction and Basic Concepts of Remote Sensing : Introduction, Basic concepts of remote sensing, Airborne and space born sensors, Passive and active remote sensing, EMR Spectrum, Energy sources and radiation principles, Energy interactions in the atmosphere, Energy interactions with earth surface features, Atmospheric windows, Spectral reflectance curves

UNIT-II: Remote Sensing Systems: Satellites and orbits, Polar orbiting satellites, Image characteristics and different resolutions in Remote Sensing, Multispectral, thermal and hyperspectral remote sensing. Some remote sensing satellites and their features, Map and Image, color composites,

introduction to digital data, elements of visual interpretation techniques. Applications of Remote sensing in various fields.

UNIT-III: Global positioning Systems (GPS) : Overview of GNSS and Introduction to GPS, GLONASS, GALILEO, COMPASS, IRNSS systems , Applications of GPS.
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 message

UNIT-IV: Errors and Positioning methods of GPS: 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). GPS Carrier Phase measurements: Single Differencing, Double Differencing and Triple Differencing in GPS measurements.

UNIT-V:Basic Concepts: Introduction to GIS, Areas of GIS application, Components of GIS, Overview of GIS Software packages, Current issues and Trends in GIS. Variables-Point, line, polygon, Map projections, Map Analysis.
GIS Data: Data types – spatial, non-spatial (attribute data) – data structure, data format – point line vector – Raster – Polygon
Data Input : Keyboard entry, Manual Digitizing, Scanner, Remotely sensed data, Existing Digital data Cartographic database, Digital elevation data
Data Editing: Detection and correction of errors, data reduction, edge matching

Learning Resources:

1. James B. Campbell & Randolph H. Wynne., Introduction to Remote Sensing, The Guilford Press, 2011
2. Lillesand, Kiefer, Chipman., Remote Sensing and Image Interpretation, Seventh Edition, 2015
3. Leick, A., GPS Satellite Survey, John Wiley: NJ, 2015
4. Hofmann, B., Lichtenegger H. and Collins J., Global Positioning System: Theory and Practice, Springer: Berlin, 2011.
5. BasudebBhatta, Remote Sensing and GIS, Oxford University Press, 2011.
6. Hofmann-Wellenh of, Bernhard, Lichtenegger, Herbert, Wasle, Elmar, GNSS – GPS, GLONASS, Galileo and more, 2013
7. ThanappanSubash., Geographical Information System, Lambert Academic Publishing, 2011.
8. Paul Longley., Geographic Information systems and Science, John Wiley & Sons, 2005

9. John E. Harmon & Steven J. Anderson., The design and implementation of Geographic Information Systems, John Wiley & Sons, 2003
10. ArcGIS 10.1 Manuals, 2013.
11. Kang Tsung Chang., Introduction to Geographic Information Systems, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2008.
12. Burrough, P.A., Principles of GIS for Land Resource Assessment, Oxford Publications, 2005.
13. C.P.Lo& Albert K. W.Yeung, Concepts and Techniques of Geographic Information Systems, Prentice Hall India Pvt.Ltd, 2002.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
INTRODUCTION TO OPERATING SYSTEMS
(OPEN ELECTIVE-III)
(COMMON FOR CIVIL, ECE, EEE & MECH)

SYLLABUS FOR B.E. V-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code : U22OE510CS
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 Understand different Operating system Structures and Services.	1 Explain Operating system structures and internal structure of a process 2 Compare CPU scheduling algorithms. Analyze Disk scheduling algorithms 3 Apply different techniques for Main memory management. 4 Describe file management techniques. 5 Describe deadlock handling methods.

UNIT-I: Introduction to operating systems: Definition, User view and System view of the Operating system, Operating system structure, Operating system services.
Process: Process concept, Process Control block, Context switching.

UNIT-II: CPU Scheduling: Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, Round Robin
Device Management: Disk Scheduling algorithms: FCFS, SSTF, SCAN.

UNIT –III: Memory Management: Swapping, Contiguous memory allocation: Fixed Partitioning, Variable Partitioning. Non-Contiguous memory allocation: Paging.
Virtual memory: Demand paging, Page replacement Algorithms: FIFO, Optimal, LRU.

UNIT –IV: File System Interface: File Concept, Access Methods: Sequential, Indexed, and Direct
File System Implementation: File-System Structure, Allocation Methods: Contiguous, Linked and Indexed.

UNIT-V: Deadlocks: System model, deadlock characterization: Mutual Exclusion, Hold and Wait, Non pre-emption, Circular wait. Deadlock Prevention, Deadlock Avoidance: Banker's algorithm.

Learning Resources:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, *Operating System Concepts*, 9th Edition (2016), Wiley India.
2. Andrew S. Tanenbaum, *Modern Operating Systems*, 2nd Edition (2001), Pearson Education, Asia.
3. Dhananjay, Dhamdhere.M, *Operating System-concept based approach*, 3rd edition (2009), Tata McGraw Hill, Asia
4. Robet Love: *Linux Kernel Development*, (2004)Pearson Education
5. Richard Stevens, Stephen Rago, *Advanced Programming in the UNIX Environment*, 3rd Edition(2013), Pearson Education
6. http://web.stanford.edu/~ouster/cgi-bin/cs140-spring19/index.php
7. https://nptel.ac.in/courses/106106144/

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

Stream- Artificial Intelligence & Machine Learning

(OPEN ELECTIVE-III)

(COMMON for CIVIL, ECE, EEE & MECH)

SYLLABUS FOR B.E V SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code:U22OE520CS
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVE	**COURSE OUTCOMES** *On completion of the course, students will be able to*	
Understand issues and techniques involved in the creation of intelligent systems.	1	Solve searching problems using A*.
	2	Develop an algorithm for playing games.
	3	Represent the knowledge using propositional logic and predicate logic
	4	Understand the Expert Systems
	5	Construct Neural Network to solve problems

UNIT-I: Introduction: Intelligent Systems, Foundation of AI, Sub areas of AI, Applications.

Problem Solving – State – Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of problem, Exhaustive Searches, Heuristic Search Techniques, Iterative – Deepening A*.

UNIT-II: Problem Reduction & Game Playing: Game Playing, Bounded Look – Ahead Strategy and use of Evaluation Function, MINIMAX procedure, Alpha-Beta Pruning.

UNIT-III: Logic Concepts: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, resolution Refutation in Propositional Logic, Predicate Logic.

UNIT-IV: Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert System versus Traditional Systems, Truth Maintenance Systems, Application of Expert Systems.

UNIT-V:Artificial Neural Networks: Introduction Artificial Neural Networks, Single – Layer Feed Forward Networks, Multi – Layer Feed Forward Networks.

Learning Resources:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning, 2011.
2. Russell, Norvig," Artificial Intelligence, A Modern Approach ", Pearson Education, Second Edition, 2004.
3. Elaine Rich, Kevin Knight, Shivshankar B. Nair, "Artificial Intelligence", Tata McGraw Hill, Third Edition 2009.Stuart Russell, Peter Norvig, Artificial Intelligence – A Modern Approach, ThirdEdition(2019),Pearson
4. NilsJ.Nilsson,ArtificialIntelligence:ANewSynthesis,(1998),Elsevier

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

INTRODUCTION TO BIOMEDICAL ELECTRONICS

(Open Elective - III)

(Civil, CSE, CSE (AI&ML), EEE,IT &Mechanical)

SYLLABUS FOR B.E. V – SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: U22OE510EC
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To provide fundamental knowledge of biomedical signals, transducers and various instruments.	On completion of the course, students will be able to 1. recite the basic need of biomedical signals and basic instruments. 2. comprehend the principles of basic bioelectric signals, electrodes and transducers in biomedical electronics. 3. demonstrate the principle of various therapeutic, prosthetic and non invasive instruments for use and prediction of diseases. 4. to acquire knowledge of the mathematical, physical and computational principles underlying modern medical imaging system for visualization and analysis of medical image data.

UNIT - I : Basics of Biomedical Electronics: Physiological systems of the body, sources of biomedical signals, basic medical instrumentation system, performance requirements of medical instrumentation systems, Intelligent medical instrumentation systems, General constraints in design of medical instrumentation systems.

UNIT - II : Bioelectric Signals, Electrodes, Transducers: Origin of bioelectrical signals, recording electrodes, electrodes for ECG, EEG, EMG, micro-electrodes. Transducer: Introduction, classification of transducers, performance characteristics of transducers, displacement position and motion transducers, pressure transducers, photoelectric transducer.

UNIT - III : Therapeutic and Prosthetic Devices: Cardiac pacemaker, defibrillators, hemodynamic &haemodialysis, ventilators, infant incubators, surgical instruments, therapeutic applications of laser.

UNIT - IV : Non-invasive Instrumentation: Temperature measurements, principles of ultrasonic measurements and its applications in medicine, medical thermography, physics of thermography infrared detectors and thermographic detectors.

UNIT - V : Modern Medical Imaging System: Radiography: Production of X-rays, units of X-radiation, block diagram of X-ray machine, MRI, computed tomography: Block diagram and working.

Learning Resources:

1. L. Cromwell, Biomedical Instrumentation and Measurements, Prentice Hall.
2. Handbook of Biomedical Instrumentation by R.S. Khandpur.
3. S.K. Venkata Ram, Bio-medical Electronics and Instrumentation, Galgotia Publications, Pvt. Ltd.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MODELLING AND SIMULATION OF PHOTOVOLTAIC SYSTEMS

(Open Elective-III)

SYLLABUS FOR B.E. V SEMESTER

L: T: P (Hrs/Week):3:0:0	SEE Marks: 60	Course Code:U22OE510EE
Credits:3	CIE Marks: 40	Duration of SEE: 3Hours

COURSE OBJECTIVES The course will enable the students to:	**COURSE OUTCOMES** On completion of the course, students will be able to
1. Understand photovoltaic systems concepts, design criteria and conclusions, 2. Verify model of photovoltaic systems using PSpice.	1. Understand basics of solar radiation and PSpice software. 2. Use a simplified analytical model of solar cell which can be implemented in PSpice. 3. Examine basic equations of a solar cell and develop PSpice models 4. Describe the association of solar cells to form PV arrays and PV modules. 5. Interface PV systems to supply either DC or AC loads.

