

**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-23)**  
**WITH EFFECT FROM 2025-26**  
**(For the students admitted in 2023-24)**



**DEPARTMENT OF MECHANICAL ENGINEERING**  
**+91-40-23146060, 23146061**  
**Fax: +91-40-23146090**  
**Website: [www.vce.ac.in](http://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*

<b>PROGRAM OUTCOMES (POs)</b>	
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-23)**

**B.E. – MECH : FIFTH SEMESTER (2025-2026)**

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									
U23PC510ME	Heat Transfer	3	-	-	3	60	40	3	
U23PC520ME	Kinematics of Machines	3	-	-	3	60	40	3	
U23PC530ME	Manufacturing Processes	3	-	-	3	60	40	3	
U23PC540ME	Design of Machine Elements	3	-	-	3	60	40	3	
U23PC550ME	CAD / CAM	3	-	-	3	60	40	3	
U23OE5XXXX	Open Elective - III	3	-	-	3	60	40	3	
U23HS510EH	Skill Development Course V (Communications Skills in English II)	1	-	-	2	40	30	1	
U23PE510ME	Skill Development Course-VI (Technical Skills-II) Mathematical Programming for Mechanical Engineers	1	-	-	2	40	30	1	
PRACTICALS									
U23PC531ME	Manufacturing Processes Lab	-	-	2	3	50	30	1	
U23PC551ME	CAD/CAM Lab	-	-	2	3	50	30	1	
U23PC561ME	Programming for Mechanical Engineers Lab	-	-	2	3	50	30	1	
U23PW519ME	Mini Project	-	-	2	3	50	30	1	
TOTAL		20	-	8	-	640	420	24	
GRAND TOTAL		28				1060		24	
1) Students are required to complete one NPTEL certification course of 8 weeks or 12 weeks duration (equivalent to 2 credits) related to Mechanical Engineering or its allied fields by the end of the VI semester as part of their academic curriculum. 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: U23PC510ME
Credits :03	CIE Marks:40	Duration of SEE:03Hours

<b>COURSE OBJECTIVE</b> <i>The objective of this course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
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 $\epsilon$ -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 TO HEAT TRANSFER**

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 slabs and cylinders, Overall heat transfer coefficient, Critical insulation thickness.

## **UNIT-II: FINS AND TRANSIENT CONDUCTION**

Fins: classification and applications, analysis of fins - 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.

Role of AI in Heat Exchangers – case study.

## **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 factor, Total emissive power, Radiation heat exchange in two-body enclosures

Note: Use of heat transfer data book permitted.

### **Learning Resources:**

1. Holman J.P, "Heat transfer", Tata McGraw Hill Publication, New Delhi, 2010. 10<sup>th</sup> 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				



**ASAVI 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: U23PC520ME
Credits : 03	CIE Marks: 40	Duration of SEE: 03Hours

<b>COURSE OBJECTIVES</b> <i>The objective of the course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
perform kinematic analysis of planar mechanisms and to analyze the transmission of motion using lower and higher kinematic pairs.	<ol style="list-style-type: none"> <li>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.</li> <li>2 perform kinematic analysis of various planar mechanisms, using graphical method.</li> <li>3 understand the steering gear mechanisms and analyze the motion transmission characteristics by using belt drive.</li> <li>4 design the cam profile for various types of followers under the given required motion of the followers.</li> <li>5 analyze the motion transmission characteristics by using gear drive.</li> </ol>

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 center methods.

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

Applications of AI in kinematic synthesis.

## UNIT-III

**Special Mechanisms:** Steering gear mechanisms Davis and Ackerman.

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

## UNIT-IV: CAMS

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

## UNIT-V

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

Introduction to Gear Trains.

### Learning Resources:

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

### Web resources:

1. [www.journals.elsevier.com/mechanism-and-machine-theory](http://www.journals.elsevier.com/mechanism-and-machine-theory)
2. [www.nptel.ac.in](http://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: U23PC530ME
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

<b>COURSE OBJECTIVE</b> <i>The objective of this course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
study various types of casting, welding and forming processes.	<ol style="list-style-type: none"> <li>1 design riser and gating system to produce required casting in sand molding process.</li> <li>2 examine special casting processes to suit various production requirements based on applications.</li> <li>3 understand the techniques of solid state and arc welding processes to join different materials.</li> <li>4 identify and select special welding process based on the application.</li> <li>5 interpret and differentiate various forming processes based on component to be manufactured.</li> </ol>

CO-PO and CO-PSO mapping															
CO	PO mapping												PSO mapping		
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CO5	3	2	3	2								3	3	2	3

**UNIT-I: CASTING PROCESS**

Casting terms, pattern materials, types of patterns, pattern allowances, Moulding sands, core sands, properties of moulding sand and its ingredients, different types of moulding machines, Directional solidification, use of chaplets, chills, riser and gating design, Numericals 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<sub>2</sub> moulding, die casting, centrifugal casting, investment or lost wax process; Casting defects, causes and remedies.

### **UNIT-III: WELDING PROCESSES**

Classification of welding processes

Gas welding and gas cutting, Arc welding- SMAW, SAW, GMAW, GTAW, PAW, Numericals on Arc Welding characteristics, Duty cycle, welding efficiency, Welding defects, principle of Soldering and Brazing.

### **UNIT-IV: SPECIAL WELDING PROCESSES**

Laser beam welding, Electron beam welding, Thermit welding, Resistance welding processes - Spot welding, Projection welding, Seam welding, Butt welding, weldability, Numericals on Resistance spot welding.

### **UNIT-V: FORMING PROCESSES**

Cold & Hot working, Yield criteria, Process description of Forging, Rolling, Extrusion, Wire drawing, Blanking, Piercing, Bending, Deep drawing, Stretch forming, Spinning. Numericals on forging force, rolling pressure, punching, blanking force and drawing operations.

#### **Learning Resources:**

1. P.N.Rao, "Manufacturing Technology," Vol. 1, 3rd Edition, Tata McGraw Hill Publ., 2011.
2. Amitabh Ghosh & Mallik, "Manufacturing Science", 4<sup>th</sup> Edition, Assoc. East west Press Pvt. Ltd., 2011.
3. Roy A. Lindberg, "Materials & Process of Manufacturing", 5<sup>th</sup> Edition, Prentice Hall of India, 1992.
4. Serope Kalpakjian, "Manufacturing Engineering and Technology", Addison, 7<sup>th</sup> Edition Wesley Publishing Company, 2006.
5. George.E. Dieter, "Mechanical Metallurgy", 4<sup>th</sup> 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: U23PC540ME
Credits : 3	CIE Marks : 40	Duration of SEE: 3 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
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: <ol style="list-style-type: none"> <li>1. estimate the size of machine component based on theories of failure for component subjected to different types of loads.</li> <li>2. estimate the size/life of machine components subjected to fluctuating (Fatigue) loads based on Goodman and Soderberg criteria/S-N diagram</li> <li>3. determine the size of shafts &amp; fasteners subjected to torsion, bending, axial load or a combination of these to prevent failure.</li> <li>4. analyze the Joints and couplings for a given load to prevent failure.</li> <li>5. design of Power screws, riveted joints and welded joints for a given load under direct and eccentric loads.</li> </ol>

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CO4	3	2	3	2								2	3	2	3
CO5	3	2	3	2								2	3	2	3

**UNIT-I**

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

Applications of AI in materials selection.

## UNIT-II

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

## UNIT-III

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

## UNIT-IV

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

## UNIT-V

Design of riveted joints and welded joints under direct load.

### Learning Resources:

1. M.F. Spotts, "*Design of Machine Elements*", 7th Ed., Pearson Education, 2003.
2. V. B. Bhandari, "*Design of Machine Elements*", 3rd Ed., Tata McGraw- Hill, 2010.
3. P.C. Sharma & D.K. Aggarwal, "*Machine Design*", 10<sup>th</sup> Ed., S.K. Kataria & Sons, 2003.
4. J.E. Shigley & Charles R. Mischke "*Mechanical Engineering Design*", 6<sup>th</sup> 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: U23PC550ME
Credits :03	CIE Marks:40	Duration of SEE: 03Hours

<b>COURSE OBJECTIVE</b> <i>The objective of this course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
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.	<ol style="list-style-type: none"> <li>1 identify the different types of Modelling Techniques in CAD and the basic entities which are useful in Model creation.</li> <li>2 analyse the concepts of solid modelling and the associated Geometric transformations.</li> <li>3 understand the basic concepts of NC machines and their programming.</li> <li>4 distinguish between CNC and NC and Summarize the concepts of Industrial Robots.</li> <li>5 understand the basic concepts of CIM and FMS and their extension to the present day Industry</li> </ol>

CO-PO and CO-PSO mapping																
CO	PO mapping												PSO mapping			
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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**

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

**Synthetic Curves:** Parametric representation of cubic spline, Bezier and B-spline curves, continuity, properties and characteristics of splines.

## 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 approaches.

**2D Transformation and their mathematics:** Translation, scaling, rotation, shearing and reflection about arbitrary points. Concatenated transformations.

## UNIT-III: NUMERICAL CONTROL OF MACHINE TOOLS

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

## UNIT-IV

**Computer Numerical Control:** CNC, DNC and adaptive control systems. Typical configurations and relative features. Machining centers.

**Group Technology:** Part families, layout, part classification and coding system.

Applications of AI in parts classification and coding.

## UNIT-V

**Computer Aided Process Planning:** Variant and Generative process planning.

**Flexible Manufacturing System & Computer Integrated**

**Manufacturing System:** Building blocks of Flexible Manufacturing systems and their control, Introduction to CIM, Reverse Engineering and 3D printing. CAD/CAM Integration.

### 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", 2<sup>nd</sup> Edition, Tata McGraw Hill, New Delhi, 2004.
5. YoramKoren, Computer Control of Manufacturing Systems, McGraw Hill Inc. New York, 1994.

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

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



<b>B.E- V SEM OPEN ELECTIVE-III COURSES</b>			
<b>Dept.</b>	<b>Title</b>	<b>Code</b>	<b>Credits</b>
Mech	Drives and Control Systems for Robotics (Stream: Robotics)	U23OE510ME	3
	Introduction to Robotics (General Pool)	U23OE520ME	3
Civil	Geo Spatial Information Technology (General Pool)	U23OE510CE	3
CSE	Fundamentals of Artificial Intelligence (Stream- Artificial Intelligence & Machine Learning)	U23OE520CS	3
	Introduction to Operating Systems (General Pool)	U23OE510CS	3
EEE	Modelling and Simulation of Photovoltaic Systems (General Pool)	U23OE510EE	3
ECE	Introduction to Biomedical Electronics (General Pool)	U23OE510EC	3
	Signal Engineering (General Pool)	U23OE530PH	3
IT	Introduction to Artificial Intelligence (Stream- Artificial Intelligence & Machine Learning)	U23OE520IT	3
	Essential of Operating Systems (General Pool)	U23OE510IT	3
HSS	Introduction to Financial Analytics (Stream: Banking Finance, Securities and Investments)	U23OE520EH	3
	Marketing Management for Engineers (General Pool)	U23OE510EH	3
	Introduction to Philosophy (General Pool)	U23OE530EH	3
	Basics of Entrepreneurship (General Pool)	U23OE540EH	3

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF MECHANICAL ENGINEERING****DRIVES AND CONTROL SYSTEMS FOR ROBOTICS****(Stream: Robotics)**

(Open Elective-III)

**SYLLABUS FOR B.E. V-SEMESTER**

Instruction : 3Hours	SEE Marks : 60	Course Code : U23OE510ME
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

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

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

**UNIT-I**

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

**UNIT-II**

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

**UNIT-III**

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

**UNIT-IV**

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

**UNIT-V**

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

**Learning Resources:**

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

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

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

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF MECHANICAL ENGINEERING****INTRODUCTION TO ROBOTICS**

(General Pool : Open Elective-III)

**SYLLABUS FOR B.E. V-SEMESTER**

L:T:P(Hrs./week):3	SEE Marks : 60	Course Code: U23OE520ME
Credits : 3	CIE Marks: : 40	Duration of SEE: 3 Hours

<b>Course objectives</b>	<b>Course Outcomes</b>
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 its 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,  
 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, Robot trajectories 2D 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.

