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-21)
WITH EFFECT FROM 2023-24
(For the students admitted in 2021-22)

DEPARTMENT OF MECHANICAL ENGINEERING
+91-40-23146060, 23146061
Fax: +91-40-23146090
Website: www.vce.ac.in

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-21)
B.E. – MECH : FIFTH SEMESTER (2023-2024)

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								
U21PC510ME	Heat Transfer	3	-	-	3	60	40	3
U21PC520ME	Kinematics of Machines	3	-	-	3	60	40	3
U21PC530ME	Manufacturing Processes	3	-	-	3	60	40	3
U21PC540ME	Design of Machine Elements	3	-	-	3	60	40	3
U21PC550ME	CAD / CAM	3	-	-	3	60	40	3
U21OE5XXXX	Open Elective - III	3	-	-	3	60	40	3
U21HS510EH	Skill Development Course V (Communications Skills in English II)	1	-	-	2	40	30	1
U21PE510ME	Skill Development Course-VI (Technical Skills-II)	1	-	-	2	40	30	1
PRACTICALS								
U21PC531ME	Manufacturing Processes Lab	-	-	2	3	50	30	1
U21PC551ME	CAD / CAM Lab	-	-	2	3	50	30	1
U21PC561ME	Programming for Mechanical Engineers Lab	-	-	2	3	50	30	1
U21PW519ME	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: U21PC510ME
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, cylinders and spheres without and with internal heat generation; Composite structures, 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: U21PC520ME
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		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
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 centre methods.

Acceleration Analysis: Graphical method for planar mechanisms including Coriolis component of acceleration.

UNIT-III

Special Mechanisms: Steering gear mechanisms Davis and Ackerman. Hooke's joint.

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 and for oscillating motion - roller follower.

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:U21PC530ME
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
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: CASTING PROCESS

Casting terms, pattern materials, types of patterns, pattern allowances, colour code for patterns, 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, Inspection and testing of casting. Processing of plastics - Extrusion, Injection moulding, Blow moulding and Thermoforming.

UNIT-III: WELDING PROCESSES

Solid state welding processes - Friction welding, Forge welding, Explosive welding and ultrasonic welding, Gas welding, Arc welding- SMAW, SAW, GMAW, GTAW, PAW, Atomic hydrogen welding, 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, and Electro slag 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: U21PC540ME
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 cotter and knuckle joints. Stresses due to Bi-axial. Factor of safety. Theories of failures. Design of components subjected to impact loading.

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

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 power Screws and screw jack. Differential and Compound Screws.

Design of riveted and welded joints under direct and eccentric loads.

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: U21PC550ME
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 circle and helix 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.
CAD Database: CAD Database and structure.

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, Programming methods 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, Elements of CIMS. 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. Yoram Koren, 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	Introduction to Robotics	U21OE510ME	3
	Introduction to Automobile Engineering	U21OE520ME	3
Civil	Spatial Information Technology	U21OE510CE	3
CSE	Web Designing	U21OE510CS	3
	Fundamentals of Object Oriented Programming	U21OE520CS	3
EEE	Solar Power and Applications	U21OE510EE	3
ECE	Sensors for Engineering Applications	U21OE510EC	3
IT	Introduction to Database Management Systems	U21OE510IT	3
	Essentials of Operating Systems	U21OE520IT	3
HSS	Technical Writing and Professional Presentation	U21OE020EH	3
	Design Thinking	U21OE530EH	3
	Basics of Entrepreneurship	U21OE540EH	3

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF MECHANICAL ENGINEERING

INTRODUCTION TO ROBOTICS

(Open Elective-III)

SYLLABUS FOR B.E. V-SEMESTER

L:T:P(Hrs./week):3	SEE Marks : 60	Course Code: U21OE510ME
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 &Parallel Manipulator

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

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

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

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF MECHANICAL ENGINEERING

INTRODUCTION TO AUTOMOBILE ENGINEERING

(Open Elective-III)

SYLLABUS FOR B.E. V-SEMESTER

Instruction : 3Hours	SEE Marks : 60	Course Code : U21OE520ME
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

Course objectives	Course Outcomes
The objectives of this course are to: 1. familiarize the student with the different types of automobiles and engine components along with its working. 2. impart adequate knowledge in fuel supply, cooling, lubrication and ignition of IC engines. 3. understand the steering geometry, steering mechanism and types of suspension systems. 4. gain the knowledge about working of clutch, gear box mechanism, and brakes 5. make the student conversant with types of wheels, tyres and pollution control techniques.	On completion of the course, the student will be able to: 1. identify types of Automobiles and engine components and describe its working. 2. describe the engine fuel Supply system in petrol and Diesel engines, cooling system, and lubrication systems. 3. describe the steering mechanism, suspension systems 4. describe the working principle and operation of clutch, gear mechanism and brakes. 5. know the pollutants from automobile and pollution control techniques and identify the types of wheels, tyres.