UNIT-I Introduction to Photovoltaic Systems and PSpice: Photovoltaic system: Introduction, Important definitions: irradiance and solar radiation, Learning some of PSpice basics, Using PSpice subcircuits to simplify portability, PSpice piecewise linear (PWL) sources and controlled voltage sources, Energy input to the PV system: solar radiation availability, Problems

UNIT-II Spectral Response and Short-Circuit Current: Introduction: Absorption coefficient and Reflectance, Analytical solar cell model, PSpice model for the short-circuit spectral current density, Short-circuit current, Effects of solar cell material, DC sweep plots and I(V) solar cell characteristics, Ideal circuit model: series and shunt resistances and recombination terms, Problems

UNIT-III: Electrical Characteristics of the Solar Cell: Ideal equivalent circuit, PSpice model of the ideal solar cell, Open circuit voltage, Maximum power point, Fill factor (FF) and power conversion efficiency, Generalized model of a solar cell, Effects of the series resistance on the short-circuit current and the open-circuit voltage, Effects of the shunt resistance, Effects of the recombination diode, Temperature effects, Problems

UNIT-IV: Solar Cell Arrays, PV Modules and PV Generators: Introduction, Series connection of solar cells, Identical solar cells in series, Bypass diode in series strings of solar cells, Shunt connection of solar cells, Shadow effects, The terrestrial PV module, Photovoltaic arrays, Photovoltaic generators and PV plants, Problems

UNIT-V:Interfacing PV Modules to Loads and Battery Modelling: DC loads directly connected to PV modules, Photovoltaic pump systems, DC series motor PSpice circuit, Centrifugal pump PSpice model, PSpice simulation of a PV array-series DC motor-centrifugal pump system, PV modules connected to a battery and load, Lead–Acid battery PSpice model, PSpice model to commercial batteries, Simplified PSpice battery model, Problems

Learning Resources:

1. Luis Castaner and Santiago Silvestre, Modelling Photovoltaic Systems using PSpice, John Wiley & Sons Ltd, 2002
2. Paul Tobin, PSpice for Circuit Theory and Electronic Devices, Morgan & Claypool Publishers, 2007.
3. Muhammad H. Rashid, Introduction to Pspice Using Orcad for Circuits and Electronics, Prentice-Hall of India Pvt.Ltd, 2004.
4. Orcad Capture User's Guide, Cadence Design Systems, Second edition 2000.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF MECHANICAL ENGINEERING

INTRODUCTION TO ROBOTICS
(General Pool)
(Open Elective-III)
SYLLABUS FOR B.E. V-SEMESTER

L:T:P(Hrs./week):3	SEE Marks : 60	Course Code: U22OE520ME
Credits : 3	CIE Marks: : 40	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. understand the anatomy of the robot and various robot configurations for it's selection depending on the task. 2. classify the end effectors , understand different types of joints, various types of robot drive systems for carrying out the assigned job effectively. 3. analyze a planar manipulator through forward kinematics and understand the control of robot manipulator for better reliability and efficiency using python programming. 4. Classify the various sensors used in robots for proper selection to an application. 5. summarize various industrial and non-industrial applications of robots for their selection to a particular task.

UNIT-I:Robot Basics: Robot-Basic concepts, Definition, Need, Law, History, Anatomy, specifications. Robot configurations-cartesian, cylindrical, polar ,articulated and SCARA, Serial manipulator &ParallelManipulator
Robot wrist mechanism, Precision and accuracy of robot.

UNIT-II: Robot Elements: End effectors-Classification, Robot drive system types: Electrical, pneumatic and hydraulic. Robot joints and links-Types, Motion interpolation, Robot trajectories2D and 3D Transformation- Scaling, Rotation and Translation, Homogeneous transformation

UNIT-III: Robot Kinematics and Control: Robot kinematics – Basics of direct and inverse kinematics. D-H matrix. Forward kinematics for a 2-link RR planar manipulator.
Control of robot manipulators – Point to point and Continuous Path Control. Robot programming methods.Introduction to solve any robotic kinematic problem using python programming.

UNIT-IV: Robot Sensors: Sensors in robots – Touch sensors-Tactile sensors – Proximity and range sensors. Force sensors, Light sensors, Pressure sensors, position and velocity feedback devices.
Introduction to Machine Vision and Artificial Intelligence.

UNIT-V: Robot Applications: Applications of robots in Industries, Medical, Household, Entertainment, Space, Underwater, Defense, and Disaster management. Applications of Micro and Nanorobots, Future Applications of robots.

Learning Resources:

1. Mikell P. Groover, Mitchell Weiss, Roger N Nagel and Nicholas G Odrey, "Industrial Robotics Technology, Programming and Applications", TataMcGraw-Hill Publishing Company Limited , 2008.
2. Deb.S.R and Sankha Deb, "Robotics Technology and Flexible Automation", Tata McGraw HillPublishing Company Limited, 2010.
3. KlafterR.D, Chmielewski T.A, and Negin. M, "Robotic Engineering: An Integrated Approach", Prentice Hall of India Pvt. Ltd.,1994.
4. K.S. Fu,R.C. Gonzalez and C.S.G.Lee , "Robotics control, sensing, vision and intelligence",TataMcGraw-Hill Publishing Company Limited, 2008
5. R.K. Mittal and I.J.Nagrath"Robotics and Control", Tata McGraw-Hill Publishing Company Limited, 2003.

The break-up of CIE: Internal Tests+Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF MECHANICAL ENGINEERING

DRIVES AND CONTROL SYSTEMS FOR ROBOTICS

(Stream: Robotics)

(Open Elective-III)

SYLLABUS FOR B.E. V-SEMESTER

Instruction : 3Hours	SEE Marks : 60	Course Code : U22OE510ME
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

Course objectives	Course Outcomes
The objectives of this course are to: To provide students with a fundamental understanding of control systems and their applications in robotics.	On completion of the course, the student will be able to: 1. Understand basic control system types and analyze block diagrams using transfer functions. 2. Interpret transient and steady-state responses and understand system stability concepts. 3. Represent control systems using state-space models and convert between state-space and transfer functions. 4. Understand control techniques to achieve precise and stable joint control in robotic systems. 5. Implement advanced control strategies to enhance the performance and interaction of robotic systems.

UNIT-I: Introduction to Control Systems: Examples of control systems, Open Loop & Closed Loop Systems.Transfer function of spring-mass-damper system, Transfer function of simple RLC circuit. Block diagrams, Block diagram reduction.

UNIT-II: Steady-State and Transient Response: Transient Response of first order and second order system to step input. Concept of steady-state error. Stability: Introduction to the concept of stability using Routh-Hurwicz criterion.

UNIT-III: State–space representation of linear control systems: Basic concepts. State–space representation of spring-mass-damper system, State–space representation of simple RLC circuit. Conversion of Transfer function into State Space, Conversion of State-Space in to Transfer Function.

UNIT-IV: Independent Joint Control: Transfer function of Armature Controlled DC Motor, Proportional (P) Control, Proportional-Integral (PI) Control, Proportional-Derivative (PD) Control, Proportional-Integral-Derivative (PID) Control.

UNIT-V: Computed Torque Feed-forward Control, Force Control: Compliance Control, Impedance Control, Hybrid Force/Motion Control.

Learning Resources:

1. Norman S. Nise, "Control Systems Engineering", John Wiley & Sons, Inc., 2001.
2. Ogata, K. "Modern Control Engineering", Prentice Hall, 2004
3. Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer Science & Business Media, 2008
4. Spong, Mark W., and M. Vidyasagar, Robot dynamics and control. John Wiley & Sons, 2008.

The break-up of CIE: Internal Tests+Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF INFORMATION TECHNOLOGY

ESSENTIALS OF OPERATING SYSTEMS
(GENERAL TRACK : OPEN ELECTIVE-III)

(Common for CIVIL, ECE, EEE & MECH)

SYLLABUS OF B.E V- SEMESTER

L:T:P(Hrs./week): 3:0:0	SEE Marks :60	Course Code : U22OE510IT
Credits :3	CIE Marks: 40	Duration of SEE :3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
Learn the principles of modern operating systems i.e various functionalities provided by an operating system such as process management, memory management, Storage and I/O management.	1. Analyze the importance and its key principles by differentiating and categorizing the functionalities of an operatingsystem 2. Examine mechanisms involved in memory management to handle processes and threads. 3. Evaluate and solve deadlocks by assessing various handling strategies related to each of the conditions for deadlock. 4. Interpret the mechanisms adopted for storage organization and access. 5. Interpret the mechanisms adopted for I/O organization and access.

UNIT-I: Introduction and Process Management:

Operating System Functionalities, Types of Operating Systems, User Operating System Interface, System calls, System Boot. Process Concept: Overview, Threads. Process Scheduling - Uniprocessor scheduling algorithms, Multiprocessor and Real-time scheduling algorithms.

UNIT-II: Memory Management:

Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation. Virtual Memory Management: Demand Paging, Page replacement algorithms, Thrashing.

UNIT-III: Process Synchronization:

Inter Process Communication, Process Synchronization - Peterson's Solution, Bakery Algorithm, Semaphores, Critical Section, Monitors. Classical problems

of synchronization. Deadlocks: Deadlock prevention, deadlock avoidance and Deadlock Detection and Recovery - Bankers Algorithm.

UNIT-IV: Storage Management:

File System-Basic Concepts, File System Structure, File System Mounting, Directory Structure, Allocation Methods, Free Space Management.

