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

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

Sponsored by
VASAVI ACADEMY OF EDUCATION
Hyderabad

SYLLABI UNDER CBCS FOR
B.E V &VI SEMESTERS OF MECHANICAL ENGINEERING
(R-22)
WITH EFFECT FROM 2024-25
(For the students admitted in 2022-23)

DEPARTMENT OF MECHANICAL ENGINEERING
+91-40-23146060, 23146061
Fax: +91-40-23146090

VISION OF THE INSTITUTE

Striving for a symbiosis of technological excellence and human values.

MISSION OF THE INSTITUTE

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

VISION OF THE DEPARTMENT

To establish global leadership in the field of mechanical engineering and develop competent human resources with values and ethics

MISSION OF THE DEPARTMENT

To nurture an environment of research, innovation and knowledge through the latest teaching-learning practices in mechanical engineering

PROGRAM OUTCOMES (POs)	
1	Graduates demonstrate knowledge of basic sciences and mechanical engineering.
2	Graduates demonstrate an ability to identify, formulate and solve engineering problems
3	Graduates demonstrate an ability to design and conduct experiments, analyze and interpret data.
4	Graduates demonstrate an ability to design a system, component or process as per needs and specifications
5	Graduates demonstrate skills to use modern engineering tools, software and equipment to analyze for problem solving.
6	Graduates demonstrate an ability to visualize and work on laboratory and multi disciplinary tasks.
7	Graduate shows the understanding of impact of environment and society of engineering solutions and aim to provide sustainable solutions.
8	Graduates demonstrate knowledge of professional and ethical responsibilities.
9	Graduates shall be able to work independently and also in multi disciplinary teams
10	Graduates are able to communicate effectively in both verbal and written form.
11	Graduates will demonstrate the ability to handle the projects through appropriate project management techniques.
12	Graduates develop confidence for self education and ability for life-long learning

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The mechanical engineering graduates will

PEO1 possess the required foundation and knowledge in the field of mechanical engineering.

PEO2 advance professionally as a result of their ability to solve technical problems and work in multidisciplinary teams leading to significant contribution to the industry

PEO3 acquire life long learning through training programs and higher qualifications.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1 Apply principles of basic sciences and engineering to mechanical systems

PSO2 Model, analyze, design, and realize mechanical components and processes

PSO3 Be prepared to work professionally and ethically in thermal, design and manufacturing areas of mechanical engineering

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-22)
B.E. – MECH : FIFTH SEMESTER (2024-2025)

B.E (MECH) V Semester								
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								
U22PC510ME	Heat Transfer	3	-	-	3	60	40	3
U22PC520ME	Kinematics of Machines	3	-	-	3	60	40	3
U22PC530ME	Manufacturing Processes	3	-	-	3	60	40	3
U22PC540ME	Design of Machine Elements	3	-	-	3	60	40	3
U22PC550ME	CAD / CAM	3	-	-	3	60	40	3
U22OE5XXXX	Open Elective - III	3	-	-	3	60	40	3
U22HS510EH	Skill Development Course V (Communications Skills in English II)	1	-	-	2	40	30	1
U22PE510ME	Skill Development Course-VI (Technical Skills-II) Mathematical Programming for Mechanical Engineers	1	-	-	2	40	30	1
PRACTICALS								
U22PC531ME	Manufacturing Processes Lab	-	-	2	3	50	30	1
U22PC551ME	CAD / CAM Lab	-	-	2	3	50	30	1
U22PC561ME	Programming for Mechanical Engineers Lab	-	-	2	3	50	30	1
U22PW519ME	Mini Project	-	-	2	3	50	30	1
	TOTAL	**20**	**-**	**8**	**-**	**640**	**420**	**24**
	GRAND TOTAL	**28**				**1060**		**24**

1) Student should complete one NPTEL certification course equivalent to 2 credits (8 weeks) by the end of VI semester.
2) Left over hours allotted to Sports / Library / PDC / Mentor Interaction / CC / RC / TC / CCA / ECA

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

HEAT TRANSFER

SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U22PC510ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
develop methodologies for solving a variety of engineering problems in conduction, convection and radiation heat transfer together with their applications.	1 formulate heat conduction problems in rectangular, cylindrical and spherical coordinate systems by transforming the physical system into a mathematical model. 2 understand augmentation of heat transfer by the provision of fins and predict time-dependent heat transfer in solids for engineering applications. 3 interpret convective heat transfer coefficients in free and forced convection for internal and external flows. 4 design the heat exchangers using the LMTD and ε-NTU approaches for industrial applications and distinguish the mechanisms involved in boiling and condensation. 5 estimate radiation heat transfer between black and non-black bodies using the laws of radiation.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	1	1							1	3	2	2
CO2	3	3	3	2	1							1	3	2	2
CO3	3	2	3	2	1							1	3	2	2
CO4	3	3	2	2	1							1	3	2	2
CO5	3	3	2	2	1							1	3	2	2

UNIT-I: INTRODUCTION

Heat Transfer – Definition and Applications; Different modes of Heat Transfer, Governing Laws, General heat conduction equation in cartesian coordinates [derivation], cylindrical and spherical coordinates, Steady-state one-dimensional heat conduction through slabs[derivation], cylinders and spheres without and with internal heat generation; Composite slabs and cylinders, Overall heat transfer coefficient, Critical insulation thickness.

UNIT-II: FINS AND TRANSIENT CONDUCTION

Fins: definition, classification and applications, analysis of fin - rectangular and circular fins, temperature distribution and heat transfer rate calculations, fin efficiency and effectiveness.

Transient 1-D heat conduction: lumped system, use of Heisler and Grober charts for infinite slabs, cylinders and spheres.

UNIT-III: CONVECTION

Forced Convection: Velocity and thermal boundary layers over an isothermal flat plate; analytical and empirical correlations: flow over flat plates, cylinders and spheres, internal flow through tubes of circular cross-section.

Free Convection: Velocity and thermal boundary layers over an isothermal vertical flat plate; empirical correlations for flow past plates and cylinders.

UNIT-IV: HEAT EXCHANGERS AND PHASE-CHANGE HEAT TRANSFER

Heat Exchangers: Definition, classification and applications of heat exchangers; overall heat transfer coefficient; Effects of fouling; design and analysis of parallel, counter and cross-flow heat exchangers using LMTD and Effectiveness-NTU methods.

Introduction to boiling and condensation.

UNIT-V: THERMAL RADIATION

Fundamental principles – Gray, White, Opaque, Transparent and Black bodies, Spectral emissive power, Wien's, Rayleigh-Jeans and Max Planck's laws, Hemispherical emissive power, Stefan-Boltzmann law for total emissive power of a black body, Emissivity and Kirchhoff's laws, Radiation view (shape) factor, Total emissive power, Radiation heat exchange between infinite parallel plates, concentric cylinders, spheres - chart solutions;

Note: Use of heat transfer data book permitted.

Learning Resources:

1. Holman J.P, "Heat transfer", Tata McGraw Hill Publication, New Delhi, 2010. 10th edition
2. Incropera, F.P. and De Witt D.P.- "Fundamentals of Heat and Mass Transfer", John Wiley and sons, New York, 2008.
3. Sachdeva R.C., "Fundamentals of Engineering Heat and Mass Transfer", New Age International (P) Ltd Publishers, New Delhi, 2010.
4. Rajput R.K., "Heat and Mass Transfer", S. Chand & Company Ltd., New Delhi, 2004.
5. Necati Ozisik M, "Heat transfer – A basic approach", McGraw-Hill, New York, 2005.

Data Book:

1. Kothandaraman C. P, Subramanyan S, "Heat and Mass Transfer Data Book" New Academic Science, 2012, ISBN: 1781830045, 9781781830048

Web Resources:

1. http://nptel.ac.in/courses/112101097/
2. http://freevideolectures.com/Course/2366/Heat-and-Mass-Transfer
3. http://textofvideo.nptel.iitm.ac.in/112101097/
4. http://www.nptelvideos.in/2012/11/heat-transfer.html
5. http://web.mit.edu/lienhard/www/ahtt.html

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

KINEMATICS OF MACHINES

SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U22PC520ME
Credits :03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVES *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
perform kinematic analysis of planar mechanisms and to analyze the transmission of motion using lower and higher kinematic pairs.	1 identify the various elements of a mechanism and calculate the degrees of freedom of a mechanism. Understand the various inversions of different kinematic chains. 2 perform kinematic analysis of various planar mechanisms, using graphical method. 3 understand the steering gear mechanisms and analyze the motion transmission characteristics by using belt drive. 4 design the cam profile for various types of followers under the given required motion of the followers. 5 analyze the motion transmission characteristics by using gear drive.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
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CO1	2	2	1	2	1								3	2	1
CO2	1	3	2	1	2								3	2	1
CO3	2	2	2	2	1								3	2	1
CO4	3	2	3	3	2								3	2	1
CO5	1	1	3	2	1								3	2	1

UNIT-I:

Definitions: Kinematic link, pair, chain, mechanism and machine. Classification of links, pairs.

Degrees of freedom of mechanisms using Kutzbach and Grubler's criterion.

Inversions: Quadric cycle chain, single and double slider crank chains.

UNIT-II

Analysis of Mechanisms

Velocity analysis: Graphical Relative velocity and Instantaneous center methods.

Acceleration Analysis: Graphical method for planar mechanisms, Coriolis component of acceleration. Acceleration analysis of planar mechanisms involving tangential and radial acceleration components.

UNIT-III

Special Mechanisms: Steering gear mechanisms Davis and Ackerman.

Belt Drives: Open and cross belt drives, Length of belt, Ratio of tensions, Effect of Centrifugal tension and initial tension over power transmission, Conditions for maximum power.

UNIT-IV: CAMS

Types of Cams and followers, Nomenclature of cam. Displacement diagrams for followers: uniform velocity, parabolic, simple Harmonic and cycloidal motions. Layout of cam profiles for translating motion - knife edge, flat and roller followers.

UNIT-V

Gears: Classification of gears, Nomenclature, Law of gear tooth action, Cycloidal and involute tooth profiles. Expressions for velocity of sliding between teeth, path of contact, arc of contact and contact ratio. Interference of involute gears, minimum number of teeth to avoid interference.

Gear Trains: Simple, Compound, Reverted and Epi-cyclic Gear Trains.

Learning Resources:

1. S.S. Ratan, "Theory of Machines", 4th Edition, McGraw-Hill, 2014.
2. Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers, 2005.
3. R.L. Norton, "Kinematics and Dynamics of machinery", 1st Edition, McGraw -Hill, 2009
4. J.E. Shigley, "Theory of Machines", 4th Edition, Oxford University press, 2015.
5. Amitabha Ghosh and Asok Kumar Mallik, "Theory of Machines", 3rd Edition, East West Press, 2006

Web resources:

1. www.journals.elsevier.com/mechanism-and-machine-theory
2. www.nptel.ac.in

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

MANUFACTURING PROCESSES

SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code:U22PC530ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
study various types of casting, welding and forming processes.	1 design riser and gating system to produce required casting in sand molding process. 2 examine special casting processes to suit various production requirements based on applications. 3 understand the techniques of solid state and arc welding processes to join different materials. 4 identify and select special welding process based on the application. 5 interpret and differentiate various forming processes based on component to be manufactured.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	2								3	3	2	3
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CO3	3	2	3	2								3	3	2	3
CO4	3	2	3	2								3	3	2	3
CO5	3	2	3	2								3	3	2	3

UNIT-I: CASTING PROCESS

Casting terms, pattern materials, types of patterns, pattern allowances, Moulding sands, core sands, properties of moulding sand and its ingredients, different types of moulding machines, Directional solidification, use of chaplets, chills, riser and gating design , Numerical problems on Pouring Time and solidification time, Riser Design and Time taken to fill the mould in different gating systems.