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	1	1		1	2	2					3	3	2	3
CO2	3	2	2		2	2	2					3	3	2	3
CO3	3	2	2		1	2	2					3	3	2	3
CO4	3	1	2		2	2	2					3	3	2	3
CO5	3	1	2		2	2	3					3	3	2	3

UNIT-I

Introduction: Types of automobiles: Hybrid Vehicles, Electrical, gas and Fuel cell vehicles. Chassis and body, Lay out of transmission system, Engine components: cylinder block, cylinder head, crankcase, crank shaft and cam shaft. Types and working of IC Engines: SI and CI engines, two stroke and four stroke engines.

UNIT-II

Fuel system: Fuel supply system for SI engines and CI engines. Simple carburettor, Introduction to Multipoint fuel injection system (**MPFI**) of petrol engines, Introduction to **CRDI** system for diesel engines.

Cooling system: air cooling, water cooling: Thermo syphon, pump circulation system.

Lubrication system: Petroil System, splash system, pressure lubrication: Wet sump and Dry Sump.

Ignition system: Battery Ignition System, Magneto Ignition System and Electronic Ignition System.

UNIT-III

Suspension system: Rigid axle, Independent suspension system: Double wish bone type, Macpherson strut system, Air suspension system.

Steering system: wheel alignment, Ackermann steering mechanism, steering geometry: camber, caster, toe-in, toe-out, steering linkage for vehicle with rigid axle front suspension, steering linkage for vehicle with independent front suspension.

UNIT –IV

Power Train: Single plate clutch, Multi plate clutch. Manual Gear Box: sliding mesh gear box, constant mesh gear box, synchromesh gear box and Automatic Gear Box. Working principle of Differential.

Brakes: Types: Drum and Disc brakes, Mechanical and Hydraulic Brakes, **ABS** system.

UNIT –V

Wheels and Tyres: Types of Wheels: wire wheels, disc wheels, alloy wheels. Types of tyres: Tube type, tubeless type.

Automobile Emissions and control: Automobile pollutants and sources of pollution. Pollution Control Techniques: Catalytic Converters, EGR and PCV. Bharath emission Norms.

Learning Resources:

1. Crouse & Anglin, "Automobile Engineering", 10th Edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi,. 2007.
2. Kirpal Singh, "Automobile Engineering", Vol.I& II, 13th Edition, Standard Publishers, New Delhi 2013.
3. R.B Gupta, "Automobile Engineering" 7th Edition, Satya Prakashan, New Delhi, 2015.
4. Joseph Heitner, "Automotive Mechanics", 2nd Edition, Affiliated East West Pvt. Ltd., 2013.
5. C.P. Nakra, "Basic Automobile Engineering", 7th Edition, Dhanpat Rai Publishing C (P) Ltd., 2016.

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)

SYLLABUS FOR B.E V Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U21OE510CE
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

WEB DESIGNING (Open Elective-III)
SYLLABUS FOR B.E V Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U21OE510CS
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
Develop web application using HTML, CSS, Java Script and PHP.	1 Design static web pages. 2 Apply styles to the web pages. 3 Create dynamic web pages using Java Script. 4 Design DTD and schema for a given XML file. 5 Develop server side components using PHP.

UNIT-I: Web Basics and overview: Introduction to Internet, World Wide Web, Web Browsers, Web Servers, URL, MIME, HTTP, Web Programmers Tool Box, Introduction to HTML Purpose of HTML and XHTML, Text Formatting, Hypertext Links, Images, Lists, Tables, Forms and Frames.

UNIT-II: Cascading Style Sheets- Levels of Stylesheet, Style Specification Formats, Selector Formats, Property Value Forms, Font Properties, List Properties, Alignment of Text, Box Model, Background Images, Borders, div and span tags, Conflict Resolution.

UNIT-III: JavaScript - Object Orientation and JavaScript, Primitives, Operations, Expressions, Control Statements, Object Creation, Arrays, Functions- Introduction, Program Modules in JavaScript, Programmer-Defined Functions, Function Definitions, Random-Number Generation, Scope Rules, JavaScript Global Functions, Recursion, Constructors, Regular Expressions, DOM Model, Events, Event Handling in JavaScript, JavaScript objects.

UNIT-IV: Introduction to XML, Syntax of XML, XML Document Structure, Document type Definition, Namespaces and Schemas.
Client-Server Architecture, Multi-tier Architecture, Web server.