UNIT-V: I/O Management:

I/O Management: Disk Structure, RAID Structure, Disk Scheduling, Protection: Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix.

Learning Resources:

1. Operating System Concepts - Operating System Concepts, Tenth Edition, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, John Wiley & Sons Inc.
2. Modern Operating Systems- Andrew S Tanenbaum, Prentice Hall
3. Operating Systems - Operating System: Internals and Design Principles , William Stallings
4. Operating Systems - System Programming and Operating Systmes D M Dhamdhere, Tata Mc Graw Hill
5. Operating Systems - Operating Systems: A Modern Perspective, Gary Nutt, Addison Wesley
6. Operating Systems - Operating Systems, Achyut S Godbole, Tata Mc Graw Hill
7. https://nptel.ac.in/courses/106108101/
8. https://www.classcentral.com/course/udacity-introduction-to-operating-systems-3419

The break-up of CIE: Internal Tests+Assignments + Quizzes

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3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

(AI&ML TRACK : OPEN ELECTIVE-III)

(Common for CIVIL, ECE, EEE & MECH)

SYLLABUS OF B.E V- SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code: U22OE520IT
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
The objective of this course is to provide the necessary fundamentals, approaches in Artificial intelligence for problem solving for a goal-based single or multi agents with or without constraints and formalise soft computing techniques for better optimization for intelligent systems.	1. Investigate applications of AI techniques in intelligent agents. 2. Apply various search algorithms for demonstrating agents, searching and inferencing 3. Analyse searching beyond classical search and adversarial Techniques. 4. Identify problem types which might have constraints and evolutionary computation. 5. Define the fuzzy systems, ethics and risks of AI.

UNIT-I: Introduction to AI: What is AI, Foundations of AI, History of AI, State of the Art, Applications of AI.
Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT-II: Solving Problems by Search: Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies: Breadth first search, Depth-first search, Depth limited search, Iterative deepening depth first search
Informed (Heuristic) Search Strategies: Greedy best first search, A* Search, Optimality of A*, Heuristic Functions.

UNIT-III: Beyond Classical Search: Local search and optimization problems, Local search in continuous spaces, Searching with non-deterministic actions and partial observations.

Adversarial Search: Games, Optimal decisions in games, Alpha-Beta Pruning, Imperfect real time decisions.

UNIT-IV: Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.
Introduction to Evolutionary Computation: Representation – The Chromosome, Initial Population, Fitness Function, Selection, Reproduction Operators, Stopping Conditions, Evolutionary Computation versus Classical Optimization.

UNIT-V: FUZZY Systems, Logic and Reasoning: Fuzzy Sets- Formal Definitions, Membership Functions, Fuzzy Operators, Fuzzy Set Characteristics, Fuzziness and Probability, Fuzzy Inferencing.
Philosophical foundations: Weak AI, Strong AI, Ethics of AI and Risks of AI.

Learning Resources:

1. Artificial Intelligence A Modern Approach Third Edition – Russell & Norvig
2. Computational Intelligence: An Introduction, 2nd Edition - Andries P. Engelbrecht
3. https://online.stanford.edu/courses/cs221-artificial-intelligence-principles-and-techniques
4. https://nptel.ac.in/courses/106105077
5. https://ocw.mit.edu/courses/6-034-artificial-intelligence-spring-2005/

The break-up of CIE: Internal Tests+ Assignments + Quizzes

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2	No. of Assignments:	3	Max. Marks for each Assignment:	5
3	No. of Quizzes:	3	Max. Marks for each Quiz Test:	5

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF PHYSICS

THIN FILM TECHNOLOGY AND APPLICATIONS

SYLLABUS FOR B.E. V-SEMESTER

L:T:P(Hrs./week):3	SEE Marks : 60	Course Code: U22OE510PH
Credits : 3	CIE Marks: : 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	On completion of the course, students will be able to
1. Learn the fundamental atomistic mechanisms. 2. Narrate thin film deposition techniques 3. Acquire knowledge on thin film devices 4. Appreciate applications of thin films	1. State fundamental definitions of thin film technology 2. Describe thin film deposition techniques 3. Illustrate thin film devices and their use 4. Apply thin films coatings for a variety industrial applications

UNIT-I: Thin Film Growth: Classification of films- formation of thin films- Condensation and nucleation, growth and coalescence of islands, -nucleation theories: capillarity and atomistic models, sticking coefficient, adhesion, substrate effect, film thickness effect.

UNIT-II: Deposition Techniques: Thin film deposition techniques-simple thermal evaporation- Chemical vapor deposition technique-Advantages and disadvantages of Chemical Vapor deposition (CVD), physical vapour deposition electron beam evaporation- RF sputtering, Laser ablation- spin coating-molecular beam epitaxy (MBE), Film thickness measurement-ellipsometry, quartz crystal oscillator techniques.

UNIT-III: Thin Film Material Characterization Techniques: Characterization techniques: X-Ray Diffraction (XRD), working principles of Scanning Electron Microscopy (SEM), working of Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM).

UNIT-IV: Properties of Thin Films: Electrical conduction in continuous and discontinuous metallic thin films. Transport and optical properties of metallic, semiconducting and dielectric films.

UNIT-V: Thin Film Devices and Applications: Anti-reflection coatings, fabrication ofthin film gas sensors and temperature sensors. Thin film solar cells, Quantum well and Quantum dot solar cells. Application of thin films in different areas such as electronics, medical, defense, sports, automobiles, applications of thin films in various fields etc.

Learning resources:

1. Kasturi Chopra Thin Film Device Applications, Mac Graw Hill, New York, 2012
2. A. Goswami, thin film fundamentals, New age international, 2006

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

DESIGN THINKING

SYLLABUSFORB.E.V-SEMESTER

L:T:P(Hrs/Week):3:0:0	SEE Marks:60	Course Code:U22OE530EH
Credits: 3	CIE Marks:40	Duration of SEE:3Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to:	On completion of the course, students will be able to
1. Understand the critical design thinking skills needed to either improve an existing product or thinking design a new product. 2. Learn to identify customer needs and draft customer needs statements as your first step toward user innovations. 3. Learn how to translate user needs into product specifications quantitatively, and how establishing product metrics can help to define those specifications. 4. Learn to apply creativity, brainstorming, and concept generation process in designing needs solutions. 5. Learn to select and implement a product development process that's aligned with your project needs. Explore prototyping methods, strategies, and real-life examples where these have been applied to create a design that represents customer needs and product specifications.	1. Learn the concepts that drive design thinking. 2. Submit project ideas around user Innovations. 3. Identify prospective customer needs and user groups. 4. Translate needs into product specifications 5. Build out the product architecture, Create a prototype and present the prototype.

Unit 1: Design Thinking Skills

Understand the critical design thinking skills needed to either improve an existing product or design a new product.

1.1 The Need for Design Thinking
1.2 What makes design thinking unique?
1.3 Design thinking checklist

Unit 2: Identifying Customer Needs

Learn to identify customer needs and draft customer needs statements as your first step towards user innovations.

2.1 Think Users' First
2.2 Users' inherent needs
2.3 Empathy and Design Thinking
2.4 Asking the Right Questions
2.5 Persona Empathy map

Unit 3: Product Specifications

Learn how to translate user needs into product specifications quantitatively, and how establishing product metrics can help define those specifications

3.1 Creating a Design Brief Template
3.2 Stakeholder map template
3.3 Customer journey template
3.4 Context map template
3.5 Opportunity map template

Unit 4: Applied Creativity

Learn to apply creativity, brainstorming, and concept generation process in designing needs solutions.

4.1 The need to ideate
4.2 The Rules of ideation
4.3 Participating in an ideation session
4.4 Building a Creative Culture
4.5 Divergent—5 common ideation techniques

Unit 5: Product Development Processes and Prototyping

Learn to select and implement a product development process that's aligned to your project needs. Explore prototyping methods, strategies, and real-life examples where these have been applied to create a design that represents customer needs and product specifications.

5.1 The need for a prototype
5.2 The Need to Test and how to conduct a structured test
5.3 How to conduct the observers' debrief

METHODOLOGY

- Case Studies
- Demonstration
- Presentations
- Expert lectures
- Writing and Audio-visual lessons

ASSESSMENTS

- Online assignments
- Individual and Group

Suggested Books

The Art of Innovation, by Tom Kelley*
Insight Out, by Tina Seelig*
Change by Design, Tim Brown
Weird Ideas That Work, by Robert Sutton*
Wired to Care, by DevPatnaik
Rapid Viz, by Kurt Hanks and Larry Belliston

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

TECHNICAL WRITING AND PROFESSIONAL PRESENTATIONS (OE)

SYLLABUS FOR B.E.V-SEMESTER

L:T: P (Hrs/Week):3:0:0	SEE Marks: 60	Course Code:U22OE020EH
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the learners to: 1. Understand the principles and mechanics of technical writing for students of engineering. 2. Identify different kinds of business correspondences and the dos and don'ts for each of them. 3. Make effective presentations as part of today's workplace demands. 4. Recognize the need for Video and Written CVs with focus on specific elements. 5. Comprehend skills associated with technical writing and understand different papers ranging from process description and feasibility reports to research projects, project proposals, and SOPs	**At the end of the course the learners will be able to: -** 1. Write effective reports. 2. Articulate business correspondences based on need. 3. Make persuasive presentations. 4. Design their videos CVs. 5. Write papers ranging from process description and feasibility reports to research projects, project proposals, and statement of purpose

UNIT 1: FORMAL & INFORMAL TECHNICAL REPORTS

1.1 Informal Report Formats
1.2 Project and Research Reports
1.3 Formal Report Components, Feasibility Reports, Evaluation reports
1.4 Analytical and Informational reports
1.5 Executive summaries.