UNIT-II: SPECIAL CASTING PROCESSES

Shell moulding, CO_2 moulding, die casting, centrifugal casting, investment or

lost wax process; Casting defects, causes and remedies.

UNIT-III: WELDING PROCESSES

Classification of welding processes

Gas welding and gas cutting, Arc welding- SMAW, SAW, GMAW, GTAW, PAW, Numerical Problems on Arc Welding characteristics, Duty cycle, welding efficiency, Welding defects, principle of Soldering and Brazing. Numericals on welding speed, melting efficiency, heat input in Arc welding process.

UNIT-IV: SPECIAL WELDING PROCESSES

Laser beam welding, Electron beam welding, Thermit welding, Resistance welding processes - Spot welding, Projection welding, Seam welding, Butt welding, weldability, Numerical problems on Resistance welding. Numericals on current, heat generated in resistance spot welding.

UNIT-V: FORMING PROCESSES

Cold & Hot working, Yield criteria, Process description of Forging, Rolling, Extrusion, Wiredrawing, Blanking, Piercing, Bending, Deep drawing, Stretch forming, Spinning. Numerical problems on Rolling, drawing, shearing and deep drawing operations. Engineering stress and strain, true stress and strain. Numericals on forging force, rolling pressure, punching and blanking force.

Learning Resources:

1. P.N.Rao, "Manufacturing Technology," Vol. 1, 3rd Edition, Tata McGraw Hill Publ., 2011.
2. Amitabh Ghosh & Mallik, "Manufacturing Science", 4th Edition, Assoc. East west Press Pvt. Ltd., 2011.
3. Roy A. Lindberg, "Materials & Process of Manufacturing", 5th Edition, Prentice Hall of India, l992.
4. Serope Kalpakjian, "Manufacturing Engineering and Technology", Addison, 7th Edition Wesley Publishing Company, 2006.
5. George.E. Dieter, "Mechanical Metallurgy", 4th Edition McGraw-Hill Book Company, 1988.

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

DESIGN OF MACHINE ELEMENTS

SYLLABUS FOR B.E. V-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks : 60	Course Code: U22PC540ME
Credits : 3	CIE Marks : 40	Duration of SEE: 3 Hours

Course objectives	Course Out comes
The objectives of this course are to analyse the failure of components due to static and fluctuating loads, design of shafts, joints, fasteners, riveted and welded joints.	On completion of the course the student will be able to: 1. estimate the size of machine component based on theories of failure for component subjected to different types of loads. 2. estimate the size/life of machine components subjected to fluctuating (Fatigue) loads based on Goodman and Soderberg criteria/S-N diagram 3. determine the size of shafts & fasteners subjected to torsion, bending, axial load or a combination of these to prevent failure. 4. analyze the Joints and couplings for a given load to prevent failure. 5. design of Power screws, riveted joints and welded joints for a given load under direct and eccentric loads.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	2								2	3	2	3
CO2	3	2	3	2								2	3	2	3
CO3	3	2	3	2								2	3	2	3
CO4	3	2	3	2								2	3	2	3
CO5	3	2	3	2								2	3	2	3

UNIT-I

Design considerations of Machine Elements: Materials used in machine design and their specifications according to Indian Standards. Preferred numbers. Review of types of loads and simple stresses. Design of knuckle joint. Stresses due to Bi-axial loads. Factor of safety. Theories of failures.

UNIT-II

Design for Fatigue: Fluctuating stresses, fatigue strength and endurance limit Stress concentration factor and Notch sensitivity. Factors affecting fatigue strength. S-N diagram, Soderberg and Modified Goodman's diagrams for fatigue design. Cumulative fatigue - Miner's rule.

UNIT-III

Design of shafts & Couplings: solid and hollow shafts and under torsion and bending loads. ASME code for design of shafts. Design of keys. Design of couplings - Muff, Flange.

UNIT-IV

Design of Bolts and nuts, locking devices for nuts, bolts of uniform strength, bolted joints under eccentric loads.

UNIT-V

Design of Screws: Design of screw jack. Differential and Compound Screws. Design of riveted joints and welded joints under direct load.

Learning Resources:

1. M.F. Spotts, *"Design of Machine Elements"*, 7th Ed., Pearson Education, 2003.
2. V. B. Bhandari, *"Design of Machine Elements",* 3rd Ed., Tata McGraw- Hill, 2010.
3. P.C. Sharma & D.K. Aggarwal, *"Machine Design",* 10th Ed., S.K. Kataria & Sons, 2003.
4. J.E. Shigley & Charles R. Mischke *Mechanical Engineering Design",* 6th Ed., Tata McGraw-Hill, 2010.
5. N.C. Pandya and C.S. Shah, *"Machine Design"* , Charotar publishing House, 2006.

Web Resources:

http://nptel.ac.in/courses/112105124

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

CAD/CAM

SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U22PC550ME
Credits :03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
analyze different types of modeling techniques, learn 2D transformations, understand numerical control machines, parts classification and coding system, process planning and flexible manufacturing system, discuss GT, CAPP, FMS and CIM.	1 identify the different types of Modelling Techniques in CAD and the basic entities which are useful in Model creation. 2 analyse the concepts of solid modelling and the associated Geometric transformations. 3 understand the basic concepts of NC machines and their programming. 4 distinguish between CNC and NC and Summarize the concepts of Industrial Robots. 5 understand the basic concepts of CIM and FMS and their extension to the present day Industry

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	3								3	2	3
CO2	3	2	2	3	3								3	2	3
CO3	3	2	3	3	3								3	2	3
CO4	3	2	2	2	3								3	2	3
CO5	3	2	3	2	3								3	2	3

UNIT-I

Introduction to computer aided design and manufacturing.

Geometric modeling: Wire frame modeling:wire frame entities and their definitions. Interpolation and approximation of curves. Concept of parametric and non–parametric representation of curves.

Synthetic Curves: Parametric representation of cubic spline, Bezier and B–spline curves, continuity, properties and characteristics of splines. Concepts of NURBS.

UNIT-II

Surface Modeling: Analytical surfaces: Definitions of planar, surface of revolution, Tabulated cylinder. Synthetic surfaces: Cubic and Bezier surfaces.
Solid modeling: C– rep and B– rep and feature instancing approaches.
2D Transformation and their mathematics: Translation, scaling, rotation, shearing and reflection about arbitrary points. Concatenated transformations.

UNIT-III: NUMERICAL CONTROL OF MACHINE TOOLS

Features and elements of NC. Positional, paraxial and contouring types. Definitions of axes, Definitions of interpolation, post– processor, preparatory and miscellaneous functions, canned cycles, tool length and cutter radius compensation. CNC programming using G and M codes for simple turning and milling operations.

UNIT-IV

Computer Numerical Control: CNC, DNC and adaptive control systems. Typical configurations and relative features. Machining centers.
Industrial Robots: Robot Anatomy, Configurations, Controls, Drivers, and applications.

UNIT-V

Group Technology: Part families, layout, part classification and coding system.
Computer Aided Process Planning: Variant and Generative process planning.
Flexible Manufacturing System & Computer Integrated Manufacturing System: Building blocks of Flexible Manufacturing systems and their control, Introduction to CIM. CAD/CAM Integration, Introduction to 3D printing and Reverse Engineering.

Learning Resources:

1. Arvid R. Eide, Roland D. Jenison, Lane H. Mashaw, Larry L. Northup, "Introduction to Engineering Design", Mc Graw– Hill, 1998.
2. Ibrahim Zeid, "CAD/CAM, Theory and Practice", McGraw Hill Inc. New York, 2011.
3. Grover, MP and Zimmers E.W., CAD/CAM, Prentice Hall of India, 1989.
4. Rao P.N., "CAD/CAM: Principles and Applications", 2nd Edition, Tata McGraw Hill, New Delhi, 2004.
5. YoramKoren, Computer Control of Manufacturing Systems, McGraw Hill Inc. New York, 1994.

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

B.E- V SEM OPEN ELECTIVE-III COURSES			
Dept.	**Title**	**Code**	**Credits**
Mech	Drives and Control Systems for Robotics (Stream: Robotics)	U22OE510ME	3
	Introduction to Robotics (General Pool)	U22OE520ME	3
Civil	Spatial Information Technology (General Pool)	U22OE510CE	3
CSE	Fundamentals of Artificial Intelligence (Stream- Artificial Intelligence & Machine Learning)	U22OE520CS	3
	Introduction to Operating Systems (General Pool)	U22OE510CS	3
EEE	Modelling and Simulation of Photovoltaic Systems (General Pool)	U22OE510EE	3
ECE	Introduction to Biomedical Electronics (General Pool)	U22OE510EC	3
	Signal Engineering (General Pool)	U22OE530PH	3
IT	Introduction to Artificial Intelligence (Stream- Artificial Intelligence & Machine Learning)	U22OE520IT	3
	Essentials of Operating Systems (General Pool)	U22OE510IT	3
Physics	Thin Film Technology and Applications (General Pool)	U22OE510PH	3
HSS	Design Thinking (General Pool)	U22OE530EH	3
	Basics of Entrepreneurship (General Pool)	U22OE540EH	3

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.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
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CO1	3	2	2		2					2		2	2	2	
CO2	3	3	2		2							2	2	2	
CO3	3	3	2		2					2		2	2	2	
CO4	3	3	3	2	3					2		2	2	2	2
CO5	3	3	3	2	3					2		2	2	2	2

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 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.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2			1	2	2					2	3	1	2
CO2	3	2			1	2	2					2	3	1	2
CO3	3	2			1	2	2					2	3	1	2
CO4	3	2			1	2	2					2	3	1	2
CO5	3	2			1	2	2					2	3	1	2

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 ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF CIVIL ENGINEERING

SPATIAL INFORMATION TECHNOLOGY (Open Elective-III)

(General Pool)

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 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
Objectives of this course are to	Upon the completion of the course, students are expected to
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. Basudeb Bhatta, 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. Thanappan Subash., 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 Mc Graw 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:	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 COMPUTER SCIENCE ENGINEERING

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE
(Stream- Artificial Intelligence & Machine Learning)
(Open Elective-III)
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 OBJECTIVES	**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. Solve problem with constraints. 6. Perform planning 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, Third Edition (2019), Pearson.
4. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, (1998),Elsevier

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 COMPUTER SCIENCE ENGINEERING

INTRODUCTION TO OPERATING SYSTEMS (Open Elective-III)
(General Pool)
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*
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/

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 ELECTRICAL AND ELECTRONICS ENGINEERING

Modelling and Simulation of Photovoltaic Systems

(General Pool: 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 : 3 Hours

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-1 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-2 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-3 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-4 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-5 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:	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 ELECTRONICS & COMMUNICTION ENGINEERING

INTRODUCTION TO BIOMEDICAL ELECTRONICS

(General Pool : Open Elective-III)

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.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2			1							1		3
CO2	2	2											1		3
CO3	2	1	3			2									2
CO4	3	2	2			2									3

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 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 ELECTRONICS & COMMUNICTION ENGINEERING

SIGNAL ENGINEERING

(General Pool : Open Elective-III)

SYLLABUS FOR B.E V Semester

L:T: P (Hrs./week):2: 0 : 1	SEE Marks:60	Course Code : U22OE530PH
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To Provide the fundamental knowledge of Signaling and interlocking to control and regulate the movement of trains safely & efficiently.	On completion of the course, students will be able to 1. Acquire knowledge on railway signaling principles. 2. Acquire the working of railway signals & their failsafe and safety aspects. 3. Understand various systems of train working, interlocking features and general requirements of signaling.