UNIT-V: PHP- Overview of PHP, General Syntactic Characteristics, Primitives, Operations, and Expressions, Output, Control Statements, Arrays, Functions, Pattern Matching, Form Handling, Cookies and Session Tracking.

Learning Resources:

1. Robert W. Sebesta, "Programming the World Wide Web", 4th edition, Pearson Education
2. Uttam K.Roy, "Web Technologies", Oxford publishers.
3. http://www.w3schools.com
4. https://www.php.net/manual/en/tutorial.php

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

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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 OBJECT ORIENTED PROGRAMMING
(Open Elective-III)
SYLLABUS FOR B.E V Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U21OE520CS
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. Apply object oriented principles for developing an application using Java constructs. 2. Design GUI using existing Java classes and interfaces.	1. Adopt the fundamentals of Object oriented system development for developing a application. 2. Apply basic features of OOP to design an application. 3. Employ runtime error handling, concurrent programming practices to develop a parallel processing application. 4. Perform string handling, read and write operations using console and files IO streams. 5. Design GUI for a java application using AWT classes.

UNIT-I: Object Oriented System Development: Understanding Object Oriented Development, Understanding Object Concepts, Benefits of Object Oriented Development.
Java Programming Fundamentals: Introduction, Overview of Java, Data types, Variables and Arrays, Operators, Control Statements.

UNIT-II: Building blocks of OOP: Classes and Methods, Constructor, Parameterized constructor, Garbage Collection, this, static, final keywords, Inheritance, types of inheritance, Method Overriding, Abstract class, Nested class, Interface, Package.

UNIT-III: Exception Handling: try, catch, throw, throws, finally, creating user defined exceptions
Multithreaded Programming: Types of Thread creation, multiple threads, isalive, join, thread priority, Thread Synchronization, Inter process communication.

UNIT-IV: String Handling: String constructors, operations, character extraction, comparison, search, modification. StringBuffer, methods, String Builder, String Tokenizer
Util: Date, Calendar, Random, Timer, Observable
IO: Files and Directories, I/O Classes and Interfaces, Byte Streams classes and Character Stream classes

UNIT-V: Applet: Applet Class, Applet architecture
Event Handling: The Delegation Event Model, Event Classes, Source of Events, Events Listener Interfaces
GUI Development: AWT: Classes, Working with Graphics, Frames, Menu, Layout Managers**.**

Learning Resources:

1. Herbert Schildt, The Complete Reference Java, 7th Edition, Tata McGraw Hill 2005.
2. P. Radha Krishna, Object Oriented Programming through Java, Universities Press, 2007.
3. Sachin Malhotra, Saurabh Choudhary, Programming in Java, 2nd Edition, Oxford Press, 2014.
4. https://docs.oracle.com/javase/tutorial/java

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

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

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SOLAR POWER AND APPLICATIONS (Open Elective-III)

SYLLABUS FOR B.E V Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U21OE510EE
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
To impart the basics of solar energy harnessing and solar panel and array.	1. Compare different energy resources. 2. Identify and choose proper type of meter for solar radiation measurement. 3. Use proper solar thermal system according to the load requirements. 4. Categorize and compare photovoltaic cells. 5. Apply the knowledge of solar energy.

Unit – I

Fundamentals of Energy Sources: Oil crisis of 1973, Classifications of Energy Resources, Importance of Non-conventional energy sources, Advantages-disadvantages and salient features of Non-conventional energy sources.

Unit – II

Solar Energy Basics: Sun as a source of energy, the Earth, Radiation Spectrums, Extraterrestrial and Terrestrial Radiations, Depletion of solar Radiation, Pyranometer, Pyrheliometer, Sunshine Recorder.

Unit – III

Solar Thermal Systems: Solar Collectors, Solar Water Heater, Solar Passive space – heating and cooling systems, Solar Cookers, Solar furnaces, Solar thermal water pump, Vapour compression refrigeration and Solar pond Electric power plant.

Unit – IV

Solar Photovoltaic Systems: Solar Cell fundamentals, Cell characteristics, Cell classification, Module, Panel and Array, Maximizing the Solar PV output and load matching, MPPT.

Unit – V

Solar PV systems & Applications: Solar PV system classification - Stand-Alone Solar PV system and Grid-Interactive Solar PV system. Applications - Water Pumping, lighting, medical refrigeration, village power and Telecommunication.

Learning Resources:

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

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

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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

SENSORS FOR ENGINEERING APPLICATIONS

(Open Elective-III)

SYLLABUS FOR B.E V Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U21OE510EC
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. Understand Sensor Principles and Classification 2. Analyzing Sensor Characteristics and Response 3. Exploring Different Types of Sensors 4. Understanding Environmental Factors and Sensor Reliability 5. Explore the applications of sensors in various engineering fields	Upon completion of the course, students will be able to 1. Understand the fundamental principles of sensors and transducers and their importance in various engineering applications. 2. Demonstrate various mechanical sensors used for measuring displacement, acceleration, force, fluid flow, level, pressure, and stress. 3. Explain the working principles and applications of thermal and optical sensors. 4. Comprehend the principles and applications of magnetic sensors and acoustic sensors. 5. Explore electrical sensors, and high-frequency sensors and their use in various engineering 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	3	1	1		1								1	1	
CO2	3	2	1		2								2	2	
CO3	2	2	2		2								2	2	
CO4	2	2	2		2								2	2	
CO5	2	2	2		2								2	2	

UNIT - I

Introduction to sensors and transducers. Need for sensors in the modern world. Different fields of sensors based on the stimuli - various schematics for active and passive sensors. Static and dynamic characteristics of sensors - zero, I, and II order sensors – Response to impulse, step, ramp, and sinusoidal inputs. Environmental factors and reliability of sensors.

UNIT – II

Mechanical Sensors Displacement - acceleration and force – the flow of fluids - level indicators - pressure in fluids - stress in solids. Typical sensors - wire and film strain gauge, anemometers, piezoelectric and magneto strictive accelerometers, potential metric sensors, LVDT.

UNIT – III

Thermal and Optical Sensors temperature – temperature difference – heat quantity. Thermometers for different situations – thermocouples thermistors – color pyrometry. light intensity – wavelength and color – light dependent resistors, photodiode, phototransistor, CCD, CMOS sensors. radiation intensity, particle counter – Gieger Muller courter (gas based), Hallide radiation detectors.

UNIT – IV

Magnetic and Acoustic Sensors magnetic field, magnetic flux density – magneto resistors, Hall sensors, superconducting squids. Intensity of sound, frequency of sound in various media, various forms of microphones, piezoelectric sensors.

UNIT – V

Electrical and High-Frequency Sensors conventional volt and ammeters, high current sensors, (current transformers), high voltage sensors, High power sensors. High frequency sensors like microwave frequency sensors, wavelength measuring sensors. MEMs and MEM based sensors.

Lab Experiments:

1. Measurement of displacement, and velocity with Pmod ACL with 3-axis Digital Accelerometer.
2. Sense the temperature with Pmod TMP3 with Ambient Temperature sensor.
3. Sense the ambient light with Pmod ALS with an Ambient light sensor.
4. Characteristics of photocell using myRIO with Photocell, API PDV-P9203.
5. Study of IR range sensor to measure the distance between the sensor and reflective target using IR range finder GP2Y0A21YK0F
6. Working principle of Hall effect using US1881 Hall-effect latch.
7. Study of acoustic sensor, to record audio signals and to monitor acoustic level using Chenyum CY-502 computer microphone.
8. Estimate the range for a given IR and ultrasonic sensor using QRB1134 IR sensors and MAXSONAR ultrasonic sensor.

Learning Resources :

1. Doebelin, "Measurement Systems: Application and Design", McGraw Hill Kogakusha Ltd.
2. Julian W. Gardner, Vijay K. Varadan, Osama O. Awadelkarim "Microsensors, MEMS and Smart Devices", New York: Wiley, 2001.
3. Henry Bolte, "Sensors – A Comprehensive Sensors", John Wiley.
4. Jocob Fraden," Handbook of Modern Sensors, Physics, Designs, and Applications", Springer.
5. Manabendra Bhuyan," Intelligent Instrumentation Principles and Applications", CRC Press.
6. Randy Frank," Understanding Smart Sensors", Second edition, Artech House.

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

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Duration of Internal Test: 90 Minutes

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

INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS
(Open Elective-III)
SYLLABUS FOR B.E V Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U21OE510IT
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** *On completion of the course, students will be able to*
Apply the concepts of database management systems and design relational databases.	1. Understand functional components of the DBMS and develop ER model for a given problem and map ER it to Relational model 2. Understand Relational model and basic relational algebra operations. 3. Devise queries using SQL. 4. Design a normalized database schema using different normal forms. 5. Understand transaction processing and concurrency control techniques.

UNIT – I
Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Architecture, Database Users and Administrators.
Database Design and the E-R Model: Overview of the Design Process, The E-R Model, Constraints, E-R Diagrams

UNIT – II
Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Fundamental Relational-Algebra Operations.

UNIT – III
Structured Query Language: Introduction, Data Definition, Basic Structure of SQL Queries, Modification of the Database, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Join Expressions, Views.

UNIT – IV

Relational Database Design: Features of Good Relational Design, Normalization-Decomposition Using Functional Dependencies, Functional-Dependency Theory.

UNIT – V

Transactions: Transaction Concepts, Transaction State, Concurrent Executions, Serializability

Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols.

Learning Resources :

1. Abraham Silberschatz, Henry F Korth, S. Sudarshan, Database System Concepts, 6th Edition, McGraw-Hill International Edition, 2011.
2. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, Third Edition, McGraw-Hill International Edition, 2003.
3. Elmasri, Navathe, Somayajulu and Gupta, Fundamentals of Database System, 6th Edition, Pearson Education, 2011.
4. Patric O'Neil, Elizabeth O'Neil, Database-principles, programming, and performance,Morgan Kaufmann Publishers, 2001.
5. Peter Rob, Carlos coronel, Database Systems, (2007), Thomoson.
6. https://nptel.ac.in/courses/106105175/

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

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Duration of Internal Test: 90 Minutes

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

ESSENTIAL OF OPERATING SYSTEMS
(Open Elective-III)
SYLLABUS FOR B.E V Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U21OE520IT
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

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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

TECHNICAL WRITING AND PROFESSIONAL PRESENTATION

(Open Elective-III)

SYLLABUS FOR B.E V Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U21OE020EH
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

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

UNIT 1: FORMAL & INFORMAL TECHNICAL REPORTS

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

UNIT 2: BUSINESS CORRESPONDENCE

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

UNIT 3: PROFESSIONAL PRESENTATIONS

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

UNIT 4: RESUME & CVs

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

UNIT 5: WRITING PROPOSALS & SOPs

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

METHODOLOGY

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

ASSESSMENTS

- Online assignments
- Individual and Group

LEARNING RESOURCES

learn.talentsprint.com

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

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

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 : U21OE530EH
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	**ASSESSMENTS**
- Case Studies	- Online assignments
- Demonstration	- Individual and Group
- Presentations	
- Expert lectures	
- Writing and Audio-visual lessons	

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 : U21OE540EH
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 businessManagement", Fourth edition, Pearson, New Delhi, 2006.
3. Alfred E. Osborne, "Entrepreneurs Toolkit", Harvard Business Essentials, HBS Press, USA, 2005
4. MadhurimaLall and ShikhaSahai, "Entrepreneurship", Excel Books, First Edition, New Delhi,2006

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 : 2 Hours	SEE Marks : 40	Course Code : U21HS510EH
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

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

Unit 3: Fact, Observation and Inference

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

Unit 4: Effective Technical Writing

a. Report writing
b. Image Writing
c. Book Reviews
d. 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: 60 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 : U21PE510ME
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.

Learning Resources:

1. Agam Kumar TyagI, "MATLAB and Simulink for Engineers", Oxford Higher Education, 2010
2. RudraPratap, " 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: U21PC531ME
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: U21PC551ME
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: U21PC561ME
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 choose appropriate field of interest, review the literature and define the problem. 2 Plan the activities for carrying out the work in teams to solve the identified problem using programming. 3 conduct investigations on the chosen problems, draw the plots and derive conclusions and prepare the 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	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: U21PW519ME
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-21)
B.E. – MECH : SIXTH SEMESTER (2023-2024)

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								
U21PC610ME	Metrology and Instrumentation	3	-	-	3	60	40	3
U21PC620ME	Dynamics of Machines	3	1	-	3	60	40	4
U21PC630ME	Machine Design	3	-	-	3	60	40	3
U21PC640ME	Metal Cutting and Machine Tools	3	-	-	3	60	40	3
U21PC650ME	Refrigeration and Air Conditioning	3	-	-	3	60	40	3
U21OE6XXXX	Open Elective-IV	3	-	-	3	60	40	3
U21BS630EH	Skill Development Course-VII (Verbal Aptitude)	1	-	-	2	40	30	1
U21PE610ME	Skill Development Course-VIII (Technical Skills-III)	1	-	-	2	40	30	1
U21PEXXXME	NPTEL Course Certification	-	-	-	-	-	-	2
PRACTICALS								
U21PC621ME	Theory of Machines Lab	-	-	2	3	50	30	1
U21PC641ME	Machine Tools and Metrology Lab	-	-	2	3	50	30	1
U21PW619ME	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: U21PC610ME
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, General Geometric tests for testing machine tools – Lathe, drilling and milling machines.

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

UNIT-IV
Displacement transducers. LVDT. Strain measurement – wire and foil type resistance strain gauges. Rosette Gauges. Adjacent arm and self-compensating gauges. 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", 3rd

Edition, 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: U21PC620ME
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 screw threads, bearings, clutches, 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. Balancing of multi cylinder in-line engines, V type engines and Radial engines.

UNIT-III

Friction:

Thrust bearings-pivots and collars.

clutches-single plate, cone and centrifugal clutches.

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",CBSPublishers&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: U21PC630ME
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. Introduction to design of gear box.

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 CUTTING AND MACHINE TOOLS

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U21PC640ME
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, ECM, LBM, and EBM. Numericals on metal removal rate in AJM, ECM and EDM processes.

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,"Manufacturing Science", 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: U21PC650ME
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 – heating & cooling with humidification and dehumidification and adiabatic dehumidification, adiabatic chemical dehumidification and 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., "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 Domkundwar S, "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.	Additive Manufacturing and its Applications	U21OE610ME	3
Civil	Project Management	U21OE610CE	3
CSE	Introduction to Databases	U21OE610CS	3
	Fundamentals of Operating System	U21OE620CS	3
EEE	Mathematical Programming for Numerical Computation	U21OE610EE	3
ECE	Introduction to Mobile Communications	U21OE610EC	3
IT	Web Application Development and Security	U21OE610IT	3
	Introduction to Machine Learning	U21OE620IT	3
	Fundamentals of Machine Learning	U21OE630IT	3
HSS	Advanced Course in Entrepreneurship	U21OE630EH	3

VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

DEPARTMENT OF MECHANICAL ENGINEERING

ADDITIVE MANUFACTURING AND ITS APPLICATIONS

(Open Elective-IV)

SYLLABUS FOR B.E VI Semester

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U21OE610ME
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)

SYLLABUS FOR B.E.VI-SEMESTER

L:T: P (Hrs/Week):3:0:0	SEE Marks: 60	Course Code:U21OE610CE
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. SrinathL.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, 2006
4. http://nptel.ac.in/courses/

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

INTRODUCTION TO DATABASES

(OPEN ELECTIVE-IV)
SYLLABUS FOR B.E. VI-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code :U21OE610CS
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES *On completion of the course, students will be able to*
1 Identify different issues involved in the design and implementation of a database system. 2 Understand transaction processing.	1 Identify the functional components of database management system. Create conceptual data model using Entity Relationship Diagram 2 Transform a conceptual data model into a relational model 3 Design database using normalization techniques 4 Apply indexing and hashing techniques for effective data retrieval 5 Explain transaction processing.

UNIT-I

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

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

UNIT-II

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

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

Learning Resources:

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

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

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

Duration of Internal Tests : 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Computer Science & Engineering

FUNDAMENTALS OF OPERATING SYSTEMS
(OPEN ELECTIVE-IV)
SYLLABUS FOR B.E. VI-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code : U21OE620CS
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	: 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

MATHEMATICAL PROGRAMMING FOR NUMERICAL COMPUTATION
Open Elective-IV
SYLLABUS FOR B.E. VI SEMESTER

L: T: P (Hrs/Week):3:0:0	SEE Marks: 60	Course Code:U21OE610EE
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
To provide fundamental knowledge of programming language for solving problems.	On completion of the course, students will be able to 1. Generate arrays and matrices for numerical problems solving. 2. Represent data and solution in graphical display. 3. Write scripts and functions to easily execute series of tasks in problem solving. 4. Use arrays, matrices and functions in Engineering applications 5. Design GUI for basic mathematical applications.

UNIT - I : Introduction:
Basics of MATLAB, MATLAB windows, Advantages of MATLAB, on-line help, file types.
MATLAB Basics: Variables and Constants –Vectors and Matrices- Arrays - manipulation- Built-in MATLAB Functions. Creating and printing simple plots, Creating ,Saving and Executing a Script File, Creating and Executing a function file.
Programming Basics: Data types-Operators – Hierarchy ofoperations, Relational and logical operators, if-end structure, if- else-end structure, if-elseif-else-end structure, switch-case statement, for-end loop, while-end loop, break and continue commands.

UNIT - II : Scripts and Functions
Script Files, Function Files, Debugging methods in MATLAB. **Graphics: Basic 2D plots:** Printing labels- grid and axes box- Entering text in a box- Axis control-Style options-Multiple plots- subplots-specialized 2D plots: stem-,bar, hist, pi, stairs, loglog, semilog, polar, comet 3D plots: Mesh, Contour, Surf, Stem3, ezplot.

UNIT - III : Numerical Methods Using MATLAB

Numerical Differentiation, Numerical integration- Newton-Cotes integration formulae, Multi-step application of Trapezoidal rule, Simpson's 1/3 Rule for Numerical Integration. MATLAB functions for integration.

Linear Equations- Linear algebra in MATLAB, Solving a linear system, Gauss Elimination, Finding eigen values and eigen vectors, Matrix factorizations, Advanced topics.

UNIT - IV : Nonlinear Equations

System of Non-linear equations, Solving System of Equations Using MATLAB function fsolve, Interpolation-Lagrange Interpolation, Two dimensional Interpolation, Straight line fit using Least Square Method, Curve fitting using built-in functions ployval and polyfit, cubic fit using least square method. Finding roots of a polynomial - roots function, Newton-Raphson Method.

UNIT - V :

Solution of Ordinary differential Equations(ODEs)-The 4th order Runge-kutta Method, ODE Solvers in MATLAB, Solving First – order equations using ODE23 and ODE45.

Structures and Graphical user interface(GUI): Advanced data Objects, How a GUI works, Creating and displaying a GUI. GUI components, Dialog Boxes.

Learning Resources:

1. Getting started with MATLAB "A quick introduction for scientist and engineers by Rudra Pratap, Oxford publications.
2. Advanced Guide to MATLAB-Practical Examples in Science and Engineering by S.N. Alam, S. Islam, S.K. Patel-I.K. International Publishing House Pvt. Ltd.
3. Stephen J. Chapman-"MATLAB Programming for Engineers"- 5th Edition-Cengage Learning- 2015. Getting started with MATLAB (Version 9) The Mathworks.
4. An Introduction to MATLAB® Programming and Numerical Methods for Engineers 1st Edition by Timmy SiauwAlexandreBayen,Elsevier-18th April2014.
5. https://nptel.ac.in/courses/103106118/2

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

INTRODUCTION TO MOBILE COMMUNICATIONS

(Open Elective-IV)

SYLLABUS FOR B.E. VI - SEMESTER

L:T:P (Hrs./week) : 3:0:0	SEE Marks : 60	Course Code: U21OE610EC
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
1. To understand the technology trends changing from generation to generation. 2. To have an insight into the various propagation models and the effects of fading. 3. To understand the multiple access techniques and Mobile communication system specifications.	On completion of the course, students will be able to 1. Analyze various methodologies to improve the cellular capacity. 2. Identify various Propagation effects. 3. Identify the effects of fading and multi path propagation. 4. Categorize various multiple access techniques for Mobile Communications. 5. Analyze the specifications of GSM based Mobile Communication Systems.

CO-PO Mapping

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

UNIT - I:

Introduction to Wireless Communication Systems: Evolution of Mobile Radio Communications, Examples of Wireless Communications Systems, Trends in Cellular Radio and Personal Communication Systems.

The Cellular Concept – System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Improving Coverage and Capacity in Cellular Systems.

UNIT - II:

Mobile Radio Propagation - Large Scale Path Loss: Introduction to Radio wave Propagation, Free Space Propagation Model, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering.

UNIT - III:

Mobile Radio Propagation - Small Scale Fading and Multipath: Small Scale Multipath Propagation, Small – Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of Small-Scale Fading, Rayleigh and Ricean Distributions.

UNIT -IV:

Multiple Access Techniques for Wireless Communications: Introduction, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Space Division Multiple Access (SDMA).

UNIT -V:

Wireless Systems and Standards: Global System for Mobile (GSM) – Services and features, System architecture, GSM Radio subsystem, channel types, Frame structure for GSM.

Learning Resources:

1. Theodore S. Rappaport, Wireless Communications Principles and Practices, 2nd edition, Pearson Education.
2. David Tse, Pramodh Viswanath, Fundamentals of Wireless Communication, 2005, Cambridge University Press.
3. Name of the course: Introduction to Wireless and Cellular Communications
4. Course url: https://swayam.gov.in/nd1_noc19_ee48/preview

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 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 : U21OE610IT
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 – 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: U21OE620IT
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

FUNDAMENTALS OF MACHINE LEARNING

(OPEN ELECTIVE-IV)

SYLLABUS FOR B.E VI- SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks :60	Course Code: U21OE630IT
Credits : 3	CIE Marks: 40	Duration of SEE :3Hrs

COURSE OBJECTIVES The objectives of this course are to	**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.

UNIT-III:

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

UNIT-IV:

Supervised Parametric learning: Support Vector Machine.

Supervised Parametric Bayesian learning: Introduction, Naive Bayes Classification.

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. Ethem Alpaydin , 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-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: U21OE630EH
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 APTITUDE)
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: U21PE610ME
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: U21PC621ME
Credits :01	CIE Marks:30	Duration of SEE: 03 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The objective of this course is to	*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 To study the gyroscopic effect on a disc subjected to precessional motion.
3 To study the controlling force curves in dead weight controlled centrifugal governors.
4 To study the controlling force curves in spring controlled centrifugal governors.
5 To determine the static and dynamic balancing masses in a rotating mass system.