UNIT 2: BUSINESS CORRESPONDENCE

2.1 Electronic communication
2.2 Effective emails
2.3 Instant and text messaging guidelines

UNIT 3: PROFESSIONAL PRESENTATIONS

3.1 Paper presentations & Poster presentations
3.2 PowerPoint presentations
3.3 Storyboard writing

UNIT 4: RESUME & CVs

4.1 Technical Resume
4.2 Cover letter, resume format
4.3 Video CVs

UNIT 5: WRITING PROPOSALS & SOPs

5.1 Types of proposals
5.2 Request for proposals
5.3 Stating your objective.

METHODOLOGY

- Case Studies
- Demonstration
- Presentations
- Expert lectures
- Writing and Audio-visual lessons

ASSESSMENTS

- Online assignments
- Individual and Group

LEARNING RESOURCES

learn.talentsprint.com

1. Read Me First!: A Style Guide for the Computer Industry by Sun Technical Publications
2. Eats, Shoots and Leaves Paperback – 18 February 2010 by Lynne Truss
3. Don't Make Me Think, Revisited: A Common Sense Approach to Web & Mobile Usability | Third Edition | By Pearson Paperback –
4. The Design of Everyday Things: Revised and Expanded Edition Paperback Illustrated,
5. November 2013 by Don Norman (Author)

The break-up of CIE: Internal Tests+ Assignments + Quizzes

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2.No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3.No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Test: 90 minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CIVIL ENGINEERING

SCHEME OF INSTRUCTION AND EXAMINATION (R-22)
BE (CIVIL ENGINEERING) VI-SEMESTER ACADEMIC YEAR 2024 - 2025
(Students Admitted in 2022-23)

Course Code	Name of the Course	Scheme of Instruction			Scheme of Examination			
		Hours per Week			Duration in Hrs	Maximum Marks		Credits
		L	T	P/D		SEE	CIE	
THEORY								
U22HS630EH	Skill Development Course-VII (Verbal Ability)	1	-	-	2	40	30	1
U22PC610CE	Design of Steel Structures	3	-	-	3	60	40	3
U22PC620CE	Soil Mechanics	3	-	-	3	60	40	3
U22PC630CE	Highway Engineering	3	-	-	3	60	40	3
U22PC640CE	Construction Management and Administration	3	-	-	3	60	40	3
U22PE610CE	Skill Development Course-VIII (Technical Skills-III)	1	-	-	2	40	30	1
U22OEXXXX	Open Elective-IV	3	-	-	3	60	40	3
PRACTICALS								
U22PC611CE	Soil Mechanics Lab	-	-	2	3	50	30	1
U22PC621CE	Computer Aided Structural Engineering Lab	-	-	2	3	50	30	1
U22PC631CE	Highway Engineering Lab	-	-	2	3	50	30	1
U22PW619CE	Theme Based Project	-	-	2*	-	50	30	1
	NPTEL Certificate Course	-	-	-	-	-	-	2
Student should complete one NPTEL (8 weeks) certificate course equivalent to 2 credits by the end of VI semester								
Total		**17**	**-**	**8**		**580**	**380**	**23**
Grand Total		**25**				**960**		
Note: The left over hours are to be allotted to Sports / Library / Mentor Interaction based on the requirement.								

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

SKILL DEVELOPMENT COURSE-VII: (VERBAL ABILITY)

SYLLABUS FOR B.E. VI SEMESTER

L : T : P (Hrs./week):2 : 0 : 0	SEE Marks:40	Course Code: U22HS630EH
Credits: 1	CIE Marks:30	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the learners to:	**At the end of the course the learners will be able to: -**
1. Introduce students to higher order thinking and problem solving via vocabulary and its various components 2. Train students to understand context & theme and use it to complete sentences. 3. Train students to identify the structure of sentences & paragraphs 4. Train students to analyze text, e.g., simple outlining and note taking, summarize, draw conclusions, and apply information to personal experiences 5. Train students to improve the quality of sentences by fixing errors	1. Use vocabulary as a tool to solve questions in verbal ability 2. Identify meanings of words using theme and context 3. Solve questions based on jumbles- sentences and paragraphs 4. Develop skills to critically analyze texts and then the ability to identify its theme 5. Improve the quality of their writing by being aware of the common errors

Unit 1: Vocabulary- Reading for Content and Context

Overview:

This course is designed for students to not just understand the importance of vocabulary but also to build on it by using the appropriate tools and methods. After which they will be able to solve vocabulary based questions and also use vocabulary as a tool to solve problems.

1.1 Concepts & Context Rules: Collocations & Phrasal Verbs
1.2 Prefixes/ Suffixes & Root Words
1.3 Phrases & Idioms; Questions based on it
1.4 One Word Substitution; Questions based on it
1.5 Antonyms, Synonyms & Incorrect Word Usage

Unit 2: Fill in the Blanks- Applying Content and Context
Overview:
This course is designed for students to identify the clue/ theme words in sentences, then understand the context in which the words are used and finally apply concepts like collocation, antonyms, and synonyms to solve questions.

2.1 Concepts & Rules: Single Fill in the Blanks
2.2 Double/ Triple Fill in the Blanks
2.3 Cloze Test

Unit 3: Jumbles
Overview:
This course is designed to develop and improve reading and study skills needed for college work. Topics include identifying main idea and supporting details, determining author's purpose and tone, distinguishing between fact and opinion, identifying patterns of organization in a sentence or passage and the transition words associated with each pattern, recognizing the relationships between words and sentences, identifying and using context clues to determine the meanings of words, identifying logical inferences and conclusions.
3.1 Concepts- Purpose, Tone, Point of view
3.2 Parajumbles
3.3 Jumbled Sentences

Unit 4: Critical Reading Skills
Overview:
Research shows that good reading skills can lead to well written assignments. In this unit, students will learn, develop and improve reading and study skills needed for college work. Building on these basic strategies, students will develop skills to critically analyze texts and then the ability to identify its theme.

4.1 Concepts- Basic Introduction & Short Passages
4.2 Article & Article Based Passages
4.3 Theme Detection

Unit 5: Spotting the Errors

Overview:

In this unit students will focus on identifying errors in sentences, rectifying them and improving the quality of sentences. Building on these skills will also have an impact on the written and spoken skills of students since they will be aware of the common and often made errors and therefore be able to avoid them while using language.

5.1 Concepts- Basic Introduction & Sentence Fillers
5.2 Spot the Errors
5.3 Sentence Improvement

METHODOLOGY ASSESSMENTS

- Demonstration - Online assignments
- Presentations - Individual and Group
- Expert lectures
- Writing and Audio-visual lessons

Learning Resources:

learn.talentsprint.com

The break-up of CIE: Internal Tests + Assignments + Quizzes

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3	No. of Quizzes	:	2	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

DESIGN OF STEEL STRUCTURES

SYLLABUS FOR B.E. VI SEMESTER

L : T : P (Hrs./week):3 : 0 : 0	SEE Marks:60	Course Code: U22PC610CE
Credits: 3	CIE Marks:40	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 and welded connections including detailing. 3. Design tension members, compression members and beams by limit state design as per IS:800-2007. 4. 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 rolled steel sections according to IS: 800-2007. Design bolted connection using black bolts and welded connections using fillet welds, groove welds subjected to concentric loads by limit state method according to IS:800-2007 2. Design tension members using limit state design according to IS:800-2007 3. Design compression members and column bases using limit state design according to IS:800-2007 4. Design laterally supported beams using limit state design according to IS:800-2007 5. 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): Types of Structural Steel-classification of Rolled Steel Sections.

Design Philosophies: Elastic or working stress design, plastic or limit design limit stated 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 grip bolts.

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

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.

UNIT-III: 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.

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 torsional buckling; design of laterally restrained beams, Check for web crippling, web buckling & deflection.

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 angles sections, bracings of roof trusses.

Pre-Engineered Buildings (PEB): Advantages of PEB, Applications of PEB Materials used for manufacturing of PEB.

Learning Resources:

1. Duggal S.K., "Limit state Design of Structures", 3rdEdition, McGrawHill Education,2019
2. Shiykar, M.R "Limit state design in structural steel" , 3rd edition,2017, PHI learning private limited.
3. Gambhir M.L., "Fundamentals of Structural Steel Design",McGrawHill Education(India) Pvt.Ltd.,NewDelhi,2013
4. BhavikattiS.S., "Limits state Designof steelStructures",5thEdition,

Dream tech Press 2019.
5. SubramanianN,"Design of Steel Structures (Limit State methods)", 2nd Edition Oxford University Press, 2018
6. K.S. Vivek and P. Vyshani "Pre – Engineered Steel Buildings" LAP Lambert Academic Publishing, 2021.
7. IS:800-2007: Code of Practice for General Construction in Steel, Bureau of Indian Standards, New Delhi.
8. IS: 875-1987: Code of Practice for Design loads for buildings and structures, Bureau of Inidan Standards, New Delhi.
9. ISI Hand book No.1 or Steel Tables by Bhavikatti S S
10. http://nptel.ac.in/courses/105103094/
11. www.steel-insdag.org

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING
SOIL MECHANICS

SYLLABUS FOR B.E. VI SEMESTER

L : T : P (Hrs./week):3 : 0 : 0	SEE Marks:60	Course Code: U22PC620CE
Credits : 3	CIE Marks:40	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 methods. 2. To comprehend effective stress under different hydraulic conditions 3. Learn concepts of compaction and consolidation of soils 4. Estimate shear strength parameters	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 and analyze mechanism of compaction of soils under given field conditions. 4. Analyze mechanism of consolidation of soils under given field conditions. 5. Determine and judge shear strength 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: 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: 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.Seepage force-downward and upward flow conditions,Quicksand phenomena- Remedial measures.

Two dimensional flow in soil–Laplace equation, qualitative representation of flownets under defined boundary conditions-flownets and their applications–computation of seepage quantity, total, effectiveandneutralstress.