CO-PO/PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1												2
CO2	3	2	1												2
CO3	3	2	1												2

UNIT – I: Introduction to General Signaling (8 Hours)

Opening of Railways: Duties of Commissioners, Sanction to Open Railway for Public Carriage of Passengers, Requirements & Recommendations for Signaling and Interlocking Installations, Catechism for Signaling and Interlocking Installations, for 25KV AC, Spl layouts: Isolation, Ruling gradients, Slip, Catch sidings

Schedule of Dimensions: General, Station Yards, Electric Traction 25KV AC 50 Cycles, Clearances required for 25KV single phase AC Electric Traction.

General Rules: Definitions, Type of Signals; Adequate Distance, System of Working, Absolute Block system, Automatic Block System, Block Working, Level Crossings, Station Working Rules.

UNIT – II: Railway Signaling (6 Hours)

Station Layouts: MACLS, Signal Aspects, Location of Signals; Station Layouts: Single Line, Double Line, 2-Road, 3-Road, 4-Road.

Signaling Elements: Track Circuits & Axle Counters, Block Instruments, point machines, Relays, Relay Interlocking and Electronic Interlocking,

Requirement of Signaling in 25KV AC Electrified Area.
Signaling Interlocking Plan: Essentials of Interlocking, Train Detection, Point Switching, Signal, Block Control, Aspect Control Chart.

UNIT – III: Signaling Equipment – I (8 Hours)
Details of Relays, Signal Cables. Signals, Control Panel & Operation – Safety features, Working.
Details of Point Machines – Components, Working, Circuit Progression, Testing, Safety features,
Level Crossing Gates – Working, Circuit Progression, Safety features
Details of Track Circuits, Axle Counters - Single section, Multi-section, Subsystems; Working and Application.

UNIT – IV: Signaling Equipment – II (8 Hours)
Details about Block Instruments – Types, Working, Circuit Progression, safety features Data Acquisition System – Interfaces, Fault Logic.
Details of Integrated Power Supply, CLS Panel, Lightning and Surge Protection.

Practicals at IRISET Laboratory (12 Hours)

1. Relays, Signal Cables. Signals, Control Panel & Operation.
2. Point Machines - Components, Working, Circuit Progression, Testing.
3. Level Crossing Gates - Working, Circuit Progression.
4. Track Circuits, Axle Counters - Single section, Multi-section, Subsystems; Working and Application.
5. Block Instruments - Types, Working, Circuit Progression.
6. Data Acquisition System - Interfaces, Fault Logic.
7. Integrated Power Supply, CLS Panel, Lightning and Surge Protection.

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 ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF INFORMATION TECHNOLOGY

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

(Stream: Artificial Intelligence and Machine Learning)

(Open Elective-III)

SYLLABUS FOR 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 Hours

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

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 INFORMATION TECHNOLOGY

ESSENTIAL OF OPERATING SYSTEMS
(General Pool)

(Open Elective-III)

SYLLABUS FOR 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 The course will enable the students to:	**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

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 PHYSICS

THIN FILM TECHNOLOGY AND APPLICATIONS

(General Pool : Open Elective-III)

SYLLABUS FOR B.E V Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U22OE510PH
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	1
CO2	3	-	-	-	-	-	-	-	-	-	-	1
CO3	3	3	-	-	-	-	-	-	-	-	-	1
CO4	3	-	-	-	-	-	-	-	-	-	-	1
CO5	2	-	-	-	-	-	-	-	-	-	-	1

Course Objectives	Course Outcomes	BTL
Students are able to	***The students acquire the ability to***	
1. Learn the fundamental atomistic mechanisms.	1. State fundamental definitions of thin film technology.	1
2. Narrate thin film deposition techniques.	2. Describe thin film deposition techniques.	2
3. Acquire knowledge on thin film devices.	3. Illustrate thin film devices and their use.	3
4. Appreciate applications of thin films	4. Use thin films coatings in industrial applications	3

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- spin coating, simple thermal evaporation- Chemical vapor deposition technique-Advantages and disadvantages of Chemical Vapor deposition (CVD), Physical vapour deposition electron beam evaporation, RF sputtering, Ion beam sputtering, Laser ablation, molecular beam epitaxy (MBE).

UNIT-III: THIN FILM MATERIAL CHARACTERIZATION TECHNIQUES

Characterization techniques: X-Ray Diffraction (XRD), Thickness measurement techniques, 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 of thin film gas and temperature sensors, Thin film solar cells, Quantum dot solar cells, Applications of thin films in electronics, medical, defense, automobiles.

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
3. NPTEL: Fundamentals of Material Processing - Part 2, IIT Kanpur Prof. Shashank Shekhar, Prof. Jitesh J Thakkar

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 HUMANITIES &SOCIAL SCIENCES

DESIGN THINKING (Open Elective-III)
SYLLABUS FOR B.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 : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the learners 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.	**At the end of the course the learners will be able to: -** 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

Learning Resources:

1. The Art of Innovation, by Tom Kelley*

2. Insight Out, by Tina Seelig*
3. Change by Design, Tim Brown
4. Weird Ideas That Work, by Robert Sutton*
5. Wired to Care, by Dev Patnaik
6. Rapid Viz, by Kurt Hanks and Larry Belliston

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 HUMANITIES & SOCIAL SCIENCES

BASICS OF ENTREPRENEURSHIP

(Open Elective-III)

SYLLABUS FOR B.E V Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U22OE540EH
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

Course objectives	Course Outcomes
The objectives of this course are to: 1. deeply understand and discover entrepreneurship 2. build a strong foundation for the students to start, build, and grow a viable and sustainable venture 3. develop an entrepreneurial mind-set equipped with the critical skills and knowledge required	On completion of the course the student will be able to: 1. take-up entrepreneurship as a career choice 2. create and Validate business models. Build a Minimum Viable Product (MVP). 3. identify various costs and revenue streams for a venture. 4. build successful teams and acquire sales skills. 5. understand the business regulations and various Government schemes available.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1									1		1				1
CO2	1			2			1							1	
CO3											1				
CO4						1									
CO5											2	1			

UNIT-I

Introduction to Entrepreneurship: Definition of Entrepreneurship, Entrepreneurship as a career choice, Benefits and Myths of Entrepreneurship; Characteristics, Qualities and Skills of an Entrepreneur. Impact of entrepreneurship on the Economy and Society.

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

Learning Resources:

1. Robert D. Hisrich, Michael P Peters, "Entrepreneurship", Sixth edition, McGraw-Hill Education.
2. Thomas W. Zimmerer, Norman M. Scarborough, "Essentials of Entrepreneurship and small business Management", Fourth edition, Pearson, New Delhi, 2006.
3. Alfred E. Osborne, "Entrepreneurs Toolkit", Harvard Business Essentials, HBS Press, USA, 2005
4. MadhurimaL all and Shikha Sahai, "Entrepreneurship", Excel Books, First Edition, New Delhi,2006

Web Resource: http://www.learnwise.org

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 HUMANITIES & SOCIAL SCIENCES

SKILL DEVELOPMENT COURSE-V (Communication Skills in English-II)
SYLLABUS FOR B.E. V-SEMESTER

Instruction : 1 Hours	SEE Marks : 40	Course Code : U22HS510EH
Credits : 1	CIE Marks : 30	Duration of SEE : 2 Hours

Course objectives	Course Outcomes
The objectives of this course are 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	On completion of the course, the student will be able to: 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

2.1 Concise Cogent Presentation
2.2 Persuasion skills
2.3 Toulmin Model
2.4 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

1.1 Report writing
1.2 Image Writing
1.3 Book Reviews
1.4 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:	02	Max.Marks for each Internal Test:	20
2	No. of Assignments:	02	Max. Marks for each Assignment:	05
3	No. of Quizzes:	02	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

SKILL DEVELOPMENT COURSE-VI (Technical Skills-II)
Mathematical Programming for Mechanical Engineers

SYLLABUS FOR B.E. V-SEMESTER

Instruction : 1 Hours	SEE Marks : 40	Course Code : U22PE510ME
Credits : 1	CIE Marks : 30	Duration of SEE : 2 Hours

Course objectives	Course Outcomes
The objectives of this course are to: formulate script/function files using Mathematical programming tools and develop programs for solving various problems including polynomial and differential equations.	On completion of the course, the student will be able to: 1. utilise Mathematical programming tool, e.g, MATLAB, Mathematica for mathematical operations using built-in functions. 2. formulate matrices and understand matrix operations. 3. create and execute script/function files and understand graphical representation using 2-D plots. 4. develop programs using conditional statements.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2	2	1	3								1	2	2
CO2	2	1	1	2	2								2	2	3
CO3	1	2	1	1	3								1	1	2
CO4	2	1	2	2	2								2	2	3

UNIT –I

Introduction to mathematical programming tools, e.g, MATLAB/ OCTAVE/ Mathematica. Working in Command Windows, Mathematical Arithmetic operations with scalars, order of preference.

Working as a calculator, Display of formats, Elementary Math-building functions, Example Problems.

Assignment operators, rules about variables.

UNIT-II

Creating Arrays and matrices, matrix operations, Examples of Applications.

Unit III

Function files, crating, saving and running a function file.
2D plots, Plots with special graphics, Multiple plots, examples.
3D plots, line plots, mesh and surface plots, plots with special graphics, view command, Examples.

Unit IV

Programming in Mat lab, conditional statements, loops, nested loops, Examples, Polynomials, curve fitting and interpolation, Examples and Applications. Free vibration analysis problems.

Learning Resources:

1. Agam Kumar TyagI, "MATLAB and Simulink for Engineers", Oxford Higher Education, 2010
2. Rudra Pratap, " Getting started with MATLAB" , Oxford University Press, 2010
3. Amos Gilat, "Matlab – An introduction with applications", Wiley India, 2012
4. Stevan C Chapra, "Applied Numerical Methods with Matlab for Scientists and Engineers". Tata McGraw- Hill, 2010
5. The Mathematica Book, Fifth Edition, Wolfram Media

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

1	No. of Internal Tests:	01	Max.Marks for each Internal Test:	30
2	No. of Assignments:	--	Max. Marks for each Assignment:	--
3	No. of Quizzes:	--	Max. Marks for each Quiz Test:	--

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

MANUFACTURING PROCESSES LAB

SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code: U22PC531ME
Credits :01	CIE Marks:30	Duration of SEE: 03 Hours

COURSE OBJECTIVE *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
manufacture components using various casting, welding and forming methods and to study their defects.	1 design and prepare mould cavity and determine time taken for solidification. 2 evaluate efficiency & performance characteristics of arc welding & gas Welding operations. 3 calculate the Ericsson number & Designing metal Forming Dies for forming operations. 4 understanding and reasoning various Casting, Forming & welding defects.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	2								3	3	2	3
CO2	3	2	3	2								3	3	2	3
CO3	3	2	3	2								3	3	2	3
CO4	3	2	3	2								3	3	2	3

Foundry

1. Single piece pattern making with wood as material considering allowances (Draft, Shrinkage and Machining)
2. Green sand mould making processes with complete sprues, gates, riser with design.
3. Testing of green sand properties and calculation of moisture content and Grain Fineness Number
4. Melting and casting of aluminium metal and Study of defects in castings by DP test
5. Preparation of shell for Shell moulding process.

Welding

6. Identification of different types of flames and making a butt joint with gas welding.
7. Making a lap joint by resistance welding process and strength evaluation.
8. Analysis of bead geometry using AC and DC welding processes.
9. Demo of TIG and MIG welding processes.
10. Exercise on submerged arc welding.

Forming

11. Evaluation of formability using Erichsen cupping test.
12. Design study of simple dies and performing blanking and piercing operations and theoretical estimation of loads.
13. Study of simple, compound and progressive dies and making simple components.
14. Study of process parameters for injection moulding.

From the above experiments, each student should perform at least 12 (Twelve) experiments.

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

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 3 Hours			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

CAD/CAM LAB

SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code: U22PC551ME
Credits :01	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVE *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
practice 2D and 3D modeling, practice assembly of various components and understand how to write the CNC programming.	1 develop 3D part models using various features of NX modeling software. 2 develop assembly of given components using assembly constraints various features of NX modeling software. 3 develop CNC programming using G codes and M codes for the given simple turning and milling operations. 4 expose to 3D manufacturing by additive manufacturing technique.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	1	3								3	2	3
CO2	3	2	2	2	3								3	2	3
CO3	3	2	2	1	3								3	2	3
CO4	3	2	2	1	3								3	2	3

I. CAD:

1. Development of 3-D components using sweep, extrude and revolve.
2. Development of Mechanical components: Gear with involute profile, helical spring, threading and pet bottle.
3. Introduction to assembly constraints and assembly of journal bearing.
4. Assembly of Flange coupling.
5. Assembly of Plummer block and Universal coupling
6. Assembly of Connecting rod.
7. Motion simulation of mechanisms
8. Motion simulation of manipulator

II. CAM:

9. Introduction of manual part programming using G-codes and M-codes.
10. Manual part program for Plain turning and step turning for CNC lathe.
11. Manual part program for taper turning and thread cutting for CNC lathe.
12. Manual part program for linear and circular interpolation for CNC Mill.
13. Manual part program for contouring and pocketing for CNC Mill.
14. Automatic part program generation for a 3-D model using manufacturing module.
15. Manufacture of a 3-D component using additive manufacturing.
16. Point cloud data acquisition through 3D scanner.

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

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 3Hours			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

Programming for Mechanical Engineers Lab

SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code: U22PC561ME
Credits :01	CIE Marks: 30	Duration of SEE: 03 Hours

COURSE OBJECTIVES *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
enable the student to take up investigative study in the field of mechanical engineering using programming.	1 Use Python Numpy library to solve mechanical engineering problems, such as structural, kinematic and dynamic analysis, thermal systems, and fluid flow. 2 solve differential equations and system simulations such as vibrations and dynamic problems using Numpy and Scipy libraries. 3 create various types of plots, such as line graphs, scatter plots, histograms, and contour plots, to visualize and interpret data from experiments or simulations using matplotlib library.

CO-PO and CO-PSO mapping

CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	1	1	2				1	1	1	1	1	2	1
CO2	2	2	1	1	2				1	1	1	1	1	2	1
CO3	2	2	1	1	2				1	1	1	1	1	2	1

1. Introduction to Python, NumPy library – working with arrays/Matrices.
2. Plotting the data with matplotlib Library
3. Program to draw the projectile motion find the projectile angle for maximum range and maximum height.
4. Program to find shear force and bending moment for the given load conditions on beam.
5. Program to find temperature distribution along a plane slab and to estimate heat transfer rate.
6. Program to find temperature distribution for a given object and to estimate heat transfer rate
7. Program to find temperature distribution along a composite system and to estimate heat transfer rate
8. Program to draw the Von Misses failure theory plots for a given material.

9. Program to find position, velocity, and acceleration for a slider crank mechanism and to draw the plots.
10. Program to plot and visualise stream lines of the fluid flow.
11. Program to analyse the Diesel cycle.
12. Program to analyse the flow over a cylinder and to plot stream lines and pressure contours.
13. Program to analyse the single degree freedom of system with scipy.
14. Program to plot the frequency response of the spring mass system.
15. Program to plot the frequency response of the multi degree freedom spring mass system.
16. Program to analyse the quarter car suspension model.
17. Reading the data from a file and plot the data.

From the above experiments, each student should perform at least 12 (Twelve) experiments.

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

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 3 Hours			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

Mini Project

SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code: U22PW519ME
Credits :01	CIE Marks: 30	Duration of SEE: 03 Hours

COURSE OBJECTIVES *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
enable the student to take up investigative study in the field of mechanical engineering.	1 choose appropriate field of interest and define the problem. 2 Plan the activities for carrying out the work in teams to solve the problem. 3 develop the capability to conduct investigations on the chosen problem and obtain results.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	2	2	3	3	3	2	2	3	2	3
CO2	3	3	3	3	3	2	2	3	3	3	2	2	3	2	3
CO3	3	3	3	3	3	2	2	3	3	3	2	2	3	2	3

The mini project can be assigned on individual basis or in a group consisting of maximum 3 students/ batch.

The students are required to identify the topic of their interest and collect data / literature in core areas of thermal, design and analysis, manufacturing and industrial engineering. The students need to identify a problem and work in that area in consultation with the project guide. The output may be in terms of a small prototype or conducting investigations through experiments or evaluate theoretically using modern tools of mechanical engineering such as CAD/CAM, FEA,CFD or prepare a review of the existing state-of-the-art technology related to mechanical Engineering.

The students are required to submit a project report containing the abstract and the summary of the work in terms of plots or fabricated models or a technical report and submit for evaluation.

The students are required to give a oral presentation/ demo of prototype before the departmental committee for evaluation.

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

No. of Internal Tests/Viva / Presentations	2	Max. Marks for Internal Test:	30
Marks for assessment of Mini Project using Rubrics			50

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-22)
B.E. – MECH : SIXTH SEMESTER (2024-2025)

B.E (MECH) VI Semester								
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								
U22PC610ME	Metrology and Instrumentation	3	-	-	3	60	40	3
U22PC620ME	Dynamics of Machines	3	1	-	3	60	40	4
U22PC630ME	Machine Design	3	-	-	3	60	40	3
U22PC640ME	Metal Cutting and Machine Tools	3	-	-	3	60	40	3
U22PC650ME	Refrigeration and Air Conditioning	3	-	-	3	60	40	3
U22OE6XXXX	Open Elective-IV	3	-	-	3	60	40	3
U22BS610MA	Skill Development Course-VII (Aptitude-III)	1	-	-	2	40	30	1
U22PE610ME	Skill Development Course-VIII (Technical Skills-III)	1	-	-	2	40	30	1
U22PEXXXME	NPTEL Course Certification	-	-	-	-	-	-	2
PRACTICALS								
U22PC621ME	Theory of Machines Lab	-	-	2	3	50	30	1
U22PC641ME	Machine Tools and Metrology Lab	-	-	2	3	50	30	1
U22PW619ME	Theme Based Project	-	-	2	-	50	30	1
	TOTAL	**20**	**1**	**6**		**590**	**390**	**26**
	GRAND TOTAL	**27**				**980**		**26**

1) Student should complete one NPTEL certification course equivalent to 2 credits (8 weeks) by the end of VI semester.
2) Left over hours allotted to Sports / Library / PDC / Mentor Interaction / CC / RC / TC / CCA / ECA

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

METROLOGY AND INSTRUMENTATION

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U22PC610ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES *The objective of this course is*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
measurement of various mechanical features using metrology principles, instrumentation systems with sensors and transducers which measure Temperature, Force, Torque, Strain, displacement & acceleration.	1. identify the Principles of measurement, study of Various types of Limit s, Fits & tolerances and demonstrate the working Principle of Limit gauges. and other devices used in measurement by following the principles of metrology. 2. measuring component features considering physical and mathematical aspects on the basis of their application and limitations. 3. learn &Analyse instrumentation Principles by classifying various Sensors and transducers based on the study of their static & dynamic characteristics aspect of their sensitivity, working range and applications. 4. study of strain gauges, Load cells and dynamometers for the measurement of strain, Force & Torque by estimating their performance during working conditions. 5. identify the seismic transducers for the measurement of displacement, acceleration, & study of various pressure measuring Instruments and temperature and choose a specific transducer based on working and ambient conditions.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	1	2	2						3	3	3	2
CO2	3	3	2	2	2	2						3	3	2	1
CO3	3	2	2	1	2	2						3	3	2	1
CO4	3	2	2	2	2	2						3	3	3	2
CO5	3	2	2	2	2	2						3	3	2	2

UNIT-I: LIMITS AND FITS, ISO SYSTEM
Fits and types of interchangeability, Allowances and types of Fits in an assembly-problems, Taylor's principle of plain limit gauges, Use of plug, Ring and Snap gauges. Design of Go Gauge and No Go gauge considering Gauge Tolerance and wear allowances- numerical problems.

Introduction– Linear and Angular measurements– Line and end standards, Slip Gauges – Types, Height gauges, Tomlinson gauges, Sine bar. Numerical problems on slip gauges, Angle gauges, measurement of angle with angle gauges sine bar and sensitivity of spirit level.

UNIT-II
Measurement of straightness and flatness, Auto collimator, Roundness measurement with bench centers and Talyrond, coordinate measuring machine in component geometries.

Surface Roughness Measurements – Numerical assessments, parameters as per ISO indices. Profilometer, Taylor Hobson Talysurf.
Gear measurement – Gear Nomenclature & Gear tooth thickness using chordal tooth thickness method and numericals.

UNIT-III: **ELEMENTS OF INSTRUMENTATION SYSTEM**
Concept of measurement measure and, sensors and transducers. Static and dynamic characteristics. Types of errors. Calibration Procedures. Numericals on static characteristics of instrument. Temperature measurement by thermocouples. Laws of thermo-electricity. Types of materials used in thermocouples. Series and parallel circuits. Ambient temperature compensation.

UNIT-IV
Introduction to Transducers. Displacement transducer-LVDT. Strain measurement – wire and foil type resistance strain gauges. Rosette Gauges. Numericals on gauge factor of strain gauge. Proving ring. Strain gauge load cells, measurement of axial load and torsion by strain gauges. Piezo-electric load cell, Torque cells, dynamometers

UNIT – V
Introduction to Seismic Transducers – displacement and acceleration measurement, Pressure measurement – Bourdon pressure gauge, Bulk modulus gauge, Pirani gauge. Introduction to data acquisition systems and signal processing.

Learning Resources:
1. Doeblin, "Measurement Systems application and design", 5th Edition, Tata McGraw Hill, 2004.
2. Thomas G Beckwith, Roy D Marangoni, John H Lienhard V, "Mechanical Measurements", 6th Edition, Pearson Education Asia, 2007.
3. B.C. Nakra, K.K. Chaudhry, "Instrumentation Measurement and Analysis", 3rdEdition, McGraw Hill, 2014.
4. R.K. Jain, "Engineering Metrology", Khanna Publications, 1996.

5. I.C. Gupta "A Text Book of Engineering Metrology",7th Edition, Dhanpat Rai Publications, New Delhi.
6. D. S. Kumar- "Mechanical Measurements & control" S. Chand Publications

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

DYNAMICS OF MACHINES

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:1:0	SEE Marks:60	Course Code: U22PC620ME
Credits :04	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
understand the operational characteristics in mechanisms, gyroscopes, governors, fly wheels, clutches and brakes and formulate the governing equations for vibrations of single degree freedom.	1 estimate the effect of forces in Four bar and slider crank mechanisms using equilibrium conditions, calculate the gyroscopic couple and interpret its effect in aeroplane, ship and automobile vehicle. 2 balancing of reciprocating and rotating machinery by addition or removal of masses by eliminating/reducing inertia forces. 3 calculate frictional torque and power due to friction in bearings, brakes and dynamo meters. 4 estimate the operational characteristics in Governors, understand the Flywheel sizes required for I.C engines and Presses. 5 Estimate the vibration characteristics of single degree of freedom free, damped and forced vibration systems.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	1	1								3	2	1
CO2	2	3	2	3	1								3	2	1
CO3	3	2	2	2	2								3	2	1
CO4	2	3	3	3	1								3	2	1
CO5	3	2	2	1	2								3	2	1

UNIT-I

Static and Dynamic Force analysis: Static force analysis of Four bar and slider crank mechanisms by graphical method. **Kinematic analysis** of slider crank mechanisms using analytical method Dynamic analysis of slider crank mechanism by considering inertia of piston by Analytical method.

Gyroscope: Gyroscopic couple, gyroscopic effects in aeroplane, ship and

automobile vehicle.