6 To study the Axial free vibrations of a spring mass system with and without damping.
7 To study the forced vibrations using a cantilever beam under harmonic excitation.
8 Determination of critical speed of the shaft using different supports.
9 To analyze a 1- DOF system subjected to un damped and damped Free Vibrations using MATLAB.
10 To analyze a 1- DOF system subjected to un damped and damped Forced Vibrations using MATLAB.
11 To analyze a 1- DOF system subjected to un damped and damped Free Vibrations using SIMULINK.
12 To analyze a 1- DOF system subjected to un damped and damped Forced Vibrations using SIMULINK.
13 Coriolis acceleration experiment by using virtual lab.
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: U21PC641ME
Credits :01	CIE Marks:30	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*
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 design of snap gauge.
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. To make alignment tests on lathe machine.

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: U21PW619ME
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-21)
B.E. (ME) Honours Degree Program in Robotics
(2023-2025)

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 2023-24								
U21PC560ME	Industrial Robotics	3	-	-	3	60	40	3
U21PC570ME	Control Engineering	3	-	-	3	60	40	3
VI-Semester AY 2023-24								
U21PC660ME	Industry 4.O	3	-	-	3	60	40	3
VII-Semester AY 2024-25								
U21PC760ME	Robotics and Control	3	-	-	3	60	40	3
U21PC770ME	Robotics Lab	-	-	2	3	50	30	1
U20PW729ME	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

INDUSTRIAL ROBOTICS

SYLLABUS FOR B.E. V-SEMESTER

Instruction : 3 Hrs /week	SEE Marks : 60	Course Code : U21PC560ME
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 programming through experiential learning.	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 classify various sensors used in industrial robots for suitable purpose. 5 outline the interface between the human user and an industrial robot using various programming languages.

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, 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

HANDS ON EXPERIENCE:

Modelling and assembly of Robotic manipulators using CAD software.

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 and velocity feedback devices

HANDS ON EXPERIENCE:

Motion simulation for robotic industrial manipulators

UNIT-III

ROBOT COORDINATE SYSTEMS

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

HANDS ON EXPERIENCE:

Homogeneous transformation using python programming

UNIT-IV

ROBOT SENSORS

Sensors in robots – Touch sensors-Tactile sensors – Proximity and range sensors. Force sensors

Introduction to Machine Vision and Artificial Intelligence.

HANDS ON EXPERIENCE:

Demonstration of various IIOT sensors and controllers

UNIT-V

Robot programming

On line programming, teach pendant control, Lead through, Walk through, off line programming, Task programming. Robot programming exercises using MATLAB.

HANDS ON EXPERIENCE:

Virtual experimentation using Coppeliasim software

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 : U21PC570ME
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

INDUSTRY 4.O

SYLLABUS FOR B.E. VI-SEMESTER

Instruction : 3 Hrs /week	SEE Marks : 60	Course Code : U21PC660ME
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.

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															
CO2															
CO3															
CO4															
CO5															

UNIT – I

Introduction to Industry 4.0

Definition of Industry 4.0, Comparison of Industry 4.0 Factory and today's Factory, Difference between conventional automation and Industry 4.0.

Basic principles and technologies of a Smart Factory

Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services, Big Data, Cyber-Physical Systems, Value chains in manufacturing companies, Customization of products, Digital Twins, Cloud Computing / Cloud Manufacturing, Security issues within Industry 4.0 networks.

UNIT – II

Cyber-Physical Systems (CPS) and Cyber-Physical Production Systems (CPPS)

Definition of Cyber-Physical System, Core elements of Cyber-Physical Systems and Cyber-Physical Production Systems, Control theory and real-time requirements, Self-organization principles, Communication in cyber-physical systems, Design Methods for Cyber-physical Systems, Applications for cyber-physical systems.

Cyber-Physical Systems and new Business Models

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

UNIT – III

Digital Twins in Production

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

Assistance systems for production

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

UNIT –IV

Human-Robot Collaboration

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

Safety and Security in networked Production Environments

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

UNIT – V

Cloud Manufacturing and the connected factory

Virtualization, Cloud Platforms, Big data in production, Cloud-based ERP and MES solutions, Connected factory applications, IT security for cloud applications.

The smart workpiece

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

Learning Resources:

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

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

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

Duration of Internal Test: 90 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Mechanical Engineering

ROBOTICS AND CONTROL

SYLLABUS FOR B.E. VII-SEMESTER

Instruction : 3+1 Hrs /week	SEE Marks : 60	Course Code : U21PC760ME
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 : U21PC731ME
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			

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

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: U21PW729ME
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			