UNIT-III: Stress Distribution : Boussinesq'sand West ergaard'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, influence of compaction on engineering properties. Determination of compaction characteristics- standard and modified Proctor tests- Light and Heavy compactiontests.CBR test – Field and laboratory based.

UNIT-IV: Consolidation Process: Spring analogy-Voidratio and effective stress (eVslog P) 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-V: Shear Strength: Significance of Shear strength in soils–Mohr-Coulomb model–shear parameters-Determination of shear strength–Direct sheartest, large shear box testTri-axial compression tests (Unconsolidated Undrained (UU), Consolidated Undrained (CU) and Consolidated Drained (CD)), UCC test, Vanesheartest. Stress- strain behavior of soils-Stress path-Skemptons pore water parameters

Learning Resources:

1. Gopal Ranjan, Rao A.S.,"Basic and Applied Soil Mechanics",New age publications, 2023.
2. Murthy V.N.S.,"ATextbookof Soil Mechanics &Foundation Engineering", CBS Publishers, 2018.
3. VenkatramaiahC.,"GeotechnicalEngineering",NewAgePublishers, 6th Edition, 2018.
4. ShashiK. Gulhati and Manoj Datta,"Geotechnical Engineering",TataMc-GrawHill,2017
5. BrajaM.Das, Khaled Sobhan,"Principles of Geotechnical Engineering", Cengage Learning, 2019
6. Craig's, R.F., "Soil Mechanics" Ninth edition,2020
7. Karl Terzaghi, Ralph B. Peck, Gholamreza Mesri., "Soil Mechanics in Engineering Practice" John Wiley & Sons, 07-Feb-1996-imported version.
8. William Lambe T., Robert V. Whitman., "Soil Mechanics" John Wiley & Sons, 2012
9. Arora K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors revised and enlarged 7th Edition, 2021.
10. Scott,R.F.,"Principles of Soil Mechanics",AddisonWesley,Massachusetts,
11. ISCode: IS-2720, Methods of tests for Soils.
12. http://nptel.ac.in/courses/105101084/
13. https://ocw.mit.edu/courses/1-361-advanced-soil-mechanics-fall-2004/pages/syllabus/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes			

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

HIGHWAY ENGINEERING

SYLLABUS FOR B.E. VI SEMESTER

L : T : P (Hrs./week):3:0 : 0	SEE Marks:60	Course Code: U22PC630CE
Credits: 3	CIE Marks:40	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. Provide comprehensive knowledge of highway development, functional classification, alignment principles, and geometric design elements. 2. equip students with fundamental understanding and practical skills in traffic characteristics, studies, regulation, and intersection design. 3. evaluate a range of pavement types, materials, characterization methods, and mixture design principles to facilitate understanding and application. 4. analyze factors influencing pavement design and apply appropriate methods for flexible and rigid pavement design. 5. develop proficiency in pavement construction techniques, and understand maintenance practices for addressing pavement failures.	1. Apply knowledge of geometric features to design horizontal and vertical alignment of highways/roads according to IRC guidelines. 2. Analyze traffic data and develop survey plans for solving urban traffic issues, utilizing key traffic elements and methodologies. 3. Evaluate highway materials through quality control tests, and formulate job mix formulas using the Rothfuch method. 4. Design flexible and rigid pavements for National highways in accordance with IRC guidelines. 5. Utilize diverse construction techniques, diagnose causes of pavement failures, and recommend appropriate remedial measures.

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, Bus bays, Cycle tracks, Service roads, Camber. Sight distances – Stopping and overtaking 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 : Traffic Engineering: 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, 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 intersections – Simple layouts. Design of isolated signal by Webster and IRC method. Introduction to grade separated interchanges.

UNIT-III : Pavement Material Characterisation: Types of pavements and materials for pavements.
Aggregates – characterizing the physical, mechanical and shape related properties of aggregate particles, Blending of aggregates and job mix formula by Rothfuch method.
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 , 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's stability method(MS 2 Manual method).

UNIT-IV : Pavement Design: Factors affecting pavement design – Traffic, soils and materials
Flexible pavement design using IRC 37:2018.
Rigid pavement design using IRC 58: 2015, Introduction to expansion , contraction, construction and longitudinal joints for jointed plain cement concrete pavements

UNIT-V: Pavement Construction and Maintenance:

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 – Introduction to Pavement evaluation, 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, 2017
2. Kadiyali L.R., Traffic Engineering and Transportation Planning, Khanna Publishers, 2024.
3. Roger P. Roess, Elena S. Prassas, William R. McShane "Traffic engineering" Pearson, 3rd Edition, 2010.
4. Nicholas J. Garber Lester A. Hoel, Traffic and Highway Engineering- III edition, Cengage publication Indian edition 2014.
5. Yoder E.J., Witczak M.W., Principles of Pavement Design, John Wiley & Sons –Indian edition. 2012
6. Srinivasa Kumar R., Pavement design, Orient Blackswan Pvt. Ltd., New Delhi, 2013
7. IRC:37 : 2018 : Guidelines for the design of flexible pavements
8. IRC 58 :2015: Guidelines for the design of plain jointed rigid pavements
9. IRC MORT&H- Specifications for road and bridge works, 2013 (Fifth Revision)
10. IRC 35 -2015 (Road markings), IRC 38 -1988 (Horizontal curves), IRC 53 -2012 (Accident forms), IRC 67 -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:23-1993 (vertical curves), IRC:SP:41-1994 (at-grade intersection)
11. Indo Highway Capacity Manual (Indo HCM) 2017 by CSIR –Central Road research institute
12. www.pavementinteractive.org
13. http://nptel.ac.in/courses/105105107/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

CONSTRUCTION MANAGEMENT AND ADMINISTRATION

SYLLABUS FOR B.E.V SEMESTER

L : T : P (Hrs./week):3:0:0	SEE Marks:60	Course Code: U22PC640CE
Credits : 3	CIE Marks:40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	Upon the completion of this course the students will be expected to:
1. Learn the concept of construction management along with functions and objectives. 2. Understand the various techniques used for construction planning such as bar charts, CPM, PERT and crashing of networks 3. Acquire knowledge on various types of construction contracts, tenders and acts related to construction and construction safety 4. Understand the concept of Linear Programming in Construction along with application of Graphical and Simplex methods.	1. Identify and report the importance and necessity of construction management. 2. Employ bar charts, networks to determine the critical path and alter the construction schedules accordingly. 3. Interpret the terms related to costs and time, and there by solve problems on crashing of networks. 4. Categorize various construction contracts, acts and examine various documents related to construction. 5. Interpret the concept of Linear Programming in Construction, and solve problems on Graphical and Simplex methods.

Unit-I: Significance of Construction Management: Objectives and functions of construction management, construction management team, principles of organization and types of organization.

Unit-II: Construction Planning: Construction planning, bar charts, network techniques in construction management – CPM, Expected likely, pessimistic and optimistic time, normal distribution curve and network problems of PERT.

Unit-III: Time Cost Analysis: Cost time analysis in network planning, updating, Earned value Management, simple problems of civil engineering works.

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

Tender: Tender form, Tender Documents, Tender Notice, e-tendering, Government e-procurement system, GEM (Government e Market) procurement, Work orders, Earnest money, Security Deposit, Arbitration.

Safety in construction: Safety measures, workmen compensation act, construction labour act. Demolition of buildings – safety measures.

Unit – V: Linear programming and optimization in construction: Introduction to optimization – Linear programming, Importance of optimization in construction, Simple problems on formulation of LP, Graphical method, Simplex method.

Learning Resources:

1. Srinath L.S., PERT and CPM: Principles and Application, East-West Press, 2001.
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, 2016.
4. Ghalot. P.S. and Dhir. B.M., Construction Planning and Management, Wiley Eastern Ltd., 2018.
5. Kumar Neerajha., Construction Project Management: Theory and Practice, Pearson Education, India, 2015.
6. Seetharaman S., Construction Engineering and Management, Umesh Publications, 2012.

The break-up of CIE: Internal Tests+Assignments + Quizzes

1	No. of Internal Tests	: 2	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5
	Duration of Internal Tests	:	90 Minutes		

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

SKILL DEVELOPMENT COURSE-VIII: (TECHNICAL SKILLS-III)

SYLLABUS FOR B.E. VI SEMESTER

L : T : P (Hrs./week):1: 0 : 0	SEE Marks:40	Course Code:U22PE610CE
Credits : 1	CIE Marks:30	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Theobjectivesofthecourseareto 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 Project Management software. 2. Execute Exterior designing plans and graphs of building by using Building Information Modelling Software.