UNIT-II

Balancing: Forces due to rotating shaft carrying several masses in several planes. Rotary balancing on single plane and multiple planes. Shaking forces in single cylinder engine, partial balancing of reciprocating masses in single cylinder engines. Conditions required for balancing of multi cylinder in-line and radial engines.

UNIT-III

Friction:

Thrust bearings-pivots and collars.

Brakes and Dynamometers: Block, band, block and band, internally expanding shoe brakes. Prony brake, rope brake, belt transmission, epi-cyclic gear transmission, torsion dynamometers.

UNIT-IV

Governors: Classification of governors, Porter and Hartnell governors, Controlling force, Stability, Isochronism, Sensitivity, Power and Effort of governors.

Flywheels: Functions, Differences between flywheel and governor. Turning moment diagrams, design of flywheel used for I.C. Engines and Presses.

UNIT-V:

Introduction to Mechanical Vibrations: Basic concepts of simple Harmonic motion. Single degree of freedom Axial-Free, Dampedand Forced Vibrations, Magnification factor, Vibration Isolation and Transmissibilty. Transverse-Free vibrations, Whirling speed. Torsional-Free vibrations.

Learning Resources:

1. R.L.Norton, "Kinematics and Dynamics of Machinery "Tata McGraw Education Pvt. Ltd., New Delhi 2009.
2. Thomas Bevan, "The Theory of Machines", CBS Publishers&Distributors,2004.
3. S.S. Rattan, "Theory of Machines", Tata McGraw Education Pvt. Ltd., New Delhi2010.
4. John J. Uicker, Jr., Gordon R. Pennock, Joseph E. Shigley, "Theory of Machines and Mechanisms", Oxford University Press,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

MACHINE DESIGN

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U22PC630ME
Credits :03	CIE Marks:40	Duration of SEE: 03Hours

COURSE OBJECTIVE The objective of this course is to	**COURSE OUTCOMES** On completion of the course, students will be able to
study the design of curved beams, springs, gears, bearings and I.C. engine parts.	1 design curved beam for machine frames, C - clamps and crane hook under pure bending 2 condition. design helical and leaf springs under direct 3 and eccentric loading for various applications. design gears under strength and wear 4 conditions for power transmission. design sliding contact bearings for supporting shafts/axles under radial and thrust loads. design rolling contact bearings for supporting 5 shafts /axles under static and dynamic loads. design piston, connecting rod and crank shaft for I.C. Engine under strength and thermal loading conditions.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	3	2	1								3	2	1
CO2	3	2	3	3	1								2	3	2
CO3	2	3	3	2	2								3	2	1
CO4	2	2	2	3	1								2	2	2
CO5	2	2	3	2	1								3	2	1

UNIT-I: CURVED BEAMS

Beams with initial curvature – rectangular, circular and trapezoidal sections. Design of crane Hooks, machine frames and C- clamps.

UNIT-II: MECHANICAL SPRINGS

Types of springs and Materials used. Design of Helical Springs based on stress, deflection and energy considerations. Concentric springs. Leaf springs: Stresses and deflection. Nipping of leaf springs.

UNIT-III: GEARS

Materials used for gear design. Standards for gear specifications. Design of spur gears. Introduction to helical, bevel and worm gears – strength and wear considerations. Types of failure of gear tooth and preventive measures.

UNIT-IV

Bearings: Materials used for Bearings, Classification of bearings. Theory of Hydrostatic and Hydrodynamic lubrication. Design of sliding contact bearings – for radial and thrust loads.

Rolling Contact Bearings: Different types of rolling element bearings and their constructional details. Static and dynamic load carrying capacity, Load–life relationship, Design for cyclic loads.

UNIT-V: I.C. ENGINE PARTS

Design of piston, connecting rod and crank shafts (single throw and overhang).

Learning Resources:

1. V.B. Bhandari, "Design of Machine Elements", 4th Edition, McGraw–Hill Publications, 2017.
2. M.F. Spotts, "Design of Machine Elements", 7thEdition, Pearson Education, 2003.
3. P.C. Sharma & D.K. Aggarwal, "Machine Design", 10th Edition, S.K. Kataria& Sons, 2003.
4. J.E. Shigley, C.R. Mischke, R.GBudynas "Mechanical Engineering Design", 6th Edition, Tata McGraw Hill Publications, 2003.
5. N.C Pandya and CS Shah, "Machine Design" Charotar publishing House, 2006.

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

METAL CUTTINGAND MACHINE TOOLS

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U22PC640ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
study the kinematic structure and constructional features of machine tools, surface finishing, tool design characteristics, metal cutting characteristics and tool characteristics.	1 classify different types of machine tools used in Industry, their constructional features and operations. 2 identify and use flat surface generating machines and able to perform gear cutting operations. 3 understand the importance of surface finishing methods and work holding devices. 4 compute forces in machining operations, tool material and principles of non conventional machining methods. 5 interpret functioning of coolants in metal cutting, tool geometry, thermal effect on tool wear, tool life and economics.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	2								3	3	2	3
CO2	3	2	3	2								3	3	2	3
CO3	3	2	3	2								3	3	2	3
CO4	3	2	3	2								3	3	2	3
CO5	3	2	3	2								3	3	2	3

UNIT-I

Machine tools: Constructional features and specifications of machine tools, Kinematic structure of lathe, types of lathes, capstan and turret lathes, various operations with applications, machining time calculations, tool and work holding devices.

Drilling: Types, operations and machining time calculations.

UNIT-II

Shaping, Planning and Slotting: Principle and quick return mechanisms used, operations and comparison, machining time calculations.

Milling Machine: Kinematic structure of Milling, Operations dividing head, Indexing Methods.

Gear cutting machines: Form cutting, Generation methods, Gear Hobbing, Gear shaping and gear finishing machines.

UNIT-III

Surface finishing: Units of surface finish, types of grinding, Abrasives and bonds used for grinding wheels, specifications and selection of grinding wheels. Broaching, Lapping, Honing, Super finishing and Burnishing.

Jigs and fixtures: Design principles of jigs and fixtures, location and clamping. Quick clamping devices, Types of Jigs and Fixtures.

UNIT – IV

Non-traditional machining: working principle process parameters, applications and material removal rate of USM, AJM, EDM and ECM. Numericals on metal removal rate.

Cutting tool materials: Tools material properties. High carbon steel, HSS, Stellites, Carbides, Coated carbides, Diamonds.

Machining: Orthogonal and Oblique cutting, chip formation, types of chips, chip breakers Mechanics of metal cutting, Merchant analysis, Shear angle, Solutions of Merchant and Lee & Shafer. Numerical problems.

UNIT-V

Tool geometry: Nomenclature of single point cutting tool by ASA and ORS systems and conversions. Geometry of drills, milling cutters.

Thermal aspects of metal cutting: Sources of heat generation and heat distribution, various methods of temperature measurement, Cutting fluids and applications.

Tool wear, tool life and machinability: Types of wear, mechanism of tool wear, Tool life and Machinability, Machinability index, Taylor's tool life equation. Numerical problems on economics of machining.

Learning Resources:

1. B.L.Juneja and Shekon, "Fundamentals of Metal Cutting & Machines Tools", Wiley Eastern Ltd., 1987.
2. P.N.Rao, "Manufacturing Technology– Metal Cutting & Machine Tools", Vol.2, Tata McGraw Hill Education Pvt.Ltd., 2010.
3. Amitab Ghosh and Mallick,"ManufacturingScience", Affiliated East West Press, 1985.
4. H.S. Shan and P.C. Pandey, "Modern Machining Process", Tata McGraw-Hill Education, 1980.
5. A.Bhattacharya, "Metal Cutting Theory and Practice", New Central Book Agency (P) Ltd., Calcutta, 1996

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

REFRIGERATION AND AIR CONDITIONING

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U22PC650ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
dwell into the basic principles of Refrigeration and Air Conditioning together with their Engineering Applications. discuss basics of refrigeration and describe the working of different types of refrigeration systems; explain the principles of psychrometry, list different equipment used in air conditioning plant.	1. classify the refrigerants and analyze the performance of air refrigeration. 2. analyze the Vapor Compression Refrigeration System and the effects of operating conditions on the system solve problems in vapour compression refrigeration systems and evaluate their performance. 3. explain the working principles of VAR and SJR systems, compare VAR and VCR systems and explain working principles of various refrigeration systems. 4. define different properties of psychrometry. 5. compute sensible and latent heat loads and cooling loads of an air conditioning building and explain working of different Air Conditioning Systems and explain the working principles of typical Air Conditioning Systems

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	2	3			2			1			1	2	3
CO2	2	3	2	3			2			1			1	2	2
CO3	2	3	3	2			2			1			1	2	2
CO4	2	3	3	2			2			1			1	2	2
CO5	2	3	3	2			2			1			2	1	1

UNIT-I

Introduction to Refrigeration: Definition of Refrigeration and Air–conditioning –Necessity of Refrigeration and its applications – Methods of Refrigeration, unit of Refrigeration and COP. Reversed Carnot cycle – limitations.

Refrigerants: Classification, Nomenclature and Desirable properties.
Air refrigeration System: Analysis of Bell Coleman cycle/reversed Brayton cycle, open and dense air system.

UNIT-II: Vapour Compression Refrigeration System
Working principle and essential components of a simple vapour compression refrigeration cycle. Analysis of the cycle, COP, Representation of the cycle on T-s,P-h planes. Dry and Wet compression, effect of operating conditions like evaporator pressure, condenser pressure, liquid sub cooling and vapour super heating on performance of the system.

UNIT-III
Vapour Absorption Refrigeration System: Simple absorption system, COP, practical Ammonia absorption refrigeration system, Lithium Bromide absorption system, common refrigerants and absorbents properties.

Working principle of Steam Jet Refrigeration System.

UNIT-IV
Psychrometry: Definition, properties, Psychrometric chart, Psychrometric processes: Sensible cooling and heating, absolute humidification and dehumidification, cooling with dehumidification, heating with humidification, adiabatic humidification and adiabatic chemical dehumidification, mixing processes; Types and working of psychrometers.
Introduction to Air conditioning: Requirements of comfort air conditioning, Thermodynamics of human body.

UNIT-V
Cooling load calculations:
Sensible heat loads, latent heat loads.
Design of Air conditioning system: All fresh air load, Re-circulated air, Concept of by-pass factor, sensible heat factor, Apparatus Dew Point, Room Sensible Heat Factor (RSHF), Gross Sensible Heat Factor (GSHF).

Air conditioning systems: Working of Window/Split air conditioner, packaged air conditioner and central air conditioning system.

Note: Use of R&AC tables and charts permitted in the examination hall.

Learning Resources:
1. Stocker W.F. and A.L. Jones "Refrigeration & Air Conditioning", 2nd Edition, Tata McGraw-Hill, New Delhi, 1985.
2. Roy J.Dossat., "Principles of Refrigeration-SI Version", 4th Edition, Wiley Eastern Limited, New Delhi, 2016.

3. Arora C.P., "Refrigeration and Air Conditioning", 3rd Edition, Tata Mc Graw-Hill, New Delhi, 2010.
4. Arora S.C. and DomkundwarS,"A course in refrigeration and air conditioning," 8th Edition, Dhanpat Rai & Co, 2010.
5. Manohar Prasad., "Refrigeration and Air conditioning", 3rd Edition, New Age International publishers, New Delhi, 2016.
6. Prof Ramgopal, IIT Kharagpur, Web and Video material of NPTEL.

Data Book:

Dr.S.S.Banwait&Dr.S.C.Laroiya., "Birla's Properties of Refrigerant &Psychrometric Tables & Charts in S.I. Units".

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

B.E. VI SEM OPEN ELECTIVE-IV COURSES			
Dept.	**Course Name**	**Code No.**	**Credits**
MECH.	Industry 4.O (Stream: Robotics)	U22OE610ME	3
	Additive Manufacturing and its Applications (General Pool)	U22OE620ME	3
Civil	Project Management (General Pool)	U22OE610CE	3
CSE	Fundamentals of Machine Learning (Stream- Artificial Intelligence & Machine Learning)	U22OE620CS	3
	Introduction to Databases Management Systems (General Pool)	U22OE610CS	3
EEE	Introduction to Batteries and Battery management System (General Pool)	U22OE610EE	3
ECE	Automatic Train Protection System - Kavach (General Pool)	U22OE630PH	3
IT	Introduction to Machine Learning (Stream- Artificial Intelligence & Machine Learning)	U22OE620IT	3
	Web Application Development and Security (General Pool)	U22OE610IT	3
HSS	Advanced Course in Entrepreneurship (General Pool)	U22OE630EH	3

VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF MECHANICAL ENGINEERING

INDUSTRY 4.O

(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 The objectives of the course is to	COURSE OUTCOMES 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 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.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	2		2	1									
CO2	3	2	2		3	2									
CO3	3	2	2		3	2									
CO4	3	2	2		3	2									
CO5	1	3	3		3	3									

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 ENGINEERING (AUTONOMOUS)

Ibrahimbagh, Hyderbad-500031

DEPARTMENT OF CIVIL ENGINEERING

PROJECT MANAGEMENT (Open Elective-IV)

(General Pool)

SYLLABUS FOR B.E.VI-SEMESTER

L:T: P (Hrs/Week):3:0:0	SEE Marks: 60	Course Code:U22OE610CE
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

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 of project 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.

Lender: Lender form, Lender documents, Lender 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:

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. Gahloj. P.S. and Dhiv. B.M., Construction Planning and Management, Wiley Eastern Ltd., 2018.
5. Kumar NeerajJha., 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 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 Test: 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)
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 OBJECTIVES	**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:

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

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 MANAGEMENET SYSTEMS
(OPEN ELECTIVE-IV)
(General Pool)
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 ELECTRICAL AND ELECTRONICS ENGINEERING

Introduction to Batteries and Battery Management System
(General Pool : 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
batteries, its parameters, modelling and charging requirements. The course will help learner to develop battery management algorithms for batteries.	On completion of the course, students will be able to 1. Interpret the role of battery management system. 2. Identify the requirements of Battery Management System. 3. Interpret the concept associated with battery charging / discharging process. 4. Calculate the various parameters of battery and battery pack. 5. Design the model of battery pack

UNIT -I: Introduction to Battery Management System:

Cells & Batteries, Nominal voltageand capacity, C rate, Energy and power, Cells connected in series, Cells connected in parallel, Electrochemical and lithium-ion cells, Rechargeable cell, Charging and Discharging Process, Overcharge and Undercharge, Modes of Charging.

UNIT -II: Battery Management System Requirement:

Introduction and BMS functionality, Battery pack topology, BMS Functionality, Voltage Sensing, Temperature Sensing, Current Sensing, High-voltage contactor control, Isolation sensing, Thermal control, Protection, Communication Interface, Range estimation, State-of-charge estimation, Cell total energy and cell total power.

UNIT –III: Battery State of Charge and State of Health Estimation, Cell Balancing:

Battery state of charge estimation (SOC), voltage-based methods to estimate SOC, Model-based state estimation, Battery Health Estimation,

Lithium-ion aging: Negative electrode, Lithium-ion aging: Positive electrode, Cell Balancing, Causes of imbalance, Circuits for balancing.

UNIT –IV: Modelling and Simulation:

Equivalent-circuit models (ECMs), Physics-based models (PBMs), Empirical modelling approach, Physics-based modelling approach, simulating an electric vehicle, Vehicle range calculations, simulating constant power and voltage, Simulating battery packs.

UNIT -V: Design of battery BMS:

Design principles of battery BMS, Effect of distance, load, and force on battery life and BMS, energy balancing with multi-battery system.

Learning Resources:

1. Plett, Gregory L. Battery management systems, Volume I: Battery modeling. ArtechHouse, 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 Book Series 2002.
4. Davide Andrea," Battery Management Systems for Large Lithium-ion Battery Packs"Artech House, 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 ENGINEERING (AUTONOMOUS)

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

AUTOMATIC TRAIN PROTECTION SYSTEM - KAVACH

(General Pool : Open Elective-IV)

SYLLABUS FOR B.E. VI - SEMESTER

L:T:P (Hrs./week) : 2:0:1	SEE Marks : 60	Course Code: U22OE630PH
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
To Provide the knowledge of Kavach technology which is used for an anti-collision system for trains.	On completion of the course, students will be able to 1. Acquire knowledge about the Train Protection Systems in general and Kavach - Indian Railways Automatic Train Protection System in detail. 2. Acquire knowledge about various elements, subsystems associated with Kavach, those on the ground - wayside, those on the train - onboard and related concepts. 3. Design various plans & diagrams required for implementation of Kavach for typical station layout. 4. Simulate & validate the system designs on the testbench.

CO-PO/PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1										3		2
CO2	3	2	1										3		2
CO3	3	3	2										3		2
CO4	3	3	2	1										2	2

UNIT – I: Introduction to Train Protection Systems (8 Hours)

Train Protection Systems: Auxiliary Warning Systems, European Train Control Systems Communication Based Interlocking System, Spot and Continuous Relay of Information

Working of Train Protection System – Kavach: Overview of Kavach and its Working, Features, Subsystems, Communication Interfaces, Signalling Interfaces

Subsystem: Onboard Kavach: Driver Machine Interlocking, Braking

Interface, Radio Equipment, Onboard Computer, Transponder Receiver, Odometry, GNSS, GPRS, GSM

Subsystem: Stationary Kavach Station Kavach, Track Side Equipment, Signalling Interface, Radio & Tower, GNSS, Transponders, Network Monitoring System

UNIT – II: (6 Hours)

Concepts : Location Referencing - Train position, Modes of Onboard subsystem, Train Characteristics, Mode Transitions, Braking Curves, Speed Profiles, Speed Limits, Speed Monitoring, Target Speed, Target Distance, Movement Authority, Communication Protocols, Key Management System (KMS), Messages & Language

UNIT – III: Design –Kavach: (8 Hours)

Survey, Assessment & Estimation: Station Layout, Radio Signal Strength, Tower Location, Power Requirement, Cable Survey, Loco Fitment Survey

Station Design: Kavach Scheme Plan, Kavach Control Table, Signalling Interface Diagram, Connectivity Plans for Remote Interface Units (RIUs), Power Supply Plan

Tower Design: Soil Testing, Foundation design, Super Structure Design

UNIT – IV: Installation, Deployment & Testing (8 Hours)

Stationary Kavach: Interlocking Interface, RFID Tags, Station Master Operation Console Indication Panel (SM_OCIP), GPS/GSM Antennas, Pre-commissioning Checklist, Testing

Onboard Kavach: DMI, Speed Sensors, RFID Reader, Onboard Computer, Brake Interface Unit, Pre-commissioning Checklist, Testing

Practicals at IRISET Laboratory (12 Hours)

1. Testbench, Preparation and deployment of Stationary Kavach Data : Configuration involving Topographical Information - Arrangement of Signals/Markers, Transponders, Inter signal Distances, Signal Routes, Gradients, Speed Restrictions
2. Verification and Validation of Onboard Data – Ceiling

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 INFORMATION TECHNOLOGY

INTRODUCTION TO MACHINE LEARNING

(OPEN ELECTIVE-IV)

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	:	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 INFORMATION TECHNOLOGY

WEB APPLICATION DEVELOPMENT AND SECURITY

(OPEN ELECTIVE-IV)

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	:	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-31

Department of Humanities & Social Sciences

ADVANCED COURSE IN ENTREPRENEURSHIP

(Open Elective-IV)

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U22OE630EH
Credits :03	CIE Marks:40	Duration of SEE: 03Hours

Course Objectives	**Course Outcomes**
The objectives of this course are to	On completion of the course the student will be able to
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, building brand strategy, making a sales and financial plan etc.	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 of business finance, do Financial Planning, find Funding for growth 4. Leverage technologies and platforms for growth stage companies 5. Develop key metrics to track progress, understand Basics of registering a company.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									2	1					
CO2			1								1				3
CO3											2			1	
CO4					2								1		
CO5											1				

Unit I: Pivoting and New Business Model

Introduction to Advanced 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:	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 OFHUMANITIES & SOCIAL SCIENCES

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: U21BS630EH
Credits : 1	CIE Marks : 30	Duration of SEE : 2 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the learners 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	At the end of the course the learners will be able to: - 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

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

ASSESSMENTS

- Online assignments
- Individual and Group

Learning Resources:

learn.talentsprint.com

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

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical 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: U22PE610ME
Credits :01	CIE Marks:30	Duration of SEE:02Hours

COURSE OBJECTIVES *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
Understand and implement coding using C/Python language.	1. implement advanced problem solving approaches to solve computational problems. 2. implement mathematical programming model solutions for coding problems. 3. implement mathematical and logical understanding approaches to implement test driven development practices. 4. write efficient coding solutions using appropriate algorithm. 5. write codes for standard questions implementing C/Python language.

UNIT-I:

Strings: Introduction to string data, problem solving on string manipulations, coding problems using string handling functions, problem solving on multi string problems, problem solving for long strings.

Modular programming & Recursive algorithms: Introduction to modular programming, problem solving implementing functions, inter function communication, call-by-value and call-by-reference, problem solving for parameter passing and return values, coding on various scopes of data in a program, problem solving approaches on recursions, problems solving implementing recursions, evaluation of recursive algorithms, problem solving using head and tail recursions, writing mathematical recurrence relation, evaluation of recurrence relations, time analysis, problem solving examples.

UNIT-II:

User defined data structures: Requirement of user defined data, problem solving implementing structures, nested structures, unions, enumeration, usage of pre-process statements in coding problems.

Structure pointers & linked lists: Structure member reference, coding on structure member pointer reference, coding to form links, example codes,

introduction to lined list coding, problem solving on insertion, deletion, search and traversal operations on linked lists, practice problems on linked lists.
Circular linked lists and double linked lists: Circular linked list formation, coding problems on circular linked lists, double linked list formation, coding problems on double linked lists, coding on error detection and correction.

UNIT-III:
Abstract data-structures: Stacks & Queues
Problem solving using stacks, coding solutions for the implementation of s tack/queue using an array, coding solutions for the implementation of stack/queue using a linked list. Problem solving on expression conversion and evaluation, problem solving implementing stacks & queues.
Sorting Algorithms: Coding solutions for search operations implementing linear/binary search. Problem solving using sorting algorithms: Bubble sort, selection sort, insertion sort, evaluation of sorting algorithms, problem solving using quick sort, merge sort, o(n log n) algorithms, problem solving using sorting techniques.
Non-linear data structures – Trees: Problem solving approaches using non-linear data structures, coding problems on the height of a binary tree, size of a binary tree, tree order traversals, problem solving on binary trees.

UNIT-IV:
Problem solving using Python – control statements: Introduction to python, basic syntax, variables and data types, operators, input and output, conditional statements and loops, example problems & hands on practice.
Problem solving using Python – strings and lists: Problem solving on accessing strings, string operations, string slices, functions and methods, introduction to lists, accessing list, working on lists, matrix data, example problems & hands on practice.
Problem solving using Python – methods, dictionaries: Introduction to tuple, accessing tuples, tuple operations, introduction to dictionaries, accessing value in dictionaries, properties and functions.

UNIT-V:
Problem solving using Python – Modules: Importing modules, math module, random module, packages and composition, example problems & hands on practice.
Problem solving using Python on exception handling: Problem solving through user defined functions and methods, implementing exception handling, except clause, try? Finally clause, user defined exceptions, advanced data types, example problem& hands on practice.

DBMS: Introduction to DBMS, SQL Queries, ER And relational Models, Data definition and querying, transactions and concurrency, normalization, case studies, examples problems.