## **UNIT-IV ROBOT SENSORS**

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

Introduction to Machine Vision and Artificial Intelligence.

## **UNIT-V**

### **ROBOT APPLICATIONS**

Applications of robots in Industries, Medical, Household, Entertainment, Space, Underwater, Defense, and Disaster management.

Applications of Micro and Nanorobots, Future Applications of robots.

### **Learning Resources:**

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

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

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

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF CIVIL ENGINEERING****GEO SPATIAL INFORMATION TECHNOLOGY**

(Open Elective-III) (General Pool)

**SYLLABUS FOR B.E V Semester**

L:T: P (Hrs./week):3: 0 : 0	SEE Marks: 60	Course Code : U23OE510CE
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
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.	<ol style="list-style-type: none"> <li>1. Explain the fundamental principles of remote sensing, including EMR spectrum, radiation interactions, and spectral reflectance characteristics, and identify their applications in observing and analyzing earth surface features.</li> <li>2. Identify and differentiate various remote sensing systems, satellite characteristics, image types, and digital data formats used in visual interpretation, and understand their applications in fields such as agriculture, water resources, urban planning, and disaster management.</li> <li>3. Describe the structure and operational principles of GPS and other GNSS systems, and recognize their practical applications .</li> <li>4. Analyze sources of GPS errors, evaluate position accuracy using DOP/URE, apply differential and carrier phase positioning methods.</li> <li>5. Explain the core concepts of GIS, spatial and non-spatial data types, map projections, and demonstrate methods of data input and editing, along with their applications in spatial analysis, infrastructure planning, and environmental monitoring.</li> </ol>

**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 of GIS:** 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-Wellenhof, 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 ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF COMPUTER SCIENCE ENGINEERING**

**FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE**

(Stream- Artificial Intelligence & Machine Learning)

(Open Elective-III)

**SYLLABUS FOR B.E V Semester**

L:T: P (Hrs./week): 3: 0 : 0	SEE Marks: 60	Course Code : U23OE520CS
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
Understand issues and techniques involved in the creation of intelligent systems.	<ol style="list-style-type: none"> <li>1. Solve searching problems using A*.</li> <li>2. Develop an algorithm for playing games.</li> <li>3. Represent the knowledge using propositional logic and predicate logic</li> <li>4. Understand the Expert Systems</li> <li>5. Construct Neural Network to solve problems</li> </ol>

**UNIT-I:**

**Introduction:** Intelligent Systems, Foundation of AI, Sub areas of AI, Applications.

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

**UNIT-II:**

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

**UNIT-III:**

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

#### **UNIT-IV:**

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

#### **UNIT-V:**

**Artificial Neural Networks:** Introduction Artificial Neural Networks, Single – Layer Feed Forward Networks, Multi – Layer Feed Forward Networks.

#### **Learning Resources:**

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

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

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

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF COMPUTER SCIENCE ENGINEERING****INTRODUCTION TO OPERATING SYSTEMS**

(General Pool)

(Open Elective-III)

**SYLLABUS FOR B.E V Semester**

L:T: P (Hrs./week): 3: 0 : 0	SEE Marks: 60	Course Code : U23OE510CS
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
Understand different Operating system Structures and Services.	<ol style="list-style-type: none"> <li>1. Explain Operating system structures and internal structure of a process.</li> <li>2. Compare CPU scheduling algorithms. Analyze Disk scheduling algorithms</li> <li>3. Apply different techniques for Main memory management.</li> <li>4. Describe file management techniques.</li> <li>5. Describe deadlock handling methods.</li> </ol>

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

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

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

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**  
 IBRAHIMBAGH, HYDERABAD – 500 031  
**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**Modelling and Simulation of Photovoltaic Systems**

(General Pool)

Open Elective-III)

**SYLLABUS FOR B.E V Semester**

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

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

**UNIT-1 Introduction to Photovoltaic Systems and P Spice**

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

**UNIT-2 Spectral Response and Short-Circuit Current**

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

**UNIT-3 Electrical Characteristics of the Solar Cell**

Ideal equivalent circuit, PSpice model of the ideal solar cell, Open circuit voltage, Maximum power point, Fill factor (FF) and power conversion efficiency, Generalized model of a solar cell, Effects of the series resistance on the short-

circuit current and the open-circuit voltage, Effects of the shunt resistance, Effects of the recombination diode, Temperature effects, Problems

#### **UNIT-4 Solar Cell Arrays, PV Modules and PV Generators**

Introduction, Series connection of solar cells, Identical solar cells in series, Bypass diode in series strings of solar cells, Shunt connection of solar cells, Shadow effects, The terrestrial PV module, Photovoltaic arrays, Photovoltaic generators and PV plants, Problems

#### **UNIT-5 Interfacing PV Modules to Loads and Battery Modelling**

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

#### **Learning Resources:**

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

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

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

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**  
 IBRAHIMBAGH, HYDERABAD – 500 031  
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**INTRODUCTION TO BIOMEDICAL ELECTRONICS**

(General Pool : Open Elective-III)

**SYLLABUS FOR B.E V Semester**

L:T: P (Hrs./week): 3: 0 : 0	SEE Marks:60	Course Code : U23OE510EC
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

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

**CO-PO-PSO Mapping**

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

**UNIT-I :**

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

**UNIT-II :**

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

## **UNIT-II :**

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

## **UNIT-V :**

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

## **UNIT-V :**

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

### **Learning Resources:**

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

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

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

Duration of Internal Tests: 90 Minutes



**VASAVI COLLEGE OF ENGINEERING (Autonomous)**  
 IBRAHIMBAGH, HYDERABAD – 500 031  
**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**SIGNAL ENGINEERING**  
 (General Pool : Open Elective-III)  
**SYLLABUS FOR B.E V Semester**

L:T: P (Hrs./week): 2: 0 : 1	SEE Marks: 60	Course Code : U23OE530PH
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

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

**CO-PO/PSO Mapping**

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

**UNIT-I: Introduction to General Signaling (8 Hours)**

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

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

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

**UNIT-II: Railway Signaling (6 Hours)**

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

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

Requirement of Signaling in 25KV AC Electrified Area.

**Signaling Interlocking Plan:** Essentials of Interlocking, Train Detection, Point Switching, Signal, Block Control, Aspect Control Chart.

### **UNIT-III: Signaling Equipment – I (8 Hours)**

Details of Relays, Signal Cables. Signals, Control Panel & Operation – Safety features, Working.

**Details of Point Machines** – Components, Working, Circuit Progression, Testing, Safety features,

**Level Crossing Gates** – Working, Circuit Progression, Safety features

**Details of Track Circuits, Axle Counters** - Single section, Multi-section, Subsystems; Working and Application.

### **UNIT-IV: Signaling Equipment – II (8 Hours)**

**Details about Block Instruments** – Types, Working, Circuit Progression, safety features Data Acquisition System – Interfaces, Fault Logic.

**Details of Integrated Power Supply**, CLS Panel, Lightning and Surge Protection.

### **Practicals at IRISSET Laboratory (12 Hours)**

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

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

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

Duration of Internal Tests: 90 Minutes

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF INFORMATION TECHNOLOGY****INTRODUCTION TO ARTIFICIAL INTELLIGENCE  
(Stream: Artificial Intelligence and Machine Learning)**

(Open Elective-III)

**SYLLABUS FOR B.E V Semester**

L:T: P (Hrs./week):3: 0 : 0	SEE Marks:60	Course Code : U23OE520IT
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
The objective of this course is to provide the necessary fundamentals, approaches in Artificial intelligence for problem solving for a goal-based single or multi agents with or without constraints and formalise soft computing techniques for better optimization for intelligent systems.	<ol style="list-style-type: none"> <li>1. Investigate applications of AI techniques in intelligent agents.</li> <li>2. Apply various search algorithms for demonstrating agents, searching and inferencing</li> <li>3. Analyse searching beyond classical search and adversarial Techniques.</li> <li>4. Identify problem types which might have constraints and evolutionary computation.</li> <li>5. Define the fuzzy systems, ethics and risks of AI.</li> </ol>

**UNIT-I:****Introduction to AI:** What is AI, Foundations of AI, History of AI, State of the Art, Applications of AI.**Intelligent Agents:** Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.**UNIT-II:****Solving Problems by Search:** Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies: Breadth first search, Depth-first search, Depth limited search, Iterative deepening depth first search**Informed (Heuristic) Search Strategies:** Greedy best first search, A\* Search, Optimality of A\*, Heuristic Functions.

### UNIT-III:

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

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

### UNIT-IV:

**Constraint Satisfaction Problems:** Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

**Introduction to Evolutionary Computation:** Representation – The Chromosome, Initial Population, Fitness Function, Selection, Reproduction Operators, Stopping Conditions, Evolutionary Computation versus Classical Optimization.

### UNIT-V:

**FUZZY Systems, Logic and Reasoning:** Fuzzy Sets- Formal Definitions, Membership Functions, Fuzzy Operators, Fuzzy Set Characteristics, Fuzziness and Probability, Fuzzy Inferencing.

**Philosophical foundations:** Weak AI, Strong AI, Ethics of AI and Risks of AI.

### Learning Resources:

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

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

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

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF INFORMATION TECHNOLOGY****ESSENTIAL OF OPERATING SYSTEMS**

(General Pool)

(Open Elective-III)

**SYLLABUS FOR B.E V Semester**

L:T: P (Hrs./week): 3: 0 : 0	SEE Marks: 60	Course Code : U23OE510IT
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVES</b> The course will enable the students to:	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
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.	<ol style="list-style-type: none"> <li>1. Analyze the importance and its key principles by differentiating and categorizing the functionalities of an operating system</li> <li>2. Examine mechanisms involved in memory management to handle processes and threads.</li> <li>3. Evaluate and solve deadlocks by assessing various handling strategies related to each of the conditions for deadlock.</li> <li>4. Interpret the mechanisms adopted for storage organization and access.</li> <li>5. Interpret the mechanisms adopted for I/O organization and access.</li> </ol>

**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 Systems D M Dhamdhare, Tata Mc Graw Hill
5. Operating Systems - Operating Systems: A Modern Perspective, Gary Nutt, Addison Wesley
6. Operating Systems - Operating Systems, Achyut S Godbole, Tata Mc Graw Hill
7. <https://nptel.ac.in/courses/106108101/>
8. <https://www.classcentral.com/course/udacity-introduction-to-operating-systems-3419>

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

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

# **VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

## **DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES**

### **INTRODUCTION TO FINANCIAL ANALYTICS**

(Stream: Banking Finance, Securities and Investments)

(Open Elective-III)

### **SYLLABUS FOR B.E V Semester**

L:T: P (Hrs./week): 3: 0 : 0	SEE Marks: 60	Course Code : U23OE520EH
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
<p>The course will enable the learners to:</p> <ol style="list-style-type: none"> <li>1. To gain knowledge of tools of financial analysis</li> <li>2. To understand valuation methodologies of Financial Debt instruments</li> <li>3. To understand corporate valuation methodologies</li> </ol>	<p>On completion of the course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Differentiate effective rates of interest vs normal rates of interest. Understand time value of money</li> <li>2. Analyse financial statements of a company. Understand efficient usage of capital.</li> <li>3. To understand the impact of debt on the capital structure and valuations of a company.</li> <li>4. Understand basis of financial projections, Valuation methods etc.</li> </ol>

This course gives an overview of key inputs, covering time value of money, interest rates and others, required to take rational financial decisions. This course gives an insight of tools used to analyse and interpret financial statements of a company and thereby value a company's worth.

This is a theory cum numerical/case-study based paper. Provides exposure to students regarding Profit & Loss statement, Balance sheet & cash flow statement. Objectives of capital structure etc.

Creates awareness about analysing a company from an investment perspective.

### **Unit 1 (5 hours)**

introduction to Financial Management - Meaning - Financial Decisions- inter relation between Financial decisions - Time Value of Money - concept of Present Value and Future value - Effective Vs Nominal rates of interest - Amortization (including simple numerical problems)

## **Unit 2 (10 hours)**

Financial statement Analysis - Financial statements- components of financial statements- Profit and Loss - Balance sheet – cash flow statement- building blocks of financial statements- sensitivity of various components on the profitability - inter and intra Company comparison - Ratio Analysis, common Size statements.(including numericals on inter and intra company comparison)

**Unit 3 (8 hours)** Debt Securities - Types of Bonds - Bond indenture -Valuation of Bonds - Bonds with Annual and Semi Annual interest payments - Current Yield- Yield to Maturity and Yield to Call - Bond Duration importance and Computation - Bond Portfolio management

## **Unit 4 (5 hours)**

Capital Structure - Concept - Sources of Finance - Determinants of capital Structure - EBlr - EPS Analysis - Effect of Taxation - consideration of Management control.

## **Unit 5 (15 hours)**

Business Valuation - concept -purpose and Hindrances -Projected Financials- Methods of Valuation Discounted Free cash Flow Method- Net Assets Based - comparable company- Market multiples Business Valuation in Mergers- Real life Examples

## **Learning Resources:**

Units 1,2,3,4 -Financial Management by M Y Khan

Unit 5 \* institute of Company Secretaries Study book

Websites: Wikipedia.com; Investopedia.com;

Newspaper: Business Standard; Economic Times

## **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****MARKETING MANAGEMENT FOR ENGINEERS**

(General Pool)

(Open Elective-III)

**SYLLABUS FOR B.E V Semester**

L:T: P (Hrs./week): 3: 0 : 0	SEE Marks: 60	Course Code : U23OE510EH
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
<p>The course will enable the learners to:</p> <ol style="list-style-type: none"> <li>1. To introduce fundamental concepts and principles of marketing relevant to engineering fields.</li> <li>2. To help students understand market needs and consumer behavior in technical markets.</li> <li>3. To develop skills in product development, pricing strategies, and promotion techniques for engineering solutions.</li> <li>4. To explore the role of marketing in innovation, technology, and B2B (business-to-business) sectors.</li> <li>5. To enable engineers to communicate the value of technical products to diverse stakeholders.</li> </ol>	<p>At the end of the course the learners will be able to:</p> <ol style="list-style-type: none"> <li>1. Define and explain core marketing concepts such as segmentation, targeting, and positioning.</li> <li>2. Analyze consumer and industrial buyer behavior using data and market research.</li> <li>3. Design basic marketing plans including product, price, place, and promotion strategies for technical products.</li> <li>4. Apply marketing principles to launch and promote innovations or engineering solutions.</li> <li>5. Communicate complex technical features in a customer-centric, value-driven language.</li> </ol>

**UNIT-I**

**Introduction:** Concept and importance of Marketing - Market Vs Marketing – Interface with Finance and Production - Marketing Mix – Marketing Environment – Internal and External

**UNIT-II**

**Market Segmentation and Positioning:** Concept - Levels and Bases for Segmentation - Segmenting Consumer Markets and Business Markets - Evaluation of Market Segments - Selecting Market Segments - Product Positioning, Positioning Strategies

### UNIT-III

**Buyer Behaviour:** Introduction to buyer behaviour - Contemporary dimensions of buyer behaviour - Motivation and buyer behavior, Consumer decision making and buyer attitude: Information search, evaluation of alternatives. Steps between evaluation of alternatives and purchase decision, Post-purchase behaviour.

### UNIT-IV

**Advertisement and Promotion:** Promotion Decision - Promotion mix - Advertising Decision, Advertising objectives - Advertising and Sales Promotion – Developing Advertising Programme – Role of Media in Advertising - Advertisement effectiveness

### UNIT-V

**Digital Marketing:** Importance of digital marketing - Difference between traditional marketing and digital marketing - Trends and scenario of the industry. Importance of Search Engine Optimization (SEO), Digital Campaign (creation, Site targeting, Keyword targeting, Demographic targeting/ bidding) - Blogging, Social networking, Video creation & Sharing, Use of different social media platforms, Web analytics.

### Learning resources:

1. Marketing Management – A South Asian Perspective, 13<sup>th</sup> Edition, by Philip Kotler ISBN 978-0-12-600998-6
2. Fundamentals of Digital Marketing, Puneet Bhatia, Pearson Ed , ISBN – 978-9352861415

### 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****INTRODUCTION TO PHILOSOPHY**

(Open Elective-III)

**SYLLABUS FOR B.E V Semester**

L:T: P (Hrs./week): 3: 0 : 0	SEE Marks: 60	Course Code : U23OE530EH
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

<b>Course objectives</b>	<b>Course Outcomes</b>
<p>The objectives of this course are to:</p> <ol style="list-style-type: none"> <li>1. To introduce students to the major branches, questions, and methods of philosophy.</li> <li>2. To develop critical and logical thinking through philosophical analysis.</li> <li>3. To explore key philosophical texts and thinkers from various traditions.</li> <li>4. To encourage reflection on ethical, metaphysical, and epistemological issues.</li> <li>5. To cultivate the ability to construct and evaluate arguments</li> </ol>	<p>On completion of the course the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Define and explain foundational philosophical concepts and theories.</li> <li>2. Analyze and critique philosophical arguments using logical reasoning.</li> <li>3. Compare perspectives from different philosophical traditions and historical periods.</li> <li>4. Apply philosophical thinking to contemporary ethical and social issues.</li> <li>5. Formulate clear, coherent arguments in both oral and written form.</li> </ol>

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															
Avg.															

**UNIT-I: What Is Philosophy?**

Definition and scope of philosophy

Branches of philosophy: metaphysics, epistemology, ethics, logic, aesthetics

Philosophical methods and the role of reasoning

## **UNIT-II: Knowledge and Reality (Epistemology and Metaphysics)**

What can we know? (Skepticism, rationalism, empiricism)

Appearance vs. reality

The mind-body problem

## **UNIT-III: Ethics and Moral Philosophy**

What is the good life?

Major ethical theories: utilitarianism, deontology, virtue ethics

Moral dilemmas and applied ethics

## **UNITIV: Political and Social Philosophy**

The state and justice

Liberty, rights, and social contract theory

Civil disobedience and authority

## **UNIT-V: Logic and Critical Thinking**

Arguments, premises, and conclusions

Fallacies and sound reasoning

Introduction to symbolic logic

### **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:				<b>90 Minutes</b>

**VASAVI COLLEGE OF ENGINEERING (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 : U23OE540EH
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

<b>Course objectives</b>	<b>Course Outcomes</b>
The objectives of this course are to: 1. Take entrepreneurship as a career choice 2. Understand the method of preparing a business model 3. Develop costing and pricing strategy 4. Understand team building and its importance.	On completion of the course the student will be able to: 1. Explain the role of entrepreneurship and assess its potential as a career path. 2. Develop and validate a business model using structured tools. 3. Apply basic costing and pricing strategies for a startup. 4. Demonstrate effective team building and leadership in startups.

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	1			
CO2		2							2	2	1					
CO3											3					
CO4			2					1		2	1	1			1	
Avg.		2	2					1	2.5	2	2	1.5	1	0	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 Propositions, 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-Learn Feedback Loop, Product-market fit test.

## UNIT-III

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

## UNIT-IV

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

## UNIT-V

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

### Learning Resources:

1. Robert D. Hisrich, Michael P Peters, "Entrepreneurship", Sixth edition, McGraw-Hill Education.
2. Thomas W. Zimmerer, Norman M. Scarborough, "Essentials of Entrepreneurship and small business Management", Fourth edition, Pearson, New Delhi, 2006.
3. Alfred E. Osborne, "Entrepreneurs Toolkit", Harvard Business Essentials, HBS Press, USA, 2005
4. MadhurimaLall and ShikhaSahai, "Entrepreneurship", Excel Books, First Edition, New Delhi,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: <b>90 Minutes</b>				

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES****SKILL DEVELOPMENT COURSE-V (Communication Skills in English-II)  
SYLLABUS FOR B.E. V-SEMESTER**

Instruction : 1 Hours	SEE Marks : 40	Course Code : U23HS510EH
Credits : 1	CIE Marks : 30	Duration of SEE : 2 Hours

<b>Course objectives</b>	<b>Course Outcomes</b>
<p>The objectives of this course are to:</p> <ol style="list-style-type: none"> <li>1. Get students proficient in both receptive and productive skills</li> <li>2. Enable students to build strategies for effective group interaction and help them in developing decisive awareness and personality while maintaining emotional balance.</li> <li>3. To introduce students to an ideal structure for a presentation</li> <li>4. To develop and improve writing and study skills needed for college work</li> </ol>	<p>On completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> <li>1. Participate in group and forum discussions by providing factual information, possible solutions, and examples</li> <li>2. Present a topic by picking up the key points from the arguments placed.</li> <li>3. Read between the lines and write informed opinions.</li> <li>4. Prepare, present, and analyze reports</li> </ol>

**UNIT-I: Delightful Discussions**

Equips participants with group discussion strategies using Six Thinking Hats, point generation, and summarization techniques, along with case study-based discussions to enhance analytical thinking.

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

**UNIT-II: Powerful Presentations**

Develops the ability to deliver clear, persuasive, and structured presentations using the Toulmin model, with practical exposure to JAM (Just A Minute) and extempore speaking exercises.

- 2.1 Concise Cogent Presentation
- 2.2 Persuasion skills
- 2.3 Toulmin Model
- 2.4 Biker B - JAM and Extempore

### **UNIT-III: Fact, Observation and Inference**

Builds critical reading and thinking skills to differentiate facts from opinions, make accurate inferences, identify main ideas, and draw logical conclusions from various texts.

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

### **UNIT-IV: Effective Technical Writing**

Trains learners in crafting technical reports, descriptive image-based writing, and composing insightful book and movie reviews with clarity and coherence.

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

### **Learning Resources:**

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

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

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	20
2	No. of Assignments:	02	Max. Marks for each Assignment:	05
3	No. of Quizzes:	02	Max. Marks for each Quiz Test:	05
	Duration of Internal Test: 90 Minutes			



**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF MECHANICAL ENGINEERING****SKILL DEVELOPMENT COURSE-VI (Technical Skills-II)  
(Mathematical Programming for Mechanical Engineers)**

SYLLABUS FOR B.E. V-SEMESTER

Instruction : 1 Hours	SEE Marks : 40	Course Code : U23PE510ME
Credits : 1	CIE Marks : 30	Duration of SEE : 2 Hours

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

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

**UNIT-I**

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

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

Assignment operators, rules about variables.

## UNIT-II

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

## UNIT-III

Function files, crating, saving and running a function file.

2D plots, Plots with special graphics, Multiple plots, examples.

3D plots, line plots, mesh and surface plots, plots with special graphics, view command, Examples.

## UNIT-IV

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

Learning Resources:

1. Agam Kumar Tyagi, "MATLAB and Simulink for Engineers", Oxford Higher Education, 2010
2. 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: U23PC531ME
Credits : 01	CIE Marks: 30	Duration of SEE: 03 Hours

<b>COURSE OBJECTIVE</b> <i>The objective of this course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
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: 2 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: U23PC551ME
Credits : 01	CIE Marks: 30	Duration of SEE: 03Hours

<b>COURSE OBJECTIVE</b> <i>The objective of this course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
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: 2 Hours			

**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: U23PC561ME
Credits :01	CIE Marks: 30	Duration of SEE: 03 Hours

<b>COURSE OBJECTIVES</b> <i>The objective of this course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
enable the student to take up investigative study in the field of mechanical engineering using programming.	<ol style="list-style-type: none"> <li>1 Use Python Numpy and Pandas library to solve mechanical engineering problems, such as structural, kinematic and dynamic analysis, thermal systems, and fluid flow.</li> <li>2 solve differential equations and system simulations such as vibrations and dynamic problems using Numpy and Pandas libraries.</li> <li>3 create various types of plots, such as line graphs, scatter plots, histograms, and contour plots, to visualize and interpret data from experiments or simulations using matplotlib library.</li> </ol>

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. Introduction to Pandas library for mechanical engineers.
4. Program to draw the projectile motion find the projectile angle for maximum range and maximum height.
5. Program to find shear force and bending moment for the given load conditions on beam.
6. Program to find temperature distribution along a plane slab and to estimate heat transfer rate.
7. Program to find temperature distribution for a given object and to estimate heat transfer rate

8. Program to find temperature distribution along a composite system and to estimate heat transfer rate
9. Program to draw the Von Misses failure theory plots for a given material.
10. Program to find position, velocity, and acceleration for a slider crank mechanism and to draw the plots.
11. Program to plot and visualise stream lines of the fluid flow.
12. Program to analyse the Diesel cycle.
13. Program to analyse the flow over a cylinder and to plot stream lines and pressure contours.
14. Program to analyse the single degree freedom of system with scipy.
15. Program to plot the frequency response of the spring mass system.
16. Program to plot the frequency response of the multi degree freedom spring mass system.
17. Program to analyse the quarter car suspension model.
18. 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: 2 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: U23PW519ME
Credits :01	CIE Marks: 30	Duration of SEE: 03 Hours

<b>COURSE OBJECTIVES</b> <i>The objective of this course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
enable the student to take up investigative study in the field of mechanical engineering.	<ol style="list-style-type: none"> <li>1 choose appropriate field of interest and define the problem.</li> <li>2 Plan the activities for carrying out the work in teams to solve the problem.</li> <li>3 develop the capability to conduct investigations on the chosen problem and obtain results.</li> </ol>

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:	12
Marks for assessment of Mini Project using Rubrics			18

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)**  
**SCHEME OF INSTRUCTION AND EXAMINATION (R-23)**  
**B.E. – MECH : SIXTH SEMESTER (2025-2026)**

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								
U23PC610ME	Metrology and Instrumentation	3	-	-	3	60	40	3
U23PC620ME	Dynamics of Machines	3	-	-	3	60	40	3
U23PC630ME	Machine Design	3	-	-	3	60	40	3
U23PC640ME	Metal Cutting and Machine Tools	3	-	-	3	60	40	3
U23PC650ME	Refrigeration and Air Conditioning	3	-	-	3	60	40	3
U23OE6XXXX	Open Elective-IV	3	-	-	3	60	40	3
U23HS630EH	Skill Development Course-VII (Verbal Ability)	1	-	-	2	40	30	1
U23PE610ME	Skill Development Course-VIII (Technical Skills-III)	1	-	-	2	40	30	1
U23HS640EH	Design Thinking	1	-	-	2	40	30	1
PRACTICALS								
U23PC621ME	Theory of Machines Lab	-	-	2	3	50	30	1
U22PC641ME	Machine Tools and Metrology Lab	-	-	2	3	50	30	1
U23PW619ME	Theme Based Project	-	-	2	-	50	30	1
U23PEXXXME	NPTEL Course Certification	-	-	-	-	-	-	2
TOTAL		21	-	6		630	420	26
GRAND TOTAL		27				1050		26
1) Students are required to complete one NPTEL certification course of 8 weeks or 12 weeks duration (equivalent to 2 credits) related to Mechanical Engineering or its allied fields by the end of the VI semester as part of their academic curriculum.								
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: U23PC610ME
Credits : 3	CIE Marks: 40	Duration of SEE: 3 Hours

<b>COURSE OBJECTIVES</b> <i>The objective of this course is</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
measurement of various mechanical features using metrology principles, instrumentation systems with sensors and transducers which measure Temperature, Force, Torque, Strain, displacement & acceleration.	<ol style="list-style-type: none"> <li>1. identify the Principles of measurement, study of Various types of Limit s, Fits &amp; tolerances and demonstrate the working Principle of Limit gauges. and other devices used in measurement by following the principles of metrology.</li> <li>2. measuring component features considering physical and mathematical aspects on the basis of their application and limitations.</li> <li>3. learn &amp; Analyse instrumentation Principles by classifying various Sensors and transducers based on the study of their static &amp; dynamic characteristics aspect of their sensitivity, working range and applications.</li> <li>4. study of strain gauges, Load cells and dynamometers for the measurement of strain, Force &amp; Torque by estimating their performance during working conditions.</li> <li>5. identify the seismic transducers for the measurement of displacement, acceleration, &amp; study of various pressure measuring Instruments and temperature and choose a specific transducer based on working and ambient conditions.</li> </ol>

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**

### **Geometric Features:**

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

**Surface Roughness Measurements** – Numerical assessments, parameters as per ISO indices. Profilometer, Taylor Hobson Talysurf.

Gear measurement –Gear tooth thickness using chordal tooth thickness method.

Quality control and inspection using machine learning classification algorithms.

## **UNIT-III: Elements of Instrumentation System**

Concept of measurement and measurand, sensors and transducers. Static and dynamic characteristics. Types of errors. Calibration Procedures. Numericals on static characteristics of instrument.

Temperature measurement by thermocouples. Laws of thermo-electricity. Types of materials used in thermocouples. Series and parallel circuits.

## **UNIT-IV**

### **Strain and Load Measurement**

Displacement transducer-LVDT. Strain measurement – wire and foil type resistance strain gauges. Rosette Gauges. Numericals on gauge factor of strain gauge. Strain gauge load cells, measurement of axial load and torsion by strain gauges. Piezo-electric load cell.

## **UNIT – V**

### **Seismic and Pressure Measuring Instruments:**

Introduction to Seismic Transducers – displacement and acceleration measurement, Pressure measurement – Bourdon pressure gauge, Bulk modulus gauge, Pirani gauge.

**Learning Resources:**

1. Doebelin, "Measurement Systems application and design", 5<sup>th</sup> Edition, Tata McGraw Hill, 2004.
2. Thomas G Beckwith, Roy D Marangoni, John H Lienhard V, "Mechanical Measurements", 6<sup>th</sup> Edition, Pearson Education Asia, 2007.
3. B.C. Nakra, K.K. Chaudhry, "Instrumentation Measurement and Analysis", 3<sup>rd</sup> Edition, McGraw Hill, 2014.
4. R.K. Jain, "Engineering Metrology", Khanna Publications, 1996.
5. I.C. Gupta "A Text Book of Engineering Metrology", 7<sup>th</sup> 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): 3:0:0	SEE Marks: 60	Course Code: U23PC620ME
Credits : 03	CIE Marks: 40	Duration of SEE: 03 Hours

<b>COURSE OBJECTIVES</b> <i>The objective of this course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
understand the operational characteristics in mechanisms, gyroscopes, governors, fly wheels, clutches and brakes and formulate the governing equations for vibrations of single degree freedom.	<ol style="list-style-type: none"> <li>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.</li> <li>2 balancing of reciprocating and rotating machinery by addition or removal of masses by eliminating/reducing inertia forces.</li> <li>3 calculate frictional torque and power due to friction in bearings, brakes and dynamo meters.</li> <li>4 estimate the operational characteristics in Governors, understand the Flywheel sizes required for I.C engines and Presses.</li> <li>5 Estimate the vibration characteristics of single degree of freedom free, damped and forced vibration systems.</li> </ol>

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. Dynamic analysis of slider crank mechanism by considering inertia of piston by Analytical method.

**Gyroscope:** Gyroscopic couple, gyroscopic effects in aeroplane, ship and automobile vehicle.

## UNIT-II

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

Applications of AI in balancing of rotors.

## UNIT-III

**Friction:**

**Thrust bearings**-pivots and collars.

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

## UNIT-IV

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

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

## UNIT-V:

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

### Learning Resources:

1. R.L.Norton, "Kinematics and Dynamics of Machinery" Tata McGraw Education Pvt. Ltd., New Delhi 2009.
2. Thomas Bevan, "The Theory of Machines", CBS Publishers & Distributors, 2004.
3. S.S.Rattan, "Theory of Machines", Tata McGraw Education Pvt. Ltd., New Delhi 2010.
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: U23PC630ME
Credits : 03	CIE Marks:40	Duration of SEE: 03Hours

<b>COURSE OBJECTIVE</b> The objective of this course is to	<b>COURSE OUTCOMES</b> On completion of the course, students will be able to
study the design of curved beams, springs, gears, bearings and I.C. engine parts.	<ol style="list-style-type: none"> <li>1 design curved beam for machine frames, C - clamps and crane hook under pure bending condition.</li> <li>2 design helical and leaf springs under direct and eccentric loading for various applications.</li> <li>3 design gears under strength and wear conditions for power transmission.</li> <li>4 design sliding contact bearings for supporting shafts/axles under radial and thrust loads.</li> <li>5 design rolling contact bearings for supporting shafts /axles under static and dynamic loads.</li> </ol> <p>design piston, connecting rod and crank shaft for I.C. Engine under strength and thermal loading conditions.</p>

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

**UNIT-I: CURVED BEAMS**

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

**UNIT-II: MECHANICAL SPRINGS**

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

### UNIT-III: GEARS

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

### UNIT-IV

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

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

Applications of AI in identifying the bearing failures.

### 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", 4<sup>th</sup> Edition, McGraw–Hill Publications, 2017.
2. M.F. Spotts, "Design of Machine Elements", 7<sup>th</sup> Edition, Pearson Education, 2003.
3. P.C. Sharma & D.K. Aggarwal, "Machine Design", 10<sup>th</sup> Edition, S.K. Kataria & Sons, 2003.
4. J.E. Shigley, C.R. Mischke, R.G. Budynas "Mechanical Engineering Design", 6<sup>th</sup> 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: U23PC640ME
Credits : 03	CIE Marks: 40	Duration of SEE: 03 Hours

<b>COURSE OBJECTIVE</b> <i>The objective of this course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
study the kinematic structure and constructional features of machine tools, surface finishing, tool design characteristics, metal cutting characteristics and tool characteristics.	<ol style="list-style-type: none"> <li>1 classify different types of machine tools used in Industry, their constructional features and operations.</li> <li>2 identify and use flat surface generating machines and able to perform gear cutting operations.</li> <li>3 understand the importance of surface finishing methods and work holding devices.</li> <li>4 compute forces in machining operations, tool material and principles of non conventional machining methods.</li> <li>5 interpret functioning of coolants in metal cutting, tool geometry, thermal effect on tool wear, tool life and economics.</li> </ol>

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, types and parts of lathes, capstan and turret lathes, various operations with applications, machining time calculations, tool and work holding devices.

**Drilling:** Types, operations and machining time calculations.

**UNIT-II**

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

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

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

### UNIT-III

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

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

### UNIT – IV

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

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

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

### UNIT-V

**Tool geometry:** Nomenclature of single point cutting tool by ASA and ORS systems and conversions

**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 and numericals.

### 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: U23PC650ME
Credits : 03	CIE Marks: 40	Duration of SEE:03Hours

<b>COURSE OBJECTIVE</b> <i>The objective of the course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
<p>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.</p>	<ol style="list-style-type: none"> <li>1. classify the refrigerants and analyze the performance of air refrigeration.</li> <li>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.</li> <li>3. explain the working principles of VAR and SJR systems, compare VAR and VCR systems and explain working principles of various refrigeration systems.</li> <li>4. define different properties of psychrometry.</li> <li>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</li> </ol>

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: mixing processes; Types and working of psychrometers, 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.

Applications of AI in Refrigeration and Air conditioning systems – predictive maintenance, energy optimization and smart thermostats.

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

### **Learning Resources:**

1. Stoecker W.F. and A.L. Jones "Refrigeration & Air Conditioning", 2<sup>nd</sup> Edition, Tata McGraw-Hill, New Delhi, 1985.
2. Roy J. Dossat., "Principles of Refrigeration-SI Version", 4<sup>th</sup> Edition, Wiley Eastern Limited, New Delhi, 2016.
3. Arora C.P., "Refrigeration and Air Conditioning", 3<sup>rd</sup> Edition, Tata McGraw-Hill, New Delhi, 2010.

4. Arora S.C. and Domkundwar S, "A course in refrigeration and air conditioning," 8<sup>th</sup> Edition, Dhanpat Rai & Co, 2010.
5. Manohar Prasad., "Refrigeration and Air conditioning", 3<sup>rd</sup> 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>B.E. VI SEM OPEN ELECTIVE-IV COURSES</b>			
<b>Dept.</b>	<b>Course Name</b>	<b>Code No.</b>	<b>Credits</b>
MECH.	Industry 4.0 (Stream: Robotics)	U23OE610ME	3
	Additive Manufacturing and its Applications (General Pool)	U23OE620ME	3
Civil	Project Management	U23OE610CE	3
CSE	Fundamentals of Machine Learning (Stream- Artificial Intelligence & Machine Learning)	U23OE620CS	3
	Fundamentals of Database Management Systems (General Pool)	U23OE610CS	3
EEE	Introduction to Batteries and Battery management System (General Pool)	U23OE610EE	3
ECE	Automatic Train Protection System – Kavach (General Pool)	U23OE630PH	3
IT	Introduction to Machine Learning (Stream- Artificial Intelligence & Machine Learning)	U23OE620IT	3
	Web Application Development and Security (General Pool)	U23OE610IT	3
Physics	Introduction to Nanotechnology (General Pool)	U23OE610PH	3
HSS	Business Intelligence (Stream: Banking Finance, Securities and Investments)	U23OE620EH	3
	Strategic Management for Engineering (General Pool)	U23OE610EH	3
	Introduction to Psychology (General Pool)	U23OE630EH	3
	Advanced course in Entrepreneurship (General Pool)	U23OE640EH	3



**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF MECHANICAL ENGINEERING****INDUSTRY 4.0**

(Stream: Robotics) (Open Elective-IV)

SYLLABUS FOR B.E VI Semester

L:T: P (Hrs./week): 3: 0 : 0	SEE Marks: 60	Course Code : U23OE610ME
Credits: 03	CIE Marks: 40	Duration of SEE : 03 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
The objectives of the course is to	On completion of the course, students will be able to
provide an overview of Industry 4.0 and its impact on modern manufacturing and develop skills for implementing industry 4.0 technologies in production processes.	<ol style="list-style-type: none"> <li>1. analyse the basic principles and technologies for smart factories and identify their applications in modern manufacturing.</li> <li>2. evaluate the concepts of Cyber-Physical Systems (CPS) and Cyber-Physical Production Systems (CPPS) and their role in creating new business models.</li> <li>3. apply the concepts of Digital Twins and Assistance Systems in production processes and their benefits.</li> <li>4. develop strategies for ensuring safety and security in networked production environments and analyse the challenges and opportunities of Human-Robot Collaboration (HRC).</li> <li>5. analyse the benefits and challenges of Cloud Manufacturing and the Connected Factory and develop strategies for implementing smart work pieces.</li> </ol>

**UNIT-I****Introduction**

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 work piece**

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:	5
3	No. of Quizzes:	03	Max. Marks for each Quiz Test:	5
Duration of Internal Test: 90 Minutes				

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF MECHANICAL ENGINEERING****ADDITIVE MANUFACTURING AND ITS APPLICATIONS**

(General Pool)

(Open Elective-IV)

SYLLABUS FOR B.E VI Semester

L:T: P (Hrs./week): 3: 0 : 0	SEE Marks: 60	Course Code : U23OE620ME
Credits: 03	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: <ol style="list-style-type: none"> <li>1. Understand the fundamentals of prototyping and the various data formats used in Additive Manufacturing.</li> <li>2. Study the principle, process, advantages, limitations and case studies of liquid based AM systems.</li> <li>3. Study the principle, process, advantages, limitations and case studies of solid based AM systems.</li> <li>4. Study the principle, process, advantages, limitations and case studies of powder based AM systems.</li> <li>5. Study the applications of AM in various engineering industries as well as the medical field.</li> </ol>

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, Hyderabad-500031

**DEPARTMENT OF CIVIL ENGINEERING****PROJECT MANAGEMENT**

(General Pool)

(Open Elective-IV)

**SYLLABUS FOR B.E.VI-SEMESTER**

L:T: P (Hrs/Week): 3:0:0	SEE Marks: 60	Course Code: U23OE610CE
Credits: 03	CIE Marks: 40	Duration of SEE : 03 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
Objectives of this course are to:	Upon the completion of this course the students will be expected to:
<ol style="list-style-type: none"> <li>1. Learn the concept of project management along with function and objectives.</li> <li>2. Understand the various techniques used for project planning such as bar charts, CPM, PERT and crashing of networks.</li> <li>3. Acquire knowledge on various types of contracts, tenders.</li> </ol>	<ol style="list-style-type: none"> <li>1. understand the objectives, functions and principles of management in projects.</li> <li>2. practice the network techniques like CPM and PERT for better planning and scheduling of engineering works.</li> <li>3. analyse the importance of cost and time in network analysis and planning the work accordingly.</li> <li>4. Knowledge on Contracts, Tenders, and Work orders related to the projects.</li> <li>5. Interpret the concept of Linear Programming and solve problems by Graphical and Simplex methods.</li> </ol>

**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.

**Tender:** Tender form, Tender Documents, Tender Notice, Work Order

### **UNIT-V**

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

#### **Learning Resources:**

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

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

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

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

**FUNDAMENTALS OF MACHINE LEARNING**  
 (Stream- Artificial Intelligence & Machine Learning)  
 (OPEN ELECTIVE-IV)  
 SYLLABUS FOR B.E. VI-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code :U23OE620CS
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

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

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

**UNIT-I:**

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

**UNIT-II:**

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



**UNIT-III:**

**Basics of Feature Engineering: Introduction**, feature transformation: feature Construction.

**UNIT IV:**

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

**UNIT-V:**

**Unsupervised Learning – Introduction**, Unsupervised vs supervised learning, Application of Unsupervised Learning, types of Clustering techniques, Partitioning methods, k-medoids.

**Learning Resources:**

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, -Machine Learning, Pearson Education
2. Tom Mitchell, —Machine Learning, McGraw-Hill Science, First edition.
3. Christopher Bishop, —Pattern Recognition and Machine learning, Springer (2006).
4. Stephen Marsland, Machine Learning –an algorithmic perspective, CRC Press.
5. Daniela witten, Trevor Hastie Robert Tibshirani and Gareth James, —An introduction to statistical Learning with applications in R, Springer 2013
6. [https://onlinecourses.nptel.ac.in/noc18\\_cs26/preview](https://onlinecourses.nptel.ac.in/noc18_cs26/preview)
7. <https://www.coursera.org/learn/machine-learning>

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

1. No. of Internal Tests	:	<input type="text" value="2"/>	Max. Marks for each Internal Test	:	<input type="text" value="30"/>
2. No. of Assignments	:	<input type="text" value="3"/>	Max. Marks for each Assignment	:	<input type="text" value="5"/>
3. No. of Quizzes	:	<input type="text" value="3"/>	Max. Marks for each Quiz Test	:	<input type="text" value="5"/>

Duration of Internal Tests : 90 Minutes

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Computer Science & Engineering****FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS**

(OPEN ELECTIVE-IV)

(General Pool)

SYLLABUS FOR B.E. VI-SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks : 60	Course Code : U23OE610CS
Credits : 03	CIE Marks : 40	Duration of SEE : 03 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
	<i>On completion of the course, students will be able to</i>
1 Identify different issues involved in the design and implementation of a database system.	1 Identify the functional components of database management system. Create conceptual data model using Entity Relationship Diagram
2 Understand transaction processing.	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, 6<sup>th</sup> 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 | : <input type="text" value="2"/> | Max. Marks for each Internal Test | : <input type="text" value="30"/> |
| 2. No. of Assignments    | : <input type="text" value="3"/> | Max. Marks for each Assignment    | : <input type="text" value="5"/>  |
| 3. No. of Quizzes        | : <input type="text" value="3"/> | Max. Marks for each Quiz Test     | : <input type="text" value="5"/>  |
- Duration of Internal Tests : 90 Minutes

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**  
**IBRAHIMBAGH, HYDERABAD – 500 031**  
**Department of Electrical and Electronics Engineering**

**Introduction to Batteries and Battery Management System**

(General Pool)

(Open Elective-IV)

SYLLABUS FOR B.E. VI SEMESTER

L: T: P (Hrs/Week): 3:0:0	SEE Marks: 60	Course Code: U23OE610EE
Credits: 3	CIE Marks: 40	Duration of SEE: 03 Hours

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

**UNIT -I: Introduction to Battery Management System:**

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

**UNIT -II: Battery Management System Requirement:**

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

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

Battery state of charge estimation (SOC), voltage-based methods to estimate SOC, Model-based state estimation, Battery Health Estimation, Lithium-ionaging: Negative electrode, Lithium-ionaging: Positive electrode, Cell Balancing, Causes of imbalance, Circuits for balancing.

### **UNIT –IV: Modelling and Simulation:**

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

### **UNIT -V: Design of battery BMS:**

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

#### **Learning Resources:**

1. Plett, Gregory L. Battery management systems, Volume I : Battery modeling. Artech House, 2015.
2. Plett, Gregory L. Battery management systems, Volume II: Equivalent-circuit methods. Artech House, 2015.
3. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems - Design by Modelling "Philips Research Book Series 2002.
4. Davide Andrea, "Battery Management Systems for Large Lithium-ion Battery Packs" Artech House, 2010.

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

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

Duration of Internal Tests : 90 Minutes

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)**

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Electronics and Communication Engineering****AUTOMATIC TRAIN PROTECTION SYSTEM - KAVACH**

(General Pool)

(Open Elective-IV)

SYLLABUS FOR B.E. VI - SEMESTER

L:T:P (Hrs./week) : 2:0:1	SEE Marks : 60	Course Code: U23OE630PH
Credits : 03	CIE Marks : 40	Duration of SEE : 03 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
To Provide the knowledge of Kavach technology which is used for an anti-collision system for trains.	<p>On completion of the course, students will be able to</p> <ol style="list-style-type: none"> <li>1. Acquire knowledge about the Train Protection Systems in general and Kavach - Indian Railways Automatic Train Protection System in detail.</li> <li>2. Acquire knowledge about various elements, subsystems associated with Kavach, those on the ground - wayside, those on the train - onboard and related concepts.</li> <li>3. Design various plans &amp; diagrams required for implementation of Kavach for typical station layout.</li> <li>4. Simulate &amp; validate the system designs on the testbench.</li> </ol>

**CO-PO/PSO Mapping**

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

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

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

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

**Subsystem: Onboard Kavach:** Driver Machine Interlocking, Braking

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

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

## **UNIT – II: (6 Hours)**

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

## **UNIT – III: Design –Kavach: (8 Hours)**

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

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

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

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

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

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

## **Practicals at IRISSET Laboratory (12 Hours)**

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

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

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

Duration of Internal Tests: 90 Minutes

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)**

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF INFORMATION TECHNOLOGY****INTRODUCTION TO MACHINE LEARNING**

(Stream- Artificial Intelligence &amp; Machine Learning)

(OPEN ELECTIVE-IV)

SYLLABUS FOR B.E VI- SEMESTER

L:T:P (Hrs./week): 3:0:0	SEE Marks: 60	Course Code: U23OE620IT
Credits : 03	CIE Marks: 40	Duration of SEE : 03 Hrs

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
Introduce the fundamental concepts, techniques and modern tools in Artificial intelligence and Machine Learning field to effectively apply it to the real-world problems.	<ol style="list-style-type: none"> <li>1. Demonstrate knowledge of the Artificial intelligence and machine learning literature.</li> <li>2. Understand and apply latest Python libraries for Machine learning models.</li> <li>3. Apply an appropriate algorithm for a given problem.</li> <li>4. Apply machine learning techniques in the design of computer systems.</li> <li>5. Explain the relative strengths and weaknesses of different machine learning methods and approaches.</li> </ol>

**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 learning:** 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 – 500 031

**DEPARTMENT OF INFORMATION TECHNOLOGY****WEB APPLICATION DEVELOPMENT AND SECURITY**

(General Pool)

(OPEN ELECTIVE-IV)

SYLLABUS FOR B.E VI- SEMESTER

L:T:P(Hrs./week): 3:0:0	SEE Marks : 60	Course Code : U23OE610IT
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hrs

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
1. Acquire basic skills for designing static and dynamic Web Applications using HTML, CSS, Java Script, Bootstrap and XML.	1. Design a static web pages using HTML, CSS.
2. Acquire fundamental knowledge of Web Security concepts	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 Java Script**

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

**UNIT-III: Bootstrap**

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

**UNIT-IV: XML**

XML- The Syntax of XML, XML Document Structure, Document Type Definitions.

**Introduction to MVC** - Introduction to Model View Controller Architecture

## **UNIT-V: Web Security Fundamentals**

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

### **Learning Resources:**

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

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

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

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD-31

**DEPARTMENT OF PHYSICS****INTRODUCTION TO NANOTECHNOLOGY**

(General Pool)

(Open Elective-IV)

**SYLLABUS FOR B.E.VI-SEMESTER**

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U23OE610PH
Credits :03	CIE Marks:40	Duration of SEE: 03Hours

<b>Course Objectives</b>	<b>Course Outcomes</b>
The objectives of this course are to	On completion of the course the student will be able to
<ol style="list-style-type: none"> <li>1. Learn bulk, thin and nano structures</li> <li>2. Acquire knowledge on properties of nano materials</li> <li>3. Appreciate fabrication techniques of nano materials</li> <li>4. Learn nanomaterial characterization techniques.</li> <li>5. Appreciate application of nano materials</li> </ol>	<ol style="list-style-type: none"> <li>1. Distinguish bulk, thin and nano materials from the point of view of size effects</li> <li>2. List various properties of nano materials</li> <li>3. Narrate various nanomaterial preparation techniques</li> <li>4. Describe necessary characterization techniques of nano materials</li> <li>5. Write various applications of CNTS and nano structures.</li> </ol>

**UNIT-I: INTRODUCTION TO NANOSCIENCE**

Distinction between bulk, thin and nano materials-surface to volume ratio, change of electronic structure, density of states of thin and nano materials, quantum confinement-quantum size effect-Reduction of dimensionality, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional).

**UNIT-II: PROPERTIES OF NANO MATERIALS**

Material behavior at reduced dimensions, Electrical properties: conductivity, surface scattering, ballistic transport Magnetic properties: Soft magnetic Nano-crystalline alloy, Permanent magnetic Nano-crystalline materials, Giant Magnetic Resonance, chemical properties, optical properties and thermal properties.

**UNIT-III: NANOMATERIALS PREPARATION TECHNIQUES**

Bottom-up and Top-down approaches. Preparation techniques Bottom-up methods: Physical Vapor Deposition, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method, Self assembly, top-down methods: ball milling, Nano-lithography, Spark plasma sintering.

**UNIT-IV: NANO MATERIAL CHARACTERIZATION TECHNIQUES**

Characterization techniques: X-Ray Diffraction (XRD), working principles of Scanning Electron Microscopy (SEM), working of Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM).

**UNIT-V: CARBON NANO MATERIALS AND APPLICATIONS**

Graphene, Elementary ideas on Carbon nanotubes, CNTs, types of CNTs-single wall (SWCNT) and multiwall carbon nanotubes (MWCNT), properties and characteristics of SWCNTS and MWCNTS. Applications of nano materials in Cosmetic sector, Food, Agricultural, engineering, automotive Industry, environment, medical applications, Textiles, Paints, Energy, space Applications, nanosensors and nanocatalysts.

**Learning Resources:**

1. B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, Text Book of Nano Science and Nano Technology –University Press (India) 2013
2. K.K. Chattopadhyay and A.N. Benerjee, Introduction to Nanoscience and Nanotechnology , PHI, 2019.

**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****BUSINESS INTELLIGENCE**

(Stream: Banking Finance, Securities and Investments)

(Open Elective-IV)

**SYLLABUS FOR B.E VI Semester**

L:T: P (Hrs./week): 3: 0 : 0	SEE Marks: 60	Course Code : U23OE620EH
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
<p>The course will enable the learners to</p> <ol style="list-style-type: none"> <li>1. To introduce the concepts and architecture of Business Intelligence (BI) systems.</li> <li>2. To familiarize students with data warehousing, data mining, and analytics tools.</li> <li>3. To provide insights into BI implementation and its role in decision-making.</li> </ol>	<p>By the end of this course, students will be able to :-</p> <ol style="list-style-type: none"> <li>1. Define the architecture, evolution, and benefits of Business Intelligence.</li> <li>2. Explain data warehousing and mining techniques, and apply them in real-time data environments.</li> <li>3. Use Business Performance Measurement (BPM) tools and performance dashboards for managerial decision-making.</li> <li>4. Employ Business Analytics and data visualization techniques in business contexts.</li> <li>5. Discuss the challenges in BI implementation and emerging trends such as social BI and reality mining.</li> </ol>

**UNIT-I: Introduction to Business Intelligence (BI)**

Definition, History and Evolution, Styles of Business Intelligence, Benefits of Business Intelligence, Real-time Business Intelligence, Business Intelligence Value chain, Architecture of Business Intelligence.

**UNIT- II: Data ware housing and Data mining**

Date Warehousing (DWH): Definition, Characteristics, types,-Date warehousing frame world, Data Warehousing architecture, Alternative architectures, Data ware housing integration, Data ware housing- Development approaches, Real time data warehousing.

Data Mining: Definition, Characteristics, Benefits, Data mining functions, Data mining applications, Data mining techniques and tools. Text mining, Web mining.

### **UNIT -III: Business Performance Measurement (BPM)**

Definition, BPM v/s BI, Summary of BPM Process, Performance measurement, BPM methodologies, BPM architecture and applications, Performance dash boards.

### **UNIT-IV: Business Analytics and Data Visualization**

Business Analytics-Definitions, Tools and techniques of BA, Advanced business analytics Business Analytics and Web usage, Benefits and success factors of Business Analytics.

Data Visualization: Definition, New direction in Data Visualization, GIS, GIS v/s GPS

### **UNIT-V: Business Intelligence implementation and emerging trends**

Implementing Business Intelligence-Implementation Factors, Critical success factors of Business implementation, Managerial issues related to BI implementation, Business Intelligence and integration -Types, Need, and Levels of Business Intelligence integration.

Emerging trends in Business Intelligence implementation, Social networks and Business Intelligence, Collaborative decision making, Reality mining.

### **Learning Resources:**

1. Business Intelligence-A Managerial Approach, Turban, Sharada, Delen, King-Pearson -Second Edition-2014.
2. Decision Support and Business Intelligence Systems-Turban, Aarons on, Liang, Sharada- Pearson, and latest Edition.
3. Successful Business Intelligence, Cindi Howson, McGraw Hill Education- Indian Edition.
4. BusinessIntelligence-AhandsonapproachbyN.Rajeshwari,1stEdition,PHI
5. Ramesh Sharda, Turban E, Business Intelligence and analytics, 10<sup>th</sup> Edition, Pearson Books
6. Bernard Marr, "Data strategy" Kogan Page publishing
7. Anoop V K Kumar, "Business Intelligence demystified" 1<sup>st</sup> edition 2022, BPB 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 HUMANITIES & SOCIAL SCIENCES****STRATEGIC MANAGEMENT FOR ENGINEERS**

(General Pool)

(Open Elective-IV)

**SYLLABUS FOR B.E VI Semester**

L:T: P (Hrs./week): 3: 0 : 0	SEE Marks: 60	Course Code : U23OE610EH
Credits: 3	CIE Marks: 40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
<p>The course will enable the learners to:</p> <ol style="list-style-type: none"> <li>1. To introduce the fundamentals of strategic management and its relevance to engineering and technology.</li> <li>2. To develop analytical skills for assessing internal and external business environments.</li> <li>3. To explore strategic planning, implementation, and performance evaluation in engineering contexts.</li> <li>4. To understand the role of innovation, competition, and sustainability in strategic decisions.</li> <li>5. To prepare engineers to contribute to strategic decision-making in technical organizations.</li> </ol>	<p>At the end of the course the learners will be able to: -</p> <ol style="list-style-type: none"> <li>1. Explain key strategic management concepts and frameworks (e.g., SWOT, PESTEL, Porter's Five Forces).</li> <li>2. Analyze organizational strengths, weaknesses, opportunities, and threats in engineering-driven firms.</li> <li>3. Develop strategic plans aligned with technical, operational, and business objectives.</li> <li>4. Evaluate strategic alternatives in terms of risk, competitiveness, and long-term sustainability.</li> <li>5. Contribute effectively to strategic discussions in interdisciplinary engineering teams.</li> </ol>

**UNIT-I : Introduction to Strategic Management :**

Strategic Planning, Planning Process, Strategy definition, Establishing Corporate direction, Vision, Mission And Objectives – Strategic Intent – Strategic Management & Process, A Model of Strategy and Elements used in strategic positioning – Strategic choice and Strategic action.

**UNIT-II : Environmental Appraisal :**

Demographic, Social and Cultural environment, Technological environment, Economic Environment, Political environment- Industry analysis - S W O T Analysis, Porter's Five Forces Model - Value chain Analysis – Core Competencies.



### **UNIT-III : Strategy Formulation :**

Business Level Strategy, Strategy formulation, Situation Analysis, Growth Strategies, Offensive strategies, Defensive strategies, Generic Strategies, Industry Life Cycle Analysis -, Emerging Industries, Maturing Industry, Fragmented Industry, Strategy For Leaders, Challengers, Followers and Niches

### **UNIT-IV : Alternative Strategies :**

Strategy analysis and Choices, Strategy Alternatives - Creating Value through Intensive Growth strategies- Integration Strategies - Diversification Strategies, Mergers & Acquisitions – Strategic Alliances – Outsourcing Strategies,

### **UNIT-V : Strategy Implementation and Control :**

Forms of Organizational Structures –Evaluation of Organization Structures – Leadership Styles - Corporate Governance - Mechanism for Evaluation - Key Performance Indicators –Difference between Operational and Strategic Controls

### **Learning resources:**

1. Strategic Management – Text and Cases, VSP Rao, 2<sup>nd</sup> Edition, Excel Publishers
2. Business Policy and Strategic Management – Text and Cases, P Subba Rao, Himalaya Publishers.

### **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-31

**DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES****INTRODUCTION TO PSYCHOLOGY**

(General Pool)

(Open Elective-IV)

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week): 3:0:0	SEE Marks: 60	Course Code: U23OE630EH
Credits : 03	CIE Marks: 40	Duration of SEE: 03Hours

<b>Course Objectives</b> The objectives of this course are to	<b>Course Outcomes</b> On completion of the course the student will be able to
1. Introduce students to the foundational concepts, theories, and branches of psychology. 2. Develop an understanding of human behaviour and mental processes through scientific approaches. 3. Encourage critical thinking and analytical reasoning in the study of psychological phenomena. 4. Foster awareness of the biological, cognitive, and socio-cultural influences on behaviour. 5. Equip students with basic research skills and ethical considerations in psychological practice.	1. Explain core psychological theories and their relevance to everyday life. 2. Analyze behaviour using major psychological perspectives (e.g., behavioural, cognitive, humanistic, etc.). 3. Apply psychological principles to real-world situations such as learning, motivation, and social interaction. 4. Demonstrate basic skills in psychological research, including hypothesis formulation, data collection, and analysis. 5. Evaluate ethical issues and cultural factors that influence psychological practice and research.

**CO-PO Mapping**

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

**Course Description:**

This course provides an overview of psychology as a scientific discipline. Students will explore the biological, cognitive, social, and developmental foundations of human behaviour. No prior knowledge is required.

### **UNIT-I: Foundations of Psychology**

1. History of psychology (structuralism, functionalism, behaviourism, etc.)
2. Major perspectives (biological, cognitive, behavioural, humanistic, psychodynamic)
3. Research methods in psychology

### **UNIT-II: Biological Bases of Behaviour**

1. The nervous system and the brain
2. Neurotransmitters and hormones
3. Sleep and consciousness

### **UNIT-III: Development across the Lifespan**

1. Cognitive and emotional development (Piaget, Erikson)
2. Social development
3. Nature vs. nurture debate

### **UNIT-IV: Learning and Memory**

1. Classical and operant conditioning
2. Observational learning
3. Memory processes and types

### **UNIT-V: Social and Abnormal Psychology**

1. Attitudes, conformity, and group behaviour
2. Psychological disorders and diagnosis (DSM overview)
3. Basic treatment approaches (CBT, psychotherapy)

Learning Resources:

"Psychology" by Sandra K. Ciccarelli & J. Noland White

### **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-31

**DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES****ADVANCED COURSE IN ENTREPRENEURSHIP**

(General Pool) (Open Elective-IV)

SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: U23OE640EH
Credits :03	CIE Marks:40	Duration of SEE: 03Hours

<b>Course Objectives</b>	<b>Course Outcomes</b>
The objectives of this course are to	On completion of the course the student will be able to
1. Develop an A-team 2. Refine business models and expand customer segments. 3. Develop strategies to grow revenues and markets, understand Financial Planning 4. Leverage technologies and platforms for growth stage companies 5. Develop key metrics to track progress.	1. Build and manage a high-performing startup team. 2. Refine business models and identify new customer segments. 3. Formulate revenue growth strategies and apply financial planning principles. 4. Utilize digital tools and platforms to scale growth-stage ventures. 5. Define and track key performance metrics for business progress.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									2	1					
CO2			1								1				1
CO3											2			1	
CO4					2								1		
CO5											1				
Avg.			1		2				2	1	1.3		1	1	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. Clancy, Ann L. & Binkert, Jacqueline, "Pivoting- A coach's guide to igniting substantial change" Palgrave Macmillan US 2017
2. Porter, Michael, E., "Competitive Advantage: Creating and Sustaining Superior Performance", Free press, 1<sup>st</sup> edi.
3. Schwetje, Gerald & Vaseghi Sam, "The Business Plan", Springer-Verlag Berlin Heidelberg.
4. LeMay, Matt, "Product Management in Practice", O'Reilly Media Inc.
5. Smart, Geoff & Randy, Street., "Who: The A method of hiring", Ballantine books, 2008.
6. 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 OF HUMANITIES & SOCIAL SCIENCES**

**SKILL DEVELOPMENT COURSE-VII (VERBAL ABILITY)**  
**SYLLABUS FOR B.E. VI - SEMESTER**

L:T:P (Hrs./week) : 2:0:0	SEE Marks : 40	Course Code: U23HS630EH
Credits : 1	CIE Marks : 30	Duration of SEE : 2 Hours

<b>COURSE OBJECTIVES</b>	<b>COURSE OUTCOMES</b>
<p>The course will enable the learners to:</p> <ol style="list-style-type: none"> <li>1. Introduce students to higher order thinking and problem solving via vocabulary and its various components</li> <li>2. Train students to understand context &amp; theme and use it to complete sentences.</li> <li>3. Train students to identify the structure of sentences &amp; paragraphs</li> <li>4. Train students to analyze text, e.g., simple outlining and note taking, summarize, draw conclusions, and apply information to personal experiences</li> <li>5. Train students to improve the quality of sentences by fixing errors</li> </ol>	<p>At the end of the course the learners will be able to: -</p> <ol style="list-style-type: none"> <li>1. Use vocabulary as a tool to solve questions in verbal ability</li> <li>2. Identify meanings of words using theme and context</li> <li>3. Solve questions based on jumbles- sentences and paragraphs</li> <li>4. Develop skills to critically analyze texts and then the ability to identify its theme</li> <li>5. Improve the quality of their writing by being aware of the common errors</li> </ol>

### **UNIT-I: 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-II: 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-III: 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-IV: 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-V: 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](https://learn.talentsprint.com)

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

1. No. of Internal Tests	:	<input type="text" value="2"/>	Max. Marks for each Internal Test	:	<input type="text" value="20"/>
2. No. of Assignments	:	<input type="text" value="2"/>	Max. Marks for each Assignment	:	<input type="text" value="5"/>
3. No. of Quizzes	:	<input type="text" value="2"/>	Max. Marks for each Quiz Test	:	<input type="text" value="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: U23PE610ME
Credits :01	CIE Marks:30	Duration of SEE:02Hours

<b>COURSE OBJECTIVES</b> <i>The objective of this course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
Understand and implement coding using C/Python language.	<ol style="list-style-type: none"> <li>1. implement advanced problem solving approaches to solve computational problems.</li> <li>2. implement mathematical programming model solutions for coding problems.</li> <li>3. implement mathematical and logical understanding approaches to implement test driven development practices.</li> <li>4. write efficient coding solutions using appropriate algorithm.</li> <li>5. write codes for standard questions implementing C/Python language.</li> </ol>

**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 stack/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 HUMANITIES & SOCIAL SCIENCES****DESIGN THINKING**  
**SYLLABUS FOR B.E.VI-SEMESTER**

L:T:P(Hrs/week): 1:0:0	SEE Marks:40	Course Code: U23HS640EH
Credits : 01	CIE Marks:30	Duration of SEE: 02Hours

<b>COURSE OBJECTIVES</b> <b>The course will enable the learners to:</b>	<b>COURSE OUTCOMES</b> <b>At the end of the course the learners will be able to:</b>
<ol style="list-style-type: none"> <li>1. Understand the stages of design thinking and the role of empathy in design.</li> <li>2. Learn techniques to brainstorm and frame problem statements effectively.</li> <li>3. Develop prototyping and feedback techniques for iterative improvements.</li> <li>4. Apply design thinking to solve community challenges and real-world problems.</li> </ol>	<ol style="list-style-type: none"> <li>1. Students will articulate the stages of design thinking and create empathy maps for user-centered solutions.</li> <li>2. Students will use ideation tools and define clear, actionable problem statements.</li> <li>3. Students will create low-fidelity prototypes and refine solutions based on feedback.</li> <li>4. Students will demonstrate design thinking by creating innovative prototypes for specific challenges.</li> </ol>

**OVERVIEW:**

In a fast-changing world driven by innovation, AI, and user-centric solutions, Design Thinking equips engineering students with the mindset and tools to solve real-world problems creatively and collaboratively. This course introduces a structured, human-centered approach to innovation through empathy, ideation, prototyping, and iteration. Students will engage in hands-on activities that enhance creativity, adaptability, and practical problem-solving.

**UNIT-I: Introduction to Design Thinking**

Help build a strong foundation in user-centric innovation by understanding the design thinking process and developing empathy to uncover real user needs.

- 1.1 Stages of Design Thinking
- 1.2 Case Studies of Innovative Solutions
- 1.3 Empathy in Design

Learning Outcomes:

- Understand the five stages of the design thinking process
- Analyze real-world innovations using the design thinking lens
- Create empathy maps by observing and interpreting user needs

**UNIT-II: Ideation and Problem Definition**

Train to convert user insights into well-defined engineering problems and generate multiple solution ideas using structured creativity techniques.

- 2.1 Brainstorming Techniques
- 2.2 Framing the Right Problem Statement
- 2.3 Ideation Tools (Affinity Mapping)

Learning Outcomes:

- Generate multiple ideas using structured creativity techniques
- Frame user-centered problem statements from gathered insights
- Organize and cluster ideas using ideation tools

**UNIT-III: Prototyping and Feedback**

Develop practical skills to rapidly prototype engineering solutions and iteratively improve them based on user testing and feedback.

- 3.1 Creating Low-Fidelity Prototypes
- 3.2 Gathering and Implementing Feedback
- 3.3 Iterative Improvements

Learning Outcomes:

- Design simple prototypes that communicate core ideas
- Collect meaningful feedback through observation and interaction
- Refine prototypes through successive iterations for better user fit

**UNIT-IV: Real-World Applications**

Learn to apply the full design thinking process to real-life engineering, business, or social challenges, enhancing teamwork and innovation readiness.

- 4.1 Design Thinking in Business and Technology
- 4.2 Creating Solutions for Community Challenges
- 4.3 Group Project: Prototype a Solution

**Learning Outcomes:**

- Apply the complete design thinking cycle to real-world problems
- Collaborate in teams to design and test user-centered solutions
- Present working prototypes and justify design decisions with user insights

**Suggested Books**

1. Change by Design by Tim Brown (IDEO)
2. Creative Confidence by Tom Kelley & David Kelley
3. The Art of Innovation by Tom Kelley
4. The Design of Everyday Things by Don Norman

**LEARNING RESOURCES**

[learn.talentsprint.com](https://learn.talentsprint.com)

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

1. No. of Internal Tests	:	<input type="text" value="2"/>	Max. Marks for each Internal Test	:	<input type="text" value="20"/>
2. No. of Assignments	:	<input type="text" value="2"/>	Max. Marks for each Assignment	:	<input type="text" value="5"/>
3. No. of Quizzes	:	<input type="text" value="2"/>	Max. Marks for each Quiz Test	:	<input type="text" value="5"/>

Duration of Internal Tests: 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: U23PC621ME
Credits :01	CIE Marks:30	Duration of SEE: 03 Hours

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

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

**LIST OF EXPERIMENTS**

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

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

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

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

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



**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: U23PC641ME
Credits : 01	CIE Marks: 30	Duration of SEE: 03Hours

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

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

**List of Experiments**

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

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

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

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

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

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering****THEME BASED PROJECT****SYLLABUS FOR B.E.VI-SEMESTER**

L:T:P(Hrs/week):0:0:2	SEE Marks: 50	Course Code: U23PW619ME
Credits :01	CIE Marks:30	Duration of SEE: VIVA

<b>COURSE OBJECTIVES</b> <i>The objective of this course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
enable the student to take up investigative study in the field of mechanical engineering.	<ol style="list-style-type: none"> <li>1 Identify appropriate field of interest, review the literature and define the problem.</li> <li>2 Plan the activities for carrying out the research work in teams to solve the identified problem using different resources.</li> <li>3 to work in teams and adapt for the advanced technological changes.</li> <li>4 Conduct the investigations on the chosen problem and prepare the final report.</li> </ol>

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-23)**  
**B.E. (ME) Honours Degree Program in Robotics**  
**(2025-2027)**

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 2025-26								
U23PC560ME	Introduction to Robotics and Automation	3	-	-	3	60	40	3
U23PC570ME	Control Engineering	3	-	-	3	60	40	3
VI-Semester AY 2025-26								
U23PC660ME	Embedded C Programming	3	-	-	3	60	40	3
VII-Semester AY 2026-27								
U23PC760ME	Robotics and Control	3	-	-	3	60	40	3
U23PC770ME	Robotics Lab	-	-	2	3	50	30	1
U23PW729ME	Course Project	-	-	6	3	50	50	3
	TOTAL	12	0	8		340	240	16
	GRAND TOTAL	20				580		16
NPTEL Course (Robotics related): 12 weeks durations (V or VI -Semester)								3
Total Credits:								19

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering****INTRODUCTION TO ROBOTICS AND AUTOMATION****SYLLABUS FOR B.E. V-SEMESTER**

Instruction : 3 Hrs /week	SEE Marks : 60	Course Code : U23PC560ME
Credits : 3	CIE Marks: : 40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVE</b> The objective of the course is to	<b>COURSE OUTCOMES</b> On completion of the course, students will be able to
study industrial robot components, configuration, sensors, drives, applications and Understand and assess the principles and technologies of Industry 4.0.	<ol style="list-style-type: none"> <li>1 explain configuration of industrial robots and summarize various applications.</li> <li>2 interpret various elements of the industrial robots</li> <li>3 develop methodology to represent position and orientation of industrial robot links in spatial coordinate system</li> <li>4 Grasp Industry 4.0 concepts and its impact on modern manufacturing.</li> <li>5 Understand key technologies driving smart manufacturing.</li> </ol>

**UNIT-I****ROBOT BASICS**

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

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

**ROBOT APPLICATIONS**

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

**UNIT-II****ROBOT ELEMENTS**

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

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

**UNIT-III****ROBOT COORDINATE SYSTEMS**

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

## **UNIT- – IV**

### **Introduction to Industry 4.0**

Definition and Evolution of Industry 4.0

Introduction to Industry 4.0

Key concepts and principles

Comparison of Industry 4.0 Factory and Today's Factory

Advantages and challenges of transitioning to Industry 4.0

Cyber-Physical Systems and Big Data

Overview of cyber-physical systems (CPS) in Industry 4.0

Real-time monitoring and control of manufacturing processes

## **UNIT –V**

Basic Principles and Technologies of a Smart Factory

Internet of Things (IoT) and Industrial Internet of Things (IIoT)

Integration of IoT devices for data collection and analysis

Enhancing operational efficiency and predictive maintenance

Value Chains in Manufacturing Companies and Customization of Products

Digital Twins and Cloud Computing/Cloud Manufacturing

Benefits and challenges of adopting cloud-based manufacturing solutions

Security Issues within Industry 4.0 Networks

### **Learning Resources:**

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

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

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	10
3	No. of Quizzes:	0	Max. Marks for each Quiz Test:	--
Duration of Internal Test: 90 Minutes				

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering****CONTROL ENGINEERING****SYLLABUS FOR B.E. V-SEMESTER**

Instruction : 3 Hrs /week	SEE Marks : 60	Course Code : U23PC570ME
Credits : 3	CIE Marks: : 40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVE</b>	<b>COURSE OUTCOMES</b>
The objective of the course is to	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.	<ol style="list-style-type: none"> <li>1. develop Transfer functions for Mechanical systems using mathematical modelling and obtain the equivalent electrical analogous systems.</li> <li>2. simplify the systems given in pictorial representation and examine the steady state and transient behaviour.</li> <li>3. estimate the system behaviour using Routh criterion, Root locus and Bode diagrams.</li> <li>4. analyze the steady state and transient behaviour of various systems using different compensators with Root locus technique .</li> <li>5. model the system in state space domain and test for controllability and observability.</li> </ol>

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

**Case Study:** AI-Powered Temperature Control in Smart Homes



## **UNIT-II**

Block diagrams, Block diagram reduction. Signal flow graphs, Mason's gain formula. Types of inputs. Time domain specifications of 2<sup>nd</sup> order systems, Response of 2<sup>nd</sup> 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., 2<sup>nd</sup> Edition, 1999.
6. Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer Science & Business Media, 2008

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

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	10
3	No. of Quizzes:	0	Max. Marks for each Quiz Test:	--
Duration of Internal Test: 90 Minutes				

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering****EMBEDDED C PROGRAMMING****SYLLABUS FOR B.E. VI-SEMESTER**

Instruction : 3 Hrs /week	SEE Marks : 60	Course Code : U23PC660ME
Credits : 3	CIE Marks: : 40	Duration of SEE : 3 Hours

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

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

**UNIT – I**

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

## UNIT – II

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

## UNIT – III

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

## UNIT –IV

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

## UNIT – V

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

### Learning Resources:

1. Simon Monk, "Programming Arduino: Getting Started with Sketches", McGraw-Hill Education, Second Edition, 2016
2. Massimo Banzi, "Getting Started with Arduino: The Open Source", Shroff Publishers & Distributors Pvt Ltd, 2014
3. Michael J. Pont, "Embedded C", 2<sup>nd</sup> Edition, Pearson Education, 2008

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

1	No. of Internal Tests:	02	Max. Marks for each Internal Test:	30
2	No. of Assignments:	03	Max. Marks for each Assignment:	10
3	No. of Quizzes:	0	Max. Marks for each Quiz Test:	--
	Duration of Internal Test:	90 Minutes		

**VASAVI COLLEGE OF ENGINEERING (Autonomous)**

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering****ROBOTICS AND CONTROL**

SYLLABUS FOR B.E. VII-SEMESTER

Instruction : 3 Hrs /week	SEE Marks : 60	Course Code : U23PC760ME
Credits : 3	CIE Marks: : 40	Duration of SEE : 3 Hours

<b>COURSE OBJECTIVE</b>	<b>COURSE OUTCOMES</b>
The objective of the course is to	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	<ol style="list-style-type: none"> <li>1. Analyze the kinematics of robotic systems and apply them to solve real world problems</li> <li>2. Apply differential kinematics and statics concepts to design and control robotic systems</li> <li>3. Analyze the dynamics of serial manipulators using lagrangian and Newton-Euler mechanics</li> <li>4. Develop motion and force control strategies for robotic systems using feedback control techniques</li> <li>5. Generate and analyze robot trajectories for various applications</li> </ol>

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 manipulators.

**UNIT-II****Differential Kinematics and Statics**

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

## 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: PD control with gravity compensation

Force Control: Passive and active compliance impedance 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", 1<sup>st</sup> 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 : U23PC731ME
Credits : 1	CIE Marks: : 30	Duration of SEE : 2 Hours

<b>COURSE OBJECTIVE</b> The objective of the course is to	<b>COURSE OUTCOMES</b> 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 5 DOF anthropomorphic robotic arm in ADAMS.
2. Simulation of 5 DOF anthropomorphic robotic 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

**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: U23PW729ME
Credits : 3	CIE Marks: 50	Duration of SEE: 3 Hours

<b>COURSE OBJECTIVE</b> <i>The objective of the course is to</i>	<b>COURSE OUTCOMES</b> <i>On completion of the course, students will be able to</i>
Design and develop a prototype related to robotics engineering using relevant tools and techniques, write a report and give a presentation.	<ol style="list-style-type: none"> <li>1. define and design the robotics problem by literature study.</li> <li>2. analyze by conducting experiments and obtain relevant data.</li> <li>3. develop a prototype / working model using the data obtained.</li> <li>4. To work in teams and adapt for the advanced technological changes</li> <li>5. make logical conclusions to justify the results.</li> </ol>

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			