Project Management Software

UNIT-I

- Training on Installation and setup
- Introduction to project management
- Introduction to primavera
- Enterprise project structure (EPS)

UNIT-II

- Organisational breakdown structure
- Project codes and values
- Global and project calendars
- Adding a project (W/O project architect)
- Work breakdown structure (WBS)

UNIT-III

- Budget and establishing spending plan

Building Information Modelling

- Project Units
- Levels
- Walls
- Basic Wall creation
- Basic creation of Plan

- Wall
- Compound Wall
- Modify Wall
- Stacked Wall
- Wall Opening

- Door
- Window

Project Management Software

- Activity codes and values
- Work products and documents
- Activities, relationships and scheduling
- Constraints

Building Information Modelling

- 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

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	1	Max. Marks for each Internal Tests	:	30
2	No. of Assignments	:	-	Max. Marks for each Assignment	:	-
3	No. of Quizzes	:	-	Max. Marks for each Quiz Test	:	-

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

SOIL MECHANICS LAB

SYLLABUS FOR B.E. VI SEMESTER

L : T : P (Hrs./week):0 : 0 : 2	SEE Marks:50	Course Code:U22PC621CE
Credits : 1	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. Index and engineering properties of various soils	1. Determine the index properties of soils and classify soils. 2. Determine shear strength of a soil sample 3. Determine Permeability and the compaction characteristics of soils 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

DETERMINATION OF INDEX PROPERTIES:

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

DETERMINATION OFENGINEERINGPROPERTIES

7. Determination of Compaction Characteristics by Standard Proctor test
8. Determination of Laboratory California Bearing Ratio (CBR)value
9. Determination of Co-efficient of Permeability by Constant Head Permeameter test and Variable Head Permeameter tests
10. Determination of shear strength parameters by Direct Shear Test
11. Study on hardness of various rock minerals with the help pH Moh's scale of hardness

DEMONSTRATIONOF TESTPROCEDURES:

12. Determination of Shear Strength of Cohesivesoils by “vane shear test”
13. Determination of Shear Strength by conducting “UCC Test”
14. Standard Penetration Test
15. Swell pressure test on expansive soils
16. Determination of Co-efficient of Consolidation (Virtual Mode) (http://eerc02-iiith.virtual-labs.ac.in/)-
17. Bio-cementation of Soil -Determination of Calcium carbonate content using Calcimeter.
18. Determination of Shear Strength by conducting “Triaxial Test”

Learning Resources:

1.http://eerc02-iiith.virtual-labs.ac.in/

2. http://home.iitk.ac.in/~madhav/geolab.html

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18

Duration of Internal Test: 2 Hours

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

COMPUTER AIDED STRUCTURAL ENGINEERING LAB

SYLLABUS FOR B.E. VI SEMESTER

L : T : P (Hrs./week):0:0: 2	SEE Marks:50	Course Code: U22PC621CE
Credits: 1	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. Use a 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 a 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 designs of ware 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-storeyed structures

Steel Design:

Perform analysis and design of:

7. Trusses
8. Frames

No. of Internal Tests: 01 Max. Marks for Internal Test: 12

Marks for day-to-day laboratory class work 18

Duration of Internal Test: 2 Hours

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

HIGHWAY ENGINEERING LAB

SYLLABUS FOR B.E. VI SEMESTER

L : T : P (Hrs./week):0: 0 : 2	SEE Marks:60	Course Code: U22PC631CE
Credits: 1	CIE Marks:40	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 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 presenting 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 aggregates

B) Tests on bitumen

6. Pentration Test
7. Ductility Test

8. Softening point Test
9. Specific gravity Test
10. Viscosity Test
11. Flash and fire point Test

C) Traffic Studies

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

D) Miscellaneous Tests (demonstration only)

15. Job mix formula by Rothfuch Method
16. Design of Bitumen mixture by Marshall stability test as per ASTM D 6927-15
17. Bitumen extraction test

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18

Duration of Internal Test: 2 Hours

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING
THEMEBASED PROJECT

SYLLABUS FOR B.E. VI-SEMESTER

L : T : P (Hrs./week):0 : 0 : 2	SEE Marks:50	Course Code: U22PW619CE
Credits: 1	CIE Marks:30	Duration of SEE: ---

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	Upon the completion of this course the students will be expected to:
1. Solve a real life societal problem through research based approaches.	1. Formulate an analytical model for a civil engineering problem and obtain its solution with necessary tools. 2. Design a civil engineering structure with due consideration for public health and safety. 3. Perform and manage as an individual or as a member of a team with ethical values. 4. Examine the concepts environment and sustainability. 5. Write effective reports and communicate effectively on civil engineering problems. 6. Present the conclusions in a way to benefit the society.

Instructions to Students:

Faculty members should prepare project briefs (giving scope and references) well in advance. The project may be classified based on the specialization. It may comprise any elements such as analysis, design, synthesis. The department will appoint a project coordinator who will coordinate the following.

1. Grouping of students (a maximum of 3 in a group)
2. Allotment of projects and project guides
3. Project monitoring at regular intervals.

All projects allotments are to be completed by the 2nd week of VI semester, so that students get sufficient time for completion of the project. All projects will

be monitored at least twice in a semester through students' presentation. Sessional marks should be based on the grades / marks, awarded by a monitoring committee of faculty members and also marks given by the supervisor.

The students are required to carry out a theme based project by selecting any one of the themes specified by the Project monitoring committee in any area relevant to Civil engineering. Students are required to submit a report on the theme based project at the end of the semester. The evaluation is based on CIE and SEE. CIE will be made based on the progress of the work developed on the rubrics. SEE is evaluated by external examiner through the group presentation given by the group members followed by the viva.

OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS IN B.E. VI-SEMESTER

Dept	Course Code	Name of the Course	Stream Type	Stream Name	credits
Civil	U22OE610CE	Project Management	General	-	3
CSE	U22OE610CS	Introduction to Database Management System	General	-	3
CSE	U22OE620CS	Fundamentals of Machine Learning	Stream	AI&ML	3
ECE	U22OE610EC	Internet of Things and Applications	General	-	3
EEE	U22OE610EE	Introduction to Batteries and Battery management System	General	-	3
IT	U22OE610IT	Web application development & Security	General	-	3
IT	U22OE620IT	Introduction to Machine Learning	Stream	AI&ML	3
Mech.	U22OE620ME	Additive Manufacturing and its Applications	General	-	3
Mech.	U22PE610ME	Industry 4.O	Stream	Robotics	3
H&SS	U22OE620EH	Advanced Course Inentrepreneurship	General	-	3

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

PROJECT MANAGEMENT (Open Elective-IV)

SYLLABUSFORB.E.VI-SEMESTER

L:T:P(Hrs/Week):3:0:0	SEE Marks:60	CourseCode:U22OE610CE
Credits: 3	CIEMarks:40	DurationofSEE:3Hours

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to:	Upon the completion of this course the students will be expected to:
1. Learn the concept of project management along with function 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. 5. Interpret the concept of Linear Programming and solve problems by Graphical and Simplex methods.

UNIT-I: Significance of Project Management: Importance of Project Management, Types of projects, Project Management Cycle, Objectives and functions ofproject management, management team, principles of organization and types of organization.

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

UNIT-III: Time Cost Analysis: Cost time analysis in network planning, updating

UNIT-IV: Contracts: Introduction, types of contracts and their advantages and disadvantages, conditions of contracts, Introduction to Indian contract act.
Tender: Tender form, Tender Documents, Tender Notice, Work Order

UNIT-V: Linear Programming and Optimization Techniques: Introduction to optimization-Linear programming, Importance of optimization, Simple problems on formulation of LP. Graphical method, Simplex method.

Learning Resources:

7. Srinath L.S., PERT and CPM: Principles and Application, East-West Press, 2001.
8. Peret, F, Construction Project Management an Integrated approach, Taylor and Francis, Taylor and Francis Group, London & New York, 2009
9. Punmia B.C., and Khandelwal, PERT and CPM, Laxmi Publications, 2016.
10. Gahloj. P.S. and Dhiv. B.M., Construction Planning and Management, Wiley Eastern Ltd., 2018.
11. Kumar NeerajJha., Construction Project Management: Theory and Practice, Pearson Education, India, 2015.
12. Seetharaman S., Construction Engineering and Management, Umesh Publications, 2012.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

INTRODUCTION TO DATABASE MANAGEMENT SYSTEM
(OPEN ELECTIVE-IV)

(Common for Civil, ECE, EEE & MECH)

SYLLABUS FOR B.E. VI-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code :U22OE610CS
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1 Identify different issues involved in the design and implementation of a database system. 2 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 5 Explain transaction processing.

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.

UNIT-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.

UNIT-III:Relational Database Design: Features of Good Relational Designs, Atomic Domains and first Normal form, Decomposition Using Functional Dependencies.

UNIT-IV:Indexing and Hashing: Basic Concepts, Ordered Indices, B+ Tree Index Files, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing.

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

Learning Resources:

1. Abraham Silberschatz, Henry F Korth, Sudharshan S, Database System Concepts, 6th Edition(2011), McGraw-Hill International Edition.
2. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System , 8th Edition(2006) Pearson Education.
3. Raghu Ramakrishna, and Johannes Gehrke, Database Management Systems, 3rd Edition(2003), McGraw Hill.
4. RamezElmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems, 4th Edition(2006), Pearson Education.
5. Peter rob, Carlos coronel, Database Systems, (2007), Thomoson.
6. http://nptel.ac.in/courses/106106093/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

FUNDAMENTALS OF MACHINE LEARNING

Stream- Artificial Intelligence & Machine Learning

(OPEN ELECTIVE-IV)

(COMMON for CIVIL, ECE, EEE & MECH)

SYLLABUS FOR B.E VI SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code:U22OE620CS
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVE	**COURSE OUTCOMES** *On completion of the course, students will be able to*
To formulate machine learning problems corresponding to an application.	1. Explain the basics machine learning. 2. Prepare the data for learning 3. Select the feature and transform it . 4. Classify the data using classification models 5. Solve problems using Unsupervised learning models

UNIT-I: Introduction to Machine Learning: Introduction, types of Human learning, types of learning, Problems not to be solved by Machine learning , applications of machine learning , Issues in machine learning,

UNIT-II: Preparing to Model : Introduction, Machine Learning Activities, Basic Data types in machine learning , Exploring Structures of Data.

UNIT-III: Basics of Feature Engineering: Introduction, feature transformation: feature Construction.

UNIT-IV: Supervised Learning – Classification: Introduction, Example of supervised learning, classification model, classification learning steps, common classification algorithms: KNN and Decision Tree, Regression : Introduction , Simple Linear regression.

UNIT-V: Unsupervised Learning: Introduction, Unsupervised vs supervised learning, Application of Unsupervised Learning , types of Clustering techniques, Partitioning methods, k-medoids.