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

1	No. of Internal Tests (along with II int):	01	Max.Marks for the Internal Test:	30
2	No. of Assignments:	--	Max. Marks for each Assignment:	--
3	No. of Quizzes:	--	Max. Marks for each Quiz Test:	--

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

THEORY OF MACHINES LAB

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):2:0:0	SEE Marks:50	Course Code: U22PC621ME
Credits :01	CIE Marks:30	Duration of SEE: 03 Hours

COURSE OBJECTIVES *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
understand the kinematic analysis of the cams, gears etc, and the dynamic behaviour of mechanical systems like governors, cams, gyroscope, rotating machines and spring-mass systems.	1 analyze the cam profile for different motion characteristics. 2 analyze the motion using gears. 3 analyse the forces in Governors, Gyroscope and a system of rotating masses in different planes. 4 determine the vibration response of free and forced vibrating systems.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	3					1			2	3	2	3
CO2	3	2	3	3					2			2	3	3	2
CO3	2	2	2	3					1			2	2	2	2
CO4	3	3	2	3					2			2	3	3	3

LIST OF EXPERIMENTS

1 To study the motion characteristics of the follower with the given profile of the cam.
2 Coriolis acceleration experiment by using virtual lab.
3 To study the motion and analyzing forces in gears.
4 To study the gyroscopic effect on a disc subjected to precessional motion.
5 To study the controlling force curves in dead weight controlled centrifugal governors.
6 To study the controlling force curves in spring controlled centrifugal governors.
7 To determine the static and dynamic balancing masses in a rotating

mass system.

8 To study the Axial free vibrations of a spring mass system with and without damping.
9 To study free vibrations of various beams.
10 To study the forced vibrations using a cantilever beam under harmonic excitation.
11 Determination of critical speed of the shaft using different supports.
12 To analyze impact test on cantilever beam.
13 To analyze a 1- DOF system subjected to un damped and damped Free Vibrations using MATLAB and SIMULINK.
14 Vibration analysis of spring mass system experiment by using virtual lab.

From the above experiments, each student should perform at least 12 (Twelve) experiments.

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

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2Hours			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

MACHINE TOOLS AND METROLOGY LAB

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code: U22PC641ME
Credits :01	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES *The objectiveof this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
1. familiarise the student with various machining forces and analyse the machining forces. 2. apply principles of metrology in the measurement using various instruments and transducers.	1 compute Various kinds of forces involved in turning operations. 2 interpret and grind Single Point Cutting Tool to the required Geometry, Multi Point cutting Tool Geometries 3 make use of the inspection gauges and various measuring instruments for applications such as measuring angles of a single point cutting tool and parameters of screw thread. 4 determine thread angles using Toolmakers microscope, tool angle using Profile projector and also learn about calibration of displacement transducer.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	2								3	3	2	3
CO2	3	2	3	2								3	3	2	3
CO3	3	2	3	2								3	3	2	3
CO4	3	2	3	2								3	3	2	3

List of Experiments

1. Thread cutting and boring on a lathe
2. To make rectangular and 'V' grooves on a shaper.
3. To manufacture a spur gear using simple indexing on a milling machine.
4. Experimental determination of shear angle by measuring thickness and length of chips on a lathe
5. Measuring the cutting forces using Lathe tool dynamometer
6. PCD drilling on radial drilling machine and tapping.

7. Grinding of flat surfaces and measurement of surface finish.
8. Estimation of MRR using Electric Discharge Machine (EDM).
9. To calibrate the various thermo couples and LVDT and displacement measurement using LVDT.
10. Linear measurements and Surface roughness measurement using Talysurf.
11. To find the chordal thickness of a gear tooth using Gear tooth Vernier.
12. To determine the depth and diameter of bore present in a component using bore gauge.
13. Grinding of HSS tool using tool and cutter grinder to a given geometry and measurement of Tool Angles using Profile Projector.
14. Angular measurement using Bevel protractor and sine bar.

From the above experiments, each student should perform at least 12 (Twelve) experiments.

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

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2Hours			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

THEME BASED PROJECT

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks: 50	Course Code: U22PW619ME
Credits :01	CIE Marks:30	Duration of SEE: VIVA

COURSE OBJECTIVES *The objective of this course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
enable the student to take up investigative study in the field of mechanical engineering.	1 Identify appropriate field of interest, review the literature and define the problem. 2 Plan the activities for carrying out the research work in teams to solve the identified problem using different resources. 3 to work in teams and adapt for the advanced technological changes. 4 Conduct the investigations on the chosen problem and prepare the final report.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	2	2	3	3	3	2	2	3	2	3
CO2	3	3	3	3	3	2	2	3	3	3	2	2	3	2	3
CO3	1	2	1	2	1	2	1	2	3	2	3	2	1	2	2
CO4	3	3	3	3	3	2	2	3	3	3	2	2	3	2	3

The students are required to identify the topic of their interest and collect data / literature in the area like supporting aids for disabled people, Domestic appliances, Agriculture equipments, Eco friendly products, Health care equipment, Machine tool Engineering, Advanced welding technologies, Automobile Engineering, Alternative fuels, Fluid flow systems, Refrigeration systems, Energy conservation, Power generation, Robotic Engineering, Mechatronics, IOT in Mechanical Engineering etc. The students need to identify a problem and work in that area in consultation with the project guide. The output may be in terms of a small prototype or conducting investigations through experiments or evaluate theoretically using modern tools of mechanical engineering such as CAD/CAM, FEA,CFD.

The students are required to submit a project report containing the abstract and the summary of the work in terms of plots or fabricated models or a technical report and submit for evaluation.
The students are required to give a oral presentation/ demo of prototype before the departmental committee for evaluation.

The department will appoint a project coordinator who will be in-charge of the following.

- The theme-based project can be assigned on individual basis or to a group consisting of maximum three students per batch.
- Allotment of project guide
- Project progress monitoring as per the time table

All the projects are to be monitored through progress seminars at least twice in a semester. CIE marks (30 marks) are based on the performance of the two presentations given by the student batches through evaluation rubrics.

The SEE marks (50 marks) are awarded by an external examiner based on a viva-voce exam.

Norms of final documentation of the project report will be provided by the Department.

No. of Presentations for CIE marks	2	Max. Marks for each CIE presentation:	15
Marks are awarded based on technical content, Tools and Technology, presentation skills, subject knowledge and discussion using rubrics.			

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-22)
B.E. (ME) Honours Degree Program in Robotics
(2024-2026)

B.E (ME) Honours Degree in Robotics								
S. No.	Name of the Course	Scheme of Instruction			Scheme of Examination			
		Hours per Week			Duration in Hrs	Maximum Marks		Credits
		L	T	P		SEE	CIE	
THEORY CUM PRACTICALS								
V-Semester AY 2024-25								
U22PC560ME	Introduction to Robotics and Automation	3	-	-	3	60	40	3
U22PC570ME	Control Engineering	3	-	-	3	60	40	3
VI-Semester AY 2024-25								
U22PC660ME	Embedded C Programming	3	-	-	3	60	40	3
VII-Semester AY 2025-26								
U22PC760ME	Robotics and Control	3	-	-	3	60	40	3
U22PC770ME	Robotics Lab	-	-	2	3	50	30	1
U22PW729ME	Course Project	-	-	6	3	50	30	3
	TOTAL	**12**	**0**	**8**		**340**	**220**	**16**
	GRAND TOTAL	**20**				**560**		**16**
NPTEL Course (Robotics related): 12 weeks durations (V or VI -Semester)								3
							Total Credits:	**19**

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

INTRODUCTION TO ROBOTICS AND AUTOMATION

SYLLABUS FOR B.E. V-SEMESTER

Instruction : 3 Hrs /week	SEE Marks : 60	Course Code : U22PC560ME
Credits : 3	CIE Marks: : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVE **The objective of the course is to**	**COURSE OUTCOMES** **On completion of the course, students will be able to**
study industrial robot components, configuration, sensors, drives, applications and Understand and assess the principles and technologies of Industry 4.0.	1 explain configuration of industrial robots and summarize various applications. 2 interpret various elements of the industrial robots 3 develop methodology to represent position and orientation of industrial robot links in spatial coordinate system 4 Grasp Industry 4.0 concepts and its impact on modern manufacturing. 5 Understand key technologies driving smart manufacturing.

UNIT-I

ROBOT BASICS

Robot-Basic concepts, Need, Law, History, Anatomy, specifications.

Robot configurations-cartesian, cylindrical, polar, articulated and SCARA. Parallel robots

ROBOT APPLICATIONS

Application in industry – material handling, loading & unloading, processing, welding &painting, assembly and inspection

UNIT-II

ROBOT ELEMENTS

End effectors-Classification, Types of Mechanical actuation, Gripper design, Robot joints

types, Robot drive system types: Electrical, pneumatic and hydraulic. Position andvelocity feedback devices

UNIT-III

ROBOT COORDINATE SYSTEMS

Coordinate frames, Rotation matrix, Euler angles, Roll pitch and yaw angle representation, Composite rotations, Homogeneous Transformation matrix.

UNIT – IV

Introduction to Industry 4.0

Definition and Evolution of Industry 4.0
Introduction to Industry 4.0
Key concepts and principles
Comparison of Industry 4.0 Factory and Today's Factory
Advantages and challenges of transitioning to Industry 4.0
Cyber-Physical Systems and Big Data
Overview of cyber-physical systems (CPS) in Industry 4.0
Real-time monitoring and control of manufacturing processes

UNIT –V

Basic Principles and Technologies of a Smart Factory
Internet of Things (IoT) and Industrial Internet of Things (IIoT)
Integration of IoT devices for data collection and analysis
Enhancing operational efficiency and predictive maintenance
Value Chains in Manufacturing Companies and Customization of Products
Digital Twins and Cloud Computing/Cloud Manufacturing
Benefits and challenges of adopting cloud-based manufacturing solutions
Security Issues within Industry 4.0 Networks

Learning Resources:

1. Mikell P. Groover, Mitchell Weiss, Roger N Nagel and Nicholas G Odrey, "Industrial Robotics Technology, Programming and Applications", Tata Mc Graw-Hill Publishing Company Limited , 2008.
2. Deb.S.R and Sankha Deb, "Robotics Technology and Flexible Automation", Tata Mc Graw Hill Publishing Company Limited, 2010.
3. Klafter R.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", Tata Mc Graw-Hill Publishing Company Limited, 2008
5. R.K. Mittal and I. J. Nagrath"Robotics and Control", Tata Mc Graw-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:	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 Mechanical Engineering

CONTROL ENGINEERING

SYLLABUS FOR B.E. V-SEMESTER

Instruction : 3 Hrs /week	SEE Marks : 60	Course Code : U22PC570ME
Credits : 3	CIE Marks: : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVE The objective of the course is to	**COURSE OUTCOMES** On completion of the course, students will be able to
describe physical systems through mathematical models and graphical representations and assess their response and stability in frequency and time domains and design suitable control methods through experiential learning.	1. develop Transfer functions for Mechanical systems using mathematical modelling and obtain the equivalent electrical analogous systems. 2 simplify the systems given in pictorial representation and examine the steady state and transient behaviour. 3 estimate the system behaviour using Routh criterion, Root locus and Bode diagrams. 4 analyze the steady state and transient behaviour of various systems using different compensators with Root locus technique . 5 model the system in state space domain and test for controllability and observability.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1									2	3	2	1
CO2	3	2										2	3	2	1
CO3	3	2	2									2	3	2	1
CO4	3	2	1									2	3	2	1
CO5	3	2	2									2	3	2	1

UNIT-I

Control Systems Classification: Examples of control systems, Open Loop & Closed Loop Systems. Mathematical models and Transfer functions from governing equations of translatory mechanical systems. Force- Voltage and Force-Current analogy.

Hands on Experience:

Experiment on DC Position control system

Experiment on traffic control system

UNIT-II

Block diagrams, Block diagram reduction. Signal flow graphs, Mason's gain formula. Types of inputs. Time domain specifications of 2nd order systems, Response of 2nd order systems to Step input. Steady state error, Static Error constants.

Hands on Experience:

Experiment to find the time response of second order system

To calculate characteristics of a second order system, such as damping ratio, natural frequency, percent overshoot, settling time, rise time and peak time using mathematical programming

UNIT-III

Routh stability criteria, Root Locus method for negative feedback systems.

Frequency Response, Bode plots. Gain and Phase Margins.

Hands on Experience:

Write a mathematical program to plot the Root locus, Bode diagram of the system

UNIT-IV

Introduction to compensator design (qualitative treatment only): PID, Lead, Lag and Lag–Lead compensators design using Root locus method.

Hands on Experience:

Experiment on temperature control system

Simulate and analyze a transfer function to step input by building a PID Controller using mathematical simulation

UNIT-V

State–space representation of linear control systems. Conversion of Transfer function into State Space, Conversion of State-Space in to Transfer Function, Solution of state equations by Laplace transformation technique. Concept of Controllability and Observability.

Hands on Experience:

To transform a mathematical model of a linear time invariant system from Transfer-function to State-space and State-space to Transfer- function using mathematical programming

Learning Resources:

1. R.C. Dorf, "Modern Control Systems", Addison Wesley, 1989
2. M. Gopal, "Control Systems", Tata McGraw-Hill, 2004.
3. Ogata, K. "Modern Control Engineering", Prentice Hall, 2004
4. Norman S. Nise, "Control Systems Engineering", John Wiley & Sons, Inc., 2001.
5. William J. Palm, III, Modelling, Analysis, and Control of Dynamic Systems, John Wiley & Sons Inc., 2nd Edition, 1999.
6. Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer Science & Business Media, 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:	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 Mechanical Engineering

EMBEDDED C PROGRAMMING

SYLLABUS FOR B.E. VI-SEMESTER

Instruction : 3 Hrs /week	SEE Marks : 60	Course Code : U22PC660ME
Credits : 3	CIE Marks: : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES The objectives of the course is to	COURSE OUTCOMES On completion of the course, students will be able to
1. Describe the developments of embedded C programming 2. Interfacing of various sensors along with displays using Embedded 'C' 3. Develop the various applications using embedded development board	1. Analyze the various functions used in embedded C programming 2. Understand the evaluation of Arduino family and its development board details 3. Interface the sensors and various i/o devices to embedded development board 4. Apply the concepts of IoT to embedded development board 5. Demonstrate and design embedded C based applications.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	1	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	2	2	1	2	-	-	-	-	-	-	1	-	3	2
CO3	2	2	3	2	2	-	-	-	-	-	-	-	3	2	2
CO4	2	1	2	2	3	-	-	-	-	-	-	2	3	2	3
CO5	2	2	3	3	2	-	-	-	-	-	-	2	3	2	2

UNIT – I

Introduction to Embedded C: Overview, Data types: variables and constants, Operators, Control Statements, Arrays and Functions. i/o Functions: Pins Configured as input, Pins Configured as output, pinMode function, digital Write function, analog Read function, time delay functions. Simple programming in 'C'

UNIT – II

Introduction to Arduino: Origin of Arduino, familiarizing with Arduino family Introduction to Arduino UNO: Pin configuration and architecture, power connections, concept of digital and analog ports, Arduino clones and variants , installation of Arduino IDE, uploading of the program.

UNIT – III

Interfacing with Displays and Sensors: Working with Serial Monitor, Line graph via serial monitor, LED interfacing, 8 bit LCD interfacing to Arduino, Fixed one line static message display, Running message display,. Interfacing-humidity sensor, temperature sensor, gas detection sensor, PIR Sensor, Ultrasonic Sensor, Flex Sensor

UNIT –IV

Motors Interfacing: L-293D, DC motor, ULN 2003, Stepper Motor, Servo Motor

UNIT – V

Applications/Case Study: Case studies related on agriculture, medical domains using Ardunio, Applications on consumer electronics, automotive and security using Arduino development board

Learning Resources:

1. Simon Monk, "Programming Arduino: Getting Started with Sketches", McGraw-Hill Education, Second Edition, 2016
2. Massimo Banzi, "Getting Started with Arduino: The Open Source", Shroff Publishers & Distributors Pvt Ltd, 2014
3. Michael J. Pont, "Embedded C", 2nd Edition, Pearson Education, 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:	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 Mechanical Engineering

ROBOTICS AND CONTROL

SYLLABUS FOR B.E. VII-SEMESTER

Instruction : 3+1 Hrs /week	SEE Marks : 60	Course Code : U22PC760ME
Credits : 3	CIE Marks: : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVE The objective of the course is to	**COURSE OUTCOMES** On completion of the course, students will be able to
To develop the fundamental knowledge and skills required to analyze, design and control robotic systems	1. Analyze the kinematics of robotic systems and apply them to solve real world problems 2 Apply differential kinematics and statics concepts to design and control robotic systems 3 Analyze the dynamics of serial manipulators using lagrangian and Newton-Euler mechanics 4 Develop motion and force control strategies for robotic systems using feedback control techniques 5 Generate and analyze robot trajectories for various applications

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2			2			2	2		2	3	2	1
CO2	2	2	2			2			2	2		2	3	2	1
CO3	3	3	3			3			3	3		2	3	2	1
CO4	3	2	2		3	3		3	2	2	3	3	3	2	1
CO5	2	2	2		2	2		2	2	2	2	2	3	2	1

UNIT-I

Robot Kinematics

Forward Kinematics: Forward/direct kinematic analysis of serial manipulators. Inverse Kinematics: General properties of inverse kinematic solution. Inverse kinematics of serial RR planar manipulators.

UNIT-II

Differential Kinematics and Statics

Linear and angular velocity of links, Velocity propagation, Manipulator Jacobian for serial manipulators, Jacobian Singularities, Static Analysis: Force and moment balance, Jacobian in statics.

UNIT-III

Dynamics of serial manipulators

Lagrangian formulation for equations of motion for RP, RR serial manipulators, Recursive dynamics using Newton-Euler formulation of RP and RR serial manipulator.

UNIT-V

Motion and Force Control:

Decentralized Control: Independent joint control, Decentralized feed forward compensation, computed torque control

Centralized control: ID control with granty compensation

Force Control: Passive and active compliance impedance control

Force control with inner position loop, inner velocity loop, parallel force / position control.

UNIT-V

Trajectory Generation

Joint-Space Techniques: Cubic Polynomial Trajectories, Linear Segments with Parabolic Blends-without and with via points

Cartesian-Space Techniques : Straight line path, Circular Path, Position Planning, Orientation Planning.

Learning Resources:

1. Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, "Robotics: Modelling, Planning and Control", Springer Science & Business Media, 2010.
2. M.W.Spong and M.Vidyasagar,"Robot Dynamics and Control", 1st Edition, John Wiley and sons,1990.
3. R.K.Mittal and I.J.Nagrath, "Robotics and Control", Tata McGraw-Hill, 2003.
4. Subir Kumar Saha, "Introduction to Robotics", Tata McGraw-Hill Education, 2014.
5. Howie M. Choset, Seth Hutchinson, Kevin M. Lynch, "Principles of Robot Motion: Theory, Algorithms, and Implementation", MIT Press, 2005.

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 Mechanical Engineering

ROBOTICS LAB

SYLLABUS FOR B.E. VII-SEMESTER

Instruction : 2 Hours /week	SEE Marks : 50	Course Code : U22PC731ME
Credits : 1	CIE Marks: : 30	Duration of SEE : 2 Hours

COURSE OBJECTIVE The objective of the course is to	**COURSE OUTCOMES** On completion of the course, students will be able to
model, analyses different types of industrial robotics using CAD software and 6DOF serial manipulator.	1. Modelling of various industrial robotics using ADAMS software. 2. Designing and controlling of robotic path using various sensors. 3. Analyses of forward and inverse kinematics of industrial manipulator using 6-dof serial manipulator

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	3		1	3							2	1	3	2
CO2	1		3	1	3							2	1	3	2
CO3	1	3		1	3							2	1	3	2

List of Experiments:

1. Modelling of 6 DOF anthropomorphic arm in ADAMS.
2. Simulation of 6 DOF anthropomorphic arm in ADAMS.
3. Forward kinematic analysis of 4 DOF SCARA Robot using MATLAB (Simscape Multi-body)
4. Inverse kinematic analysis of 4 DOF SCARA Robot using MATLAB (Simscape Multi-body)
5. Assembling of robot mechanical components mounting of motors, sensors, electronic circuits to the chassis
6. Navigation and obstacle avoidance robot using ultrasonic sensor
7. Navigation and obstacle avoidance robot using computer vision
8. Programming and controlling a line follower robot using IOT
9. Trajectory planning and navigation of an autonomous rover
10. Forward kinematic analysis of 6-DOF serial manipulator

11. Inverse kinematic analysis of 6-DOF serial manipulator
12. Forward kinematic analysis of 6-DOF Parallel manipulator
13. Inverse kinematic analysis of 6-DOF parallel manipulator
14. Assembling of drone using mechanical components mounting of motors, sensors, electronic circuits

Note: Any 12 Experiments can be conducted

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

No. of Internal Tests:	02	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 3Hours			

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Department of Mechanical Engineering

Course Project

SYLLABUS FOR B.E.VII-SEMESTER

L:T:P(Hrs/week)::0:0:6	SEE Marks: 50	Course Code: U22PW729ME
Credits : 3	CIE Marks: 30	Duration of SEE: 3 Hours

COURSE OBJECTIVE *The objective of the course is to*	**COURSE OUTCOMES** *On completion of the course, students will be able to*
Design and develop a prototype related to robotics engineering using relevant tools and techniques, write a report and give a presentation.	1. define and design the robotics problem by literature study. 2. analyze by conducting experiments and obtain relevant data. 3. develop a prototype / working model using the data obtained. 4. To work in teams and adapt for the advanced technological changes 5. make logical conclusions to justify the results.

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3											3	3	3	2
CO2		3	3	2	3							3	3	2	3
CO3					3	3	3	1	1	3		3	1	2	2
CO4									3	2	3	2	1	2	2
CO5	2	1								3	3	3	1	2	3

The department will appoint a project coordinator who will be in-charge of the following.

- Grouping of students (Maximum of 3 in a group)
- Allotment of project guide
- Project progress monitoring at regular intervals
- Attendance monitoring for those students doing project in Industry.

Project topics may be chosen by the student with advice and approval from the faculty members. Students are to be assessed and evaluated as per the following criteria.

- Problem definition based on literature study.

- Usage of modern tools.
- Analysis of the problem under consideration.
- Fabrication of the model / prototype.
- Results and conclusions.
- Team Work, Report writing & Presentation with ethics
- Project Management

Each student is required to:

1. Submit a one-page synopsis in the beginning of project work for display on the notice board.
2. Give a 20 minutes presentation through LCD power point presentation followed by a 10 minutes discussion.
3. Submit a report on the project work with list of references and slides used.

The project allotment should be completed by the IV week of VII semester so that students get enough time for completion of their project.

All the projects are to be evaluated for progress at least twice in a semester. CIE marks (30 marks) are based on the performance in the two presentations which are awarded by a committee based on project rubrics.

The SEE marks (50 marks) are awarded by an external examiner based on a viva-voce exam.

Norms of final documentation of the project report will be provided by the Department.

No. of Presentations for CIE marks	2	Max. Marks for each CIE presentation:	15
Marks are awarded based on literature study, usage advanced tools, prototype development, presentation and conclusions using rubrics.			
Duration of Presentation: 20 min			