Learning Resources:

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, -Machine Learning, Pearson Education
2. TomMitchell,—MachineLearning‖,McGraw-HillScience,Firstedition.
3. ChristopherBishop,—PatternRecognitionandMachinelearning‖,Springer(2006).
4. StephenMarsland,‖MachineLearning–analgorithmicperspective‖,CRCPress.
5. Danielawitten,TrevorHastieRobertTibshiraniandGarethJames,—Anintrod uctiontostatisticalLearningwithapplicationsin R,Springer2013
6. https://onlinecourses.nptel.ac.in/noc18_cs26/preview
7. https://www.coursera.org/learn/machine-learning

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5
Duration of Internal Tests		: 90 Minutes			

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

INTERNET OF THINGS AND APPLICATIONS
(Open Elective - IV)

SYLLABUS FOR B.E. VI- SEMESTER (EEE &IT)

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: U22OE610EC
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. The purpose of this course is to impart knowledge on IoT Architecture, practical constrains. 2. To study various protocols And to study their implementations	On completion of the course, students will be able to 1. Understand the Architectural Overview of IoT 2. Enumerate the need and the challenges in Real World Design Constraints 3. Compare various IoT Protocols. 4. Build basic IoT applications using Raspberry Pi. 5. Understand IoT usage in various applications.

UNIT - I : OVERVIEW: Introduction to IoT – Improving Quality of life. IoT-An Architectural Overview, M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT.

UNIT - II : Real-World Design Constraints: Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control. Power Management in IoT device, Power conditioning using energy harvesting.

UNIT - III : IOT PROTOCOLS: Introduction to MQTT, Quality of services in MQTT,standards and security in MQTT.
Introduction and implementation of AMQP, Implementation of CoAP and MDNS.

UNIT - IV : Device for IoT: Choice of Microcontroller, Introduction to Raspberry Pi,Features of Pi, Programming platform, Phython programming for Pi. Building basic IoT Applications using Raspberry Pi.

UNIT - V : IoT case studies: Smart Cities and Smart Homes, Connected Vehicles, Agriculture, Healthcare, Activity Monitoring.

Learning Resources:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014.
2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
4. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications
5. https://nptel.ac.in/courses/106105166/5
6. https://nptel.ac.in/courses/108108098/4

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
Duration of Internal Tests		:	90 Minutes			

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
INTRODUCTION TO BATTERIES AND BATTERY MANAGEMENT SYSTEM
(Open Elective-IV)

SYLLABUS FOR B.E. VI SEMESTER

L: T: P (Hrs/Week):3:0:0	SEE Marks: 60	Course Code:U22OE610EE
Credits:3	CIE Marks: 40	Duration of SEE: 3Hours

COURSE OBJECTIVES The course will enable the students to:	**COURSE OUTCOMES** On completion of the course, students will be able to
The objective of this course is to introduce learner to batteries, its parameters,modelling and charging requirements. The course will help learner to develop batterymanagementalgorithms for batteries.	1. Interpretthe role of battery management system. 2. IdentifytherequirementsofBatteryManagementSystem. 3. Interpretthe conceptassociatedwithbatterycharging/ dischargingprocess. 4. Calculatethevarious parametersofbattery and batterypack. 5. Designthemodel ofbatterypack

UNIT -I: Introduction to Battery Management System: Cells&Batteries,Nominalvoltageandcapacity,Crate,Energyandpower,Cellsconnectedinseries,Cellsconnected in parallel, Electrochemical and lithium-ion cells, Rechargeable cell,Charging and Discharging Process, Overcharge and Undercharge, Modes ofCharging.

UNIT -II: Battery Management System Requirement: Introduction and BMS functionality, Battery pack topology, BMSFunctionality, Voltage Sensing, Temperature Sensing, Current Sensing, High-voltage contactor control, Isolation sensing, Thermalcontrol,Protection,CommunicationInterface,Rangeestimation,State-of-chargeestimation,Celltotalenergyand celltotal power.

UNIT –III:Battery State of Charge and State of Health Estimation, Cell Balancing: Battery state of charge estimation (SOC), voltage-based

methods to estimateSOC, Model-based state estimation, Battery Health Estimation, Lithium-ionaging:Negativeelectrode, Lithium-ion aging:Positive electrode,Cell Balancing,Causesofimbalance,Circuitsforbalancing.

UNIT –IV: ModellingandSimulation: Equivalent-circuit models (ECMs), Physics-based models (PBMs), Empiricalmodelling approach, Physics-based modelling approach, simulating an electricvehicle, Vehicle range calculations, simulating constant power and voltage,Simulatingbattery packs.

UNIT -V: Designofbattery BMS: Design principles of battery BMS Effect of distance, load, and forceonbatterylifeand BMS, energy balancing with multi-battery system.

Learning Resources:

1. Plett,GregoryL.Battery management systems, VolumeI: Battery modeling. Artech House,2015.
2. Plett, Gregory L. Battery management systems, Volume II: Equivalent-circuitmethods.Artech House,2015.
3. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design byModelling"Philips Research BookSeries2002.
4. Davide Andrea," Battery Management Systems for Large Lithium-ion Battery Packs"ArtechHouse, 2010.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5
Duration of Internal Tests		:	90 Minutes			

VASAVI COLLEGE OF ENGINEEING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF MECHANICAL ENGINEERING

ADDITIVE MANUFACTURING AND ITS APPLICATIONS

(General Pool) - (Open Elective-IV)

SYLLABUS FOR B.E VI Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U22OE620ME
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

Course objectives	Course Outcomes
The objectives of this course are to: understand the fundamentals of various additive manufacturing technologies and their applications in Engineering Industry.	On completion of the course the student will be able to: 1. Understand the fundamentals of prototyping and the various data formats used in Additive Manufacturing. 2. Study the principle, process, advantages, limitations and case studies of liquid based AM systems. 3. Study the principle, process, advantages, limitations and case studies of solid based AM systems. 4. Study the principle, process, advantages, limitations and case studies of powder based AM systems. 5. Study the applications of AM in various engineering industries as well as the medical field.

UNIT-I: Introduction, Prototyping fundamentals, Historical development, Advantages of AMT, Commonly used terms, **Fundamental Automated Processes,** process chain, 3D modeling, Data Conversion, and transmission, Checking and preparing, Building, Post processing, RP data formats, **Newly Proposed formats,** Classification of AMT process.

UNIT-II: Liquid based systems: Stereo lithography apparatus (SLA): Models and specifications, process,working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, applications,advantages and disadvantages, case studies.

Solid ground curing (SGC): Models and specifications, process, working,principle, applications, advantages and disadvantages, case studies.

UNIT-III: Solid based systems: Laminated object manufacturing (LOM): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies.
Fused Deposition Modeling (FDM): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies.

UNIT-IV: Powder Based Systems: Selective laser sintering (SLS): Models and specifications, process, **materials,** working principle, applications, advantages and disadvantages, case studies.
Three dimensional printing (3DP): Models and specification, process, working principle, applications, advantages and disadvantages, case studies.

UNIT-V: Applications of AM systems: Applications in **Design,** aerospace industry, automotive industry, jewellery industry, coin industry, GIS Application, arts and architecture.
RP medical and bio engineering Application: planning and simulation of complex surgery, customized implant and prosthesis, design and production of medical devices, forensic science and anthropology, visualization of bio-molecules.

Learning Resources:

1. Chua C.K., Leong K.F. and LIM C.S Rapid prototyping: Principles an Applications, World Scientific publications, 3rdEd., 2010
2. D.T. Pham and S.S. Dimov, “Rapid Manufacturing”, Springer, 2001
3. Terry Wohlers, “ Wholers Report 2000”, Wohlers Associates, 2000
4. Paul F. Jacobs, “ Rapid Prototyping and Manufacturing”–, ASME Press, 1996
5. Ian Gibson, Davin Rosen, Brent Stucker “Additive Manufacturing Technologies, Springer, 2nd Ed, 2014.

The break-up of CIE: Internal Tests+Assignments + Quizzes

1	No. of Internal Tests:	02	Max.Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	05
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	05
	Duration of Internal Test:	90 Minutes		

VASAVI COLLEGE OF ENGINEEING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF MECHANICAL ENGINEERING

INDUSTRY 4.O

(Stream: Robotics)

(Open Elective-IV)

SYLLABUS FOR B.E VI Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U22OE610ME
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objectives of the course is to	On completion of the course, students will be able to
provide an overview of Industry 4.O and its impact on modern manufacturing and develop skills for implementing industry 4.O technologies in production processes.	1. analyse the basic principles and technologies for smart factories and identify their applications in modern manufacturing. 2. evaluate the concepts of Cyber-Physical Systems (CPS) and Cyber-Physical Production Systems (CPPS) and their role in creating new business models. 3. apply the concepts of Digital Twins and Assistance Systems in production processes and their benefits. 4. develop strategies for ensuring safety and security in networked production environments and analyse the challenges and opportunities of Human-Robot Collaboration (HRC). 5. analyse the benefits and challenges of Cloud Manufacturing and the Connected Factory and develop strategies for implementing smart work pieces.

UNIT–I: Introduction to Industry 4.0: Definition of Industry 4.0, Comparison of Industry 4.0 Factory and today's Factory, Difference between conventional automation and Industry 4.0.

Basic principles and technologies of a Smart Factory: Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services, Big Data, Cyber-Physical Systems, Value chains in manufacturing companies,

Customization of products, Digital Twins, Cloud Computing / Cloud Manufacturing, Security issues within Industry 4.0 networks.

UNIT – II: Cyber-Physical Systems (CPS) and Cyber-Physical Production Systems (CPPS): Definition of Cyber-Physical System, Core elements of Cyber-Physical Systems and Cyber-Physical Production Systems, Control theory and real-time requirements, Self-organization principles, Communication in cyber-physical systems, Design Methods for Cyber-physical Systems, Applications for cyber-physical systems.

Cyber-Physical Systems and new Business Models: How CPS can induce new Business Models, The Role of horizontal and vertical value streams, New Business Models for the Smart Factory, Characteristics of Business Models within the Smart Factory, Examples of new Business Models: Service provider, Data provider, Technology provider, Platform provider.

UNIT – III: Digital Twins in Production: Basic concepts of Digital Twins, Benefits, impact and challenges of Digital Twins, Features and Implementation of Digital Twins, Types of Digital Twins, Digital Twin use cases, Applications for digital twins in production.

Assistance systems for production: The connected worker within the Industry 4.0 scenario, Diversity-driven workplaces, Human-and task-centered assistance systems, Technical tools ("Ambient Assisted Working" (AAW)), Mobile information technologies, Shop floor information systems, Production line support systems, Manipulator systems and intelligent chairs, Human work support by using exoskeletons, Applications of assistance systems in production.

UNIT –IV: Human-Robot Collaboration: Human-Robot Collaboration in Industry, Collaborative Robots: tasks, examples, Types of Human-Robot Collaboration, Safety of Human-Robot Collaboration, Applications with Collaborative Robots.

Safety and Security in networked Production Environments

Definition of Safety with Industry 4.0, Safety for connected Machines and Systems, Safety in Human Robot cooperation, Optimizing Safety with Industry 4.0, Security & Security Risks with Industry 4.0.

UNIT–V: Cloud Manufacturing and the connected factory: Virtualization, Cloud Platforms, Big data in production, Cloud-based ERP and MES solutions, Connected factory applications, IT security for cloud applications.

The smart workpiece: Intelligent work piece, Work piece tagging, QR codes and RFID, Communication between work piece and environment, Multi-agent systems in production, Applications for smart work pieces.

Learning Resources:

1. Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things, Apress, 2016.
2. Ibrahim Garbie, Sustainability in Manufacturing Enterprises: Concepts, Analyses and Assessments for Industry 4.0, Illustrated Edition, Springer, 2016.
3. Klaus Schwab, The Fourth Industrial Revolution, Crown, 2017.

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	10
3	No. of Quizzes:	0	Max. Marks for each Quiz Test:	--

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF INFORMATION TECHNOLOGY

WEB APPLICATION DEVELOPMENT AND SECURITY

(GENERAL TRACK : OPEN ELECTIVE-IV)

(Common for CIVIL, ECE, EEE & MECH)

SYLLABUS FOR B.E VI- SEMESTER

L:T:P(Hrs./week): 3:0:0	SEE Marks : 60	Course Code : U22OE610IT
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. Acquire basic skills for designing static and dynamic Web Applications using HTML, CSS, Java Script, Bootstrap and XML. 2. Acquire fundamental knowledge of Web Security concepts	1. Design a static web pages using HTML, CSS. 2. Create dynamic web pages and client side validation using JavaScript. 3. Develop responsive web applications using Bootstrap. 4. Build an application using an MVC Framework and XML 5. Analyze and evaluate web security attacks.

UNIT-I: Introduction: Introduction: World Wide Web, Web Browsers, Web Servers, URL, HTTP, TCP Port. 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: Basics of JavaScript: JavaScript: Introduction, Basics of JavaScript-variables, data types and operators, Control Structures, Arrays, Functions, HTML Forms, Events and event handling.

UNIT-III: Bootstrap: Bootstrap: The Grid system, Layout components: Tables, Images, alerts, buttons, badges, progress bars, cards, drop downs, pagination, Collapse, Navbar, Carousel.

UNIT-IV: XML: XML- The Syntax of XML, XML Document Structure, Document Type Definitions.

Introduction to MVC - Introduction to Model View Controller Architecture

UNIT-V: Web Security Fundamentals: Web Hacking Basics, HTTP & HTTPS URL, Evolution of Web Applications - Web Application Security - Core Defence Mechanisms - Handling User Access - Handling User Input- Handling Attackers - Managing the Application, Introduction to Web 2.0

Learning Resources:

1. Robert W. Sebesta, Programming the World Wide Web, 7th Edition (2014), Pearson Education.
2. "Web Technologies", 7th Edition, Uttam K.Roy,2012.
3. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, Internet & World Wide Web How to Program, 5th Edition, Pearson Education.
4. http://getbootstrap.com/

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	10
3	No. of Quizzes:	0	Max. Marks for each Quiz Test:	--

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO MACHINE LEARNING

(AI&ML TRACK : OPEN ELECTIVE-IV)

(Common for ECE, EEE, MECH & CIVIL)

SYLLABUS FOR B.E VI- SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks :60	Course Code: U22OE620IT
Credits: 3	CIE Marks: 40	Duration of SEE :3Hrs

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
Introduce the fundamental concepts, techniques and modern tools in Artificial intelligence and Machine Learning field to effectively apply it to the real-world problems.	1. Demonstrate knowledge of the Artificial intelligence and machine learning literature. 2. Understand and apply latest Python libraries for Machine learning models. 3. Apply an appropriate algorithm for a given problem. 4. Apply machine learning techniques in the design of computer systems. 5. Explain the relative strengths and weaknesses of different machine learning methods and approaches.

UNIT-I: Introduction to AIML: Foundations of AI, Sub areas of AI, Applications. Introduction to learning, Types of Learning: Supervised Learning, Unsupervised Learning, Reinforcement Learning.
Introduction to Python and ML libraries: intro to python data types, control flow, loops, functions, modules & packages. Intro to NumPy & Scikit-learn.

UNIT-II: Supervised learning: ML Task, ML Experience or Data, ML Performance metric, Linear Regression, Linear regression Simulator, Logistic Regression.
Supervised Non-parametric learning: Introduction to Decision Trees, K-Nearest Neighbor, Feature Selection.

UNIT-III: Supervised Parametric learning (Neural networks): Perceptron, Multilayer Neural Network, Playground Simulator, Backpropagation.

UNIT-IV: Supervised Parametric learning: Support Vector Machine, Kernel function and Kernel SVM.
Supervised Parametric Bayesian learning: Introduction, Naive Bayes Classification, Bayesian Network.

UNIT-V:Unsupervised leaning: Clustering, K-means Clustering, DBSCAN

Learning Resources:

1. Tom Mitchell, Machine Learning,First Edition, McGraw-Hill, 1997
2. Christopher Bishop. Pattern Recognition and Machine Learning. Second Edition.
3. EthemAlpaydin , Introduction to Machine Learning, Second Edition
4. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e, 2008.
5. http://nptel.ac.in/courses/106106139/
6. https://www.w3schools.com/python/
7. https://www.w3schools.com/python/numpy/default.asp
8. https://scikit-learn.org/stable/
9. Linear Regression Simulator (mladdict.com)
10. Neural Network Playground simulator
11. https://www.mladdict.com/neural-network-simulator

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	10
3	No. of Quizzes:	0	Max. Marks for each Quiz Test:	--

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD-31

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES
ADVANCED COURSE INENTREPRENEURSHIP

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U22OE620EH
Credits :03	CIE Marks:40	Duration of SEE: 03Hours

Course objectives *The objectives of this course are to*	**Course Outcomes** *On completion of the course the*
1. Acquire additional knowledge and skills for developing early customer traction into a repeatable business. 2. They will learn the tools and methods for achieving sustainable growth, such as refining the product or service and business models,	1. Develop an A-team 2. Refine business models and expand customer segments, brand strategy and create digital presence, channel strategy for customer outreach 3. Develop strategies to grow revenues and markets, understand Advance Concepts

Unit I: Pivoting and New Business Model: Introduction to Advance Course and Recapping the key concepts; Revisit of idea/ solution, business model and team members, Need for a mentor; Pivoting and its need; Types of Business models; Refining business model; Analyzing the Business Model of Competitors; Adding new customer segments to existing business model.

Unit II: Business Planning: Product Management: Need for a product management with examples; Making a sales plan; Building sales organization: Entrepreneur interview, Hiring sales team; Making a people plan for the venture; Introduction and understanding financial planning and forecasting template; Discussing financial planning and revisiting business model; Creating a procurement plan; Negotiation.

Unit III: Customer Life cycle and Building the A-team: Customer life cycle; identifying secondary revenue streams; Funding Landscape: Funding options for an entrepreneur; Investor hunt: Creating funding plan and designing the pitch deck; Attracting right talent – I: Intro to building the A-team; Examples; Setting the team for success.

Unit IV: Branding and Channel Strategy, Leveraging Technologies: Creating brand Strategy: Drawing venture's golden circle; Defining the positioning statement: values; Creating a Public Image and Presence of the Venture; Identifying the right channel; Platforms for Marketing and Promotion; Platforms for Communication and Collaboration; Making the Tech Plan.

Unit V: Measuring Progress, Legal Matters and Role of Mentors & Advisors: Metrics for Customer Acquisition and Retention; Financial Metrics: Finding new revenue streams based on key financial metrics; Re-forecasting financial plan to increase margin; Professional Help and Legal & Compliance Requirements; Selecting IP for organization; Identifying mentors and advisors; Scouting board of directors; Capstone Project.

Learning Resources:

1. http://www.learnwise.org
2. Clancy, Ann L. &Binkert, Jacqueline, "Pivoting- A coach's guide to igniting substantial change" Palgrave Macmillan US 2017
3. Porter, Michael, E., "Competitive Advantage: Creating and Sustaining Superior Performance", Free press, 1st edi.
4. Schwetje, Gerald &Vaseghi Sam, "The Business Plan", Springer-Verlag Berlin Heidelberg.
5. LeMay, Matt, "Product Management in Practice", O'Reilly Media Inc.
6. Smart, Geoff & Randy, Street., "Who: The A method of hiring", Ballantine books, 2008.
7. Blokdyk, Gerardus., "Customer Lifecycle Management - A complete guide", 5starcooks, 2018

The break-up of CIE: Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes