# 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-24)
## WITH EFFECT FROM 2026-27
## (For the students admitted in 2024-25)

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

## VISION OF THE INSTITUTE

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

## MISSION OF THE INSTITUTE

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

## VISION OF THE DEPARTMENT

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

## MISSION OF THE DEPARTMENT

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

| PROGRAM OUTCOMES (POs) | |
|---|---|
| 1 | Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| 2 | Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| 3 | Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| 4 | Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. |
| 5 | Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. |
| 6 | Analyse and evaluate societal and environmental aspects while solving complex engineering problems, considering their impact on sustainability with reference to economy, health, safety, legal frameworks, culture, and the environment. |
| 7 | Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| 8 | Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| 9 | Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. |
| 10 | Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |
| 11 | Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |

## PROGRAM 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-24)
## B.E. – MECH : FIFTH SEMESTER (2026-2027)

| 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** | | | | | | | | |
| U24PC510ME | Heat Transfer | 3 | - | - | 3 | 60 | 40 | 3 |
| U24PC520ME | Kinematics of Machines | 3 | - | - | 3 | 60 | 40 | 3 |
| U24PC530ME | Manufacturing Processes | 3 | - | - | 3 | 60 | 40 | 3 |
| U24PC540ME | Design of Machine Elements | 3 | - | - | 3 | 60 | 40 | 3 |
| U24PC550ME | CAD / CAM | 3 | - | - | 3 | 60 | 40 | 3 |
| U24OE5XXXX | Open Elective - III | 3 | - | - | 3 | 60 | 40 | 3 |
| U24HS510EH | Skill Development Course V : Communications Skills in English II | 1 | - | - | 2 | 40 | 30 | 1 |
| U24PE510ME | Skill Development Course-VI (Technical Skills-II) Mathematical Programming for Mechanical Engineers | 1 | - | - | 2 | 40 | 30 | 1 |
| U24HS530EH | Design Thinking | 1 | - | - | 2 | 40 | 30 | 1 |
| **PRACTICALS** | | | | | | | | |
| U24PC531ME | Manufacturing Processes Lab | - | - | 2 | 3 | 50 | 30 | 1 |
| U24PC551ME | CAD/CAM Lab | - | - | 2 | 3 | 50 | 30 | 1 |
| U24PC561ME | Programming for Mechanical Engineers Lab | - | - | 2 | 3 | 50 | 30 | 1 |
| U24PW519ME | Mini Project | - | - | 2 | 3 | 50 | 30 | 1 |
| | **TOTAL** | **21** | **-** | **8** | **-** | **680** | **450** | **25** |
| | **GRAND TOTAL** | **29** | | | | **1130** | | **25** |

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: U24PC510ME |
| Credits :03 | CIE Marks:40 | Duration of SEE:03Hours |

| **COURSE OBJECTIVE** *The objective of this course is to* | **COURSE OUTCOMES** *On completion of the course, students will be able to* |
|---|---|
| develop methodologies for solving a variety of engineering problems in conduction, convection and radiation heat transfer together with their applications. | 1 formulate heat conduction problems in rectangular, cylindrical and spherical coordinate systems by transforming the physical system into a mathematical model.<br>2 understand augmentation of heat transfer by the provision of fins and predict time-dependent heat transfer in solids for engineering applications.<br>3 interpret convective heat transfer coefficients in free and forced convection for internal and external flows.<br>4 design the heat exchangers using the LMTD and ε-NTU approaches for industrial applications and distinguish the mechanisms involved in boiling and condensation.<br>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 | 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 coordinates, Steady-state one-dimensional heat conduction through slabs, cylinders without and with internal heat generation; Composites labs 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 and cylinders.

**UNIT-III: CONVECTION**

Forced Convection: Velocity and thermal boundary layers over an isothermal flat plate; analytical and empirical correlations: flow over flat plates and cylinders, 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. 10th edition
2. Incropera, F.P. and De Witt D.P. "Fundamentals of Heat and Mass Transfer", John Wiley and sons, New York, 2008.
3. Sachdeva R.C., "Fundamentals of Engineering Heat and Mass Transfer", New Age International (P) Ltd Publishers, New Delhi, 2010.
4. Rajput R.K., "Heat and Mass Transfer", S. Chand & Company Ltd., New Delhi, 2004.
5. NecatiOzisik 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: U24PC520ME |
| Credits :03 | CIE Marks:40 | Duration of SEE: 03Hours |

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

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO mapping | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 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. Analytical method for kinematic analysis of slider crank mechanism.

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 toGear Trains.

**Learning Resources:**

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

**Web resources:**

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

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

## MANUFACTURING PROCESSES

SYLLABUS FOR B.E.V-SEMESTER

| | | |
|---|---|---|
| L:T:P(Hrs/week):3:0:0 | SEE Marks:60 | Course Code:U24PC530ME |
| Credits :03 | CIE Marks:40 | Duration of SEE:03Hours |

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

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

### UNIT-I: CASTING PROCESS

Casting terms, pattern materials, types of patterns, pattern allowances, 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, $CO_2$moulding, die casting, centrifugal casting, investment or lost wax process; Casting defects, causes and remedies.

**UNIT-III: WELDING PROCESSES**

Classification of welding processes

Gas welding and gas cutting, Arc welding- SMAW, SAW, GMAW, GTAW, PAW, 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, Wiredrawing, 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", 4thEdition, Assoc. East west Press Pvt. Ltd., 2011.
3. Roy A. Lindberg, "Materials & Process of Manufacturing", 5th Edition, Prentice Hall of India, l992.
4. SeropeKalpakjian, "Manufacturing Engineering and Technology", Addison, 7th Edition Wesley Publishing Company, 2006.
5. George.E. Dieter, "Mechanical Metallurgy", 4th Edition McGraw-Hill Book Company, 1988.

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

## DESIGN OF MACHINE ELEMENTS

SYLLABUS FOR B.E. V-SEMESTER

| | | |
|---|---|---|
| L:T:P(Hrs/week):3:0:0 | SEE Marks : 60 | Course Code: U24PC540ME |
| Credits : 3 | CIE Marks : 40 | Duration of SEE: 3 Hours |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| 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:<br>1. estimate the size of machine component based on theories of failure for component subjected to different types of loads.<br>2. estimate the size/life of machine components subjected to fluctuating (Fatigue) loads based on Goodman and Soderberg criteria/S-N diagram<br>3. determine the size of shafts & fasteners subjected to torsion, bending, axial load or a combination of these to prevent failure.<br>4. analyze the Joints and couplings for a given load to prevent failure.<br>5. design of Power screws, riveted joints and welded joints for a given load under direct and eccentric loads. |

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

### UNIT-I

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

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",* 10th Ed., S.K. Kataria& Sons, 2003.
4. J.E. Shigley& Charles R. Mischke "*Mechanical Engineering Design",* 6th Ed., Tata McGraw-Hill, 2010.
5. N.C. Pandya and C.S. Shah, *"Machine Design"* ,Charotar publishing House, 2006.

**Web Resources:**

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

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

## CAD/CAM

SYLLABUS FOR B.E.V-SEMESTER

| | | |
|---|---|---|
| L:T:P(Hrs/week):3:0:0 | SEE Marks:60 | Course Code: U24PC550ME |
| Credits :03 | CIE Marks:40 | Duration of SEE: 03Hours |

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

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

### UNIT-I

**Geometric modeling:** Wire frame modelling; 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.

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**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", 2nd Edition, Tata McGraw Hill, New Delhi, 2004.
5. YoramKoren, Computer Control of Manufacturing Systems, McGraw Hill Inc. New York, 1994.

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

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

Duration of Internal Test: 90 Minutes

| B.E- V SEM OPEN ELECTIVE-III COURSES | | | |
|---|---|---|---|
| **Dept.** | **Title** | **Code** | **Credits** |
| Mech | Drives and Control Systems for Robotics (Stream: Robotics) | U24OE510ME | 3 |
| Civil | Geo Spatial Information Technology (General Pool) | U24OE510CE | 3 |
| CSE | Fundamentals of Artificial Intelligence (Stream- Artificial Intelligence & Machine Learning) | U24OE520CS | 3 |
| | Introduction to Operating Systems (General Pool) | U24OE510CS | 3 |
| ECE | Introduction to Biomedical Electronics (General Pool) | U24OE510EC | 3 |
| Physics | Signal Engineering (General Pool) | U24OE530PH | 3 |
| IT | Introduction to Artificial Intelligence (Stream- Artificial Intelligence & Machine Learning) | U24OE520IT | 3 |
| | Introduction to Database Management Systems (General Pool) | U24OE510IT | 3 |
| HSS | Financial Analytics (Stream: Banking Finance, Securities and Investments) | U24OE520EH | 3 |
| | Marketing Management for Engineers (General Pool) | U24OE510EH | 3 |
| | Philosophy (General Pool) | U24OE530EH | 3 |
| | Basics of Entrepreneurship (General Pool) | U24OE540EH | 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 : U24OE510ME |
| Credits : 3 | CIE Marks : 40 | Duration of SEE : 3 Hours |

| Course objectives | Course Outcomes |
|---|---|
| The objectives of this course are to:<br>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:<br>1. Understand basic control system types and analyze block diagrams using transfer functions.<br>2. Interpret transient and steady-state responses and understand system stability concepts.<br>3. Represent control systems using state-space models and convert between state-space and transfer functions.<br>4. Understand control techniques to achieve precise and stable joint control in robotic systems.<br>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 | 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-Hurwicz criterion.

**UNIT-III**

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

**UNIT-IV**

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

**UNIT-V**

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

**Learning Resources:**

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

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEEING (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 : U24OE510CE |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| Objectives of this course are to | Upon the completion of the course, students are expected to |
| To provide fundamental knowledge on geo spatial technology such as Remote sensing GPS and GIS. | 1. 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.<br>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.<br>3. Describe the structure and operational principles of GPS and other GNSS systems, and recognize their practical applications .<br>4. Analyze sources of GPS errors, evaluate position accuracy using DOP/UERE, apply differential and carrier phase positioning methods.<br>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. |

**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, 2022
3. Leick, A., GPS Satellite Survey, John Wiley: NJ, 2015
4. Hofmann, B., Lichtenegger H. and Collins J., Global Positioning System: Theory and Practice, Springer: Berlin, 2011.
5. Basudeb Bhatta, Remote Sensing and GIS, Oxford University Press, 2011.
6. Hofmann-Wellenh of, Bernhard, Lichtenegger, Herbert, Wasle, Elmar, GNSS – GPS, GLONASS, Galileo and more, 2013

7. ThanappanSubash., Geographical Information System, Lambert Academic Publishing, 2011.
8. Paul Longley., Geographic Information systems and Science, John Wiley & Sons, 2015
9. John E. Harmon & Steven J. Anderson., The design and implementation of Geographic Information Systems, John Wiley & Sons, 2003
10. Kang Tsung Chang., Introduction to Geographic Information Systems, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2021.
11. Kang Tsung Chang., Introduction to Geographic Information Systems, Tata Mc Graw Hill Publishing Company Ltd, New Delhi, 2015.
12. B C.P.Lo & Albert K. W.Yeung, Concepts and Techniques of Geographic Information Systems, Prentice Hall India Pvt.Ltd, 2016.

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF 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 : U24OE520CS |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

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

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

**UNIT-I:**

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

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

**UNIT-II:**

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

**UNIT-III:**

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

**UNIT-IV:**

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

**UNIT-V:**

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

**Learning Resources:**

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

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

## DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

## INTRODUCTION TO OPERATING SYSTEMS

(General Pool)

(Open Elective-III)

**SYLLABUS FOR B.E V Semester**

| | | |
|---|---|---|
| L:T: P (Hrs./week):3: 0 : 0 | SEE Marks:60 | Course Code : U24OE510CS |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

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

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

**UNIT-I:**

**Introduction to operating systems:** Definition, User view and System view of the Operating system, Operating system structure, Operating system services.

**Process**: Process concept, Process Control block, Context switching.

**UNIT-II:**

**CPU Scheduling:** Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, Round Robin

**Device Management**: Disk Scheduling algorithms: FCFS, SSTF, SCAN.

**UNIT-III:**

**Memory Management**: Swapping, Contiguous memory allocation: Fixed Partitioning, Variable Partitioning. Non-Contiguous memory allocation: Paging.

**Virtual memory**: Demand paging, Page replacement Algorithms: FIFO, Optimal, LRU.

**UNIT –IV:**

**File System Interface**: File Concept, Access Methods: Sequential, Indexed, and Direct

**File System Implementation**: File-System Structure, Allocation Methods: Contiguous, Linked and Indexed.

**UNIT-V:**

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

**Learning Resources:**


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


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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

## DEPARTMENT OF ELECTRONICS & COMMUNICTION ENGINEERING

## INTRODUCTION TO BIOMEDICAL ELECTRONICS

(General Pool : Open Elective-III)

**SYLLABUS FOR B.E V Semester**

| | | |
|---|---|---|
| L:T: P (Hrs./week): 3 : 0 : 0 | SEE Marks:60 | Course Code : U24OE510EC |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| 1. To provide foundational knowledge of physiological systems and the origin of biomedical signals relevant to medical instrumentation.<br>2. To introduce the basic components and performance requirements of medical instrumentation systems, including intelligent and non-invasive systems.<br>3. To familiarize students with various electrodes and transducers used in biomedical applications, including their working principles and characteristics.<br>4. To develop understanding of therapeutic and prosthetic devices such as pacemakers, defibrillators, and ventilators, and their role in patient care.<br>5. To explore modern medical imaging technologies such as X-ray, CT, MRI, and thermography, and their applications in diagnostic medicine. | On completion of the course, students will be able to<br>1. Recognize the fundamental need for biomedical signal acquisition and describe the structure and function of basic biomedical instrumentation systems.<br>2. Explain the principles and applications of bioelectric signals, and evaluate the use of electrodes and transducers in biomedical measurements.<br>3. Demonstrate the working principles and clinical relevance of therapeutic, prosthetic, and non-invasive biomedical instruments used in diagnosis and treatment.<br>4. Apply mathematical, physical, and computational principles to interpret and analyze data from modern medical imaging systems such as X-ray, CT, and MRI.<br>5. Integrate knowledge of biomedical instrumentation systems to analyze constraints and design considerations for safe, reliable, and intelligent healthcare solutions. |

**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 |
| CO5 | 2 | 2 | 2 | | | 2 | | | | | | | 1 | | 2 |

**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 ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

## DEPARTMENT OF ELECTRONICS & COMMUNICTION ENGINEERING

## SIGNAL ENGINEERING

(General Pool :Open Elective-III)

**SYLLABUS FOR B.E V Semester**

| | | |
|---|---|---|
| L:T: P (Hrs./week):2: 0 : 1 | SEE Marks:60 | Course Code : U24OE530PH |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| 1. To provide fundamental knowledge of railway signaling systems and their role in ensuring safe and efficient train operations.<br>2. To develop understanding of signaling components such as signals, relays, track circuits, axle counters, and point machines.<br>3. To familiarize students with station layouts, train working systems, and block signaling methods.<br>4. To impart knowledge on interlocking principles, safety mechanisms, and modern electronic interlocking systems.<br>5. To enable practical exposure to signaling equipment, testing procedures, and real-time railway signaling operations. | On completion of the course, students will be able to<br>1. Explain the principles and concepts of railway signaling and train working systems.<br>2. Analyze the functioning of various signaling components and their safety features.<br>3. Apply interlocking principles to ensure safe train movement in different station layouts.<br>4. Evaluate the performance and operation of signaling equipment such as relays, track circuits, axle counters, and block instruments.<br>5. Demonstrate practical skills in handling, testing, and analyzing railway signaling systems and associated subsystems. |

**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 | 3 | 2 | | 1 | | | | | | | | | | 2 |
| CO3 | 3 | 3 | 3 | 1 | 2 | | | | | | | | | | 2 |
| CO4 | 3 | 3 | 2 | 2 | 2 | | | | | | | | | | 2 |
| CO5 | 3 | 2 | 2 | 3 | 3 | | | | | | | | | | 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, for25KV AC, Spl layouts: Isolation, Ruling gradients, Slip, Catch sidings

**Schedule of Dimensions:** General, Station Yards, Electric Traction 25KV AC 50 Cycles, Clearances required for 25KV single phase AC Electric Traction.
**General Rules:** Definitions, Type of Signals; Adequate Distance, System of Working, Absolute Block system, Automatic Block System, Block Working, Level Crossings, Station Working Rules.

**UNIT-II: Railway Signaling (6 Hours)**
**Station Layouts:** MACLS, Signal Aspects, Location of Signals; Station Layouts: Single Line, Double Line, 2-Road, 3-Road, 4-Road.
**Signaling Elements:** Track Circuits & Axle Counters, Block Instruments, point machines, Relays, Relay Interlocking and Electronic Interlocking, Requirement of Signaling in 25KV AC Electrified Area.
**Signaling Interlocking Plan:** Essentials of Interlocking, Train Detection, Point Switching, Signal, Block Control, Aspect Control Chart.

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

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

**Practicals at IRISET Laboratory (12 Hours)**

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

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

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

Duration of Internal Tests: 90 Minutes

# VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF INFORMATION TECHNOLOGY**

## INTRODUCTION TO ARTIFICIAL INTELLIGENCE

**(Stream: Artificial Intelligence and Machine Learning)**

(Open Elective-III)

**SYLLABUS FOR B.E V Semester**

| | | |
|---|---|---|
| L:T: P (Hrs./week):3: 0 : 0 | SEE Marks:60 | Course Code : U24OE520IT |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

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

**UNIT-I:**

**Introduction to AI**: What is AI, Foundations of AI, History of AI, State of the Art, Applications of AI.

**Intelligent Agents**: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, the Structure of Agents.

**UNIT-II:**

**Solving Problems by Search**: Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies: Breadth first search, Depth-first search, Depth limited search, Iterative deepening depth first search

**Informed (Heuristic) Search Strategies:** Greedy best first search, A* Search, Optimality of A*, Heuristic Functions.

**UNIT-III:**

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

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

**UNIT-IV:**

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

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

**UNIT-V:**

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

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

**Learning Resources:**

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

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

## DEPARTMENT OF INFORMATION TECHNOLOGY

## INTRODUCTION TO DATABASE MANAGEMENT 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 : U24OE510IT |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

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

**UNIT-I:**

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

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

**UNIT-II:**

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

**UNIT-III:**

**Structured Query Language**: Introduction, Data Definition, Basic Structure of SQL Queries, Modification of the Database, Additional Basic Operations, Set

Operations, Null Values, Aggregate Functions, Nested Subqueries, Join Expressions, Views.

**UNIT-IV:**

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

**UNIT-V:**

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

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

**Learning Resources:**

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

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

| | | | | |
|---|---|---|---|---|
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Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES**

## 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 : U24OE520EH |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| The course will enable the learners to:<br>1. To gain knowledge of tools of financial analysis<br>2. To understand valuation methodologies of Financial Debt instruments<br>3. To understand corporate valuation methodologies | On completion of the course, students will be able to:<br>1. Provides insights into working of financial markets<br>2. Blend of Theory and numerical problems<br>3. Domain knowledge important in view of focus by Fintech companies |

**Unit 1 : Introduction to Financial Management**

Introduction to Financial Management - Meaning - Financial Decisions- Interrelation between Financial decisions - Time Value of Money - Concept of Present Value and Future value - Effective Vs Nominal rates of interest. Risk Return Tradeoff- (Simple numerical problems on Risk)

**Unit 2 : Financial Statement Analysis-MS-Excel based**

Financial Statement Analysis - Financial Statements- Components of financial statements- Profit and Loss - Balance Sheet - Cashflow Statement - building blocks of financial statements- Sensitivity of various components on the profitability - Inter and Intra Company comparision - Ratio Analysis, Common Size statements.(Including numericals on Inter and Intra company comparison)

**Unit 3 : Debt Securities-MS-Excel based**

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 : Capital Structure**

Capital Structure- Concept - Sources of Finance - Determinants of Capital Structure - EBIT - EPS Analysis - Effect of Taxation - Consideration of Management Control.

**Unit 5 : Business Valuation**

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

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

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Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF 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 : U24OE510EH |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| The course will enable the learners to: | At the end of the course the learners will be able to: |
| 1. To introduce fundamental concepts and principles of marketing relevant to engineering fields. | 1. Define and explain core marketing concepts such as segmentation, targeting, and positioning. |
| 2. To help students understand market needs and consumer behavior in technical markets. | 2. Analyze consumer and industrial buyer behavior using data and market research. |
| 3. To develop skills in product development, pricing strategies, and promotion techniques for engineering solutions. | 3. Design basic marketing plans including product, price, place, and promotion strategies for technical products. |
| 4. To explore the role of marketing in innovation, technology, and B2B (business-to-business) sectors. | 4. Apply marketing principles to launch and promote innovations or engineering solutions. |
| 5. To enable engineers to communicate the value of technical products to diverse stakeholders. | 5. Communicate complex technical features in a customer-centric, value-driven language. |

**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, 13th 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**

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Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

## DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

## PHILOSOPHY

(Open Elective-III)

## SYLLABUS FOR B.E V Semester

| | | |
|---|---|---|
| L:T: P (Hrs./week):3: 0 : 0 | SEE Marks:60 | Course Code : U24OE530EH |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

| Course objectives | Course Outcomes |
|---|---|
| The objectives of this course are to:<br>1. To introduce students to the major branches, questions, and methods of philosophy.<br>2. To develop critical and logical thinking through philosophical analysis.<br>3. To explore key philosophical texts and thinkers from various traditions.<br>4. To encourage reflection on ethical, metaphysical, and epistemological issues.<br>5. To cultivate the ability to construct and evaluate arguments | On completion of the course the student will be able to:<br>1. Define and explain foundational philosophical concepts and theories.<br>2. Analyze and critique philosophical arguments using logical reasoning.<br>3. Compare perspectives from different philosophical traditions and historical periods.<br>4. Apply philosophical thinking to contemporary ethical and social issues.<br>5. Formulate clear, coherent arguments in both oral and written form. |

**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

**UNIT-IV: Political Philosophy**

The state, justice and authority
Liberty, rights, and duties

**UNIT-V: Social Philosophy**

Social contact theory and civil disobedience

**LEARNING RESOURCES:-**

1. An Introduction to Philosophy – S.E. Panta (Indian Author)
   A clear, concise textbook introducing Indian and Western philosophical concepts.
2. *Introduction to Indian Philosophy – Dutta & Chatterjee* (Indian Authors)
   A classic and easy-to-follow overview of schools like Nyaya, Vedanta, Samkhya, etc.
3. *Indian Philosophy (Vol. 1 & 2) – Dr. S. Radhakrishnan*
   A standard reference covering all the major schools of Indian thought. More advanced, but essential.
4. *Contemporary Indian Philosophy – Basant Kumar Lal*
   Covers modern thinkers like Gandhi, Aurobindo, Vivekananda, Tagore, Krishnamurti, and Ambedkar.

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

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

Duration of Internal Test: **90 Minutes**

# VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

## DEPARTMENT OF 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 : U24OE540EH |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

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

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO mapping | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 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, Crafting your Value Proportions, Customer-Driven Innovation.

**UNIT-II**

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

**UNIT-III**

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

**UNIT-IV**

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

**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.

**Learning Resources:**

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

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

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

Duration of Internal Test: **90 Minutes**

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

## DEPARTMENT OF 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 : U24HS510EH |
| Credits : 1 | CIE Marks : 30 | Duration of SEE : 2 Hours |

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

**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 BikerB - 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**

| | | | | |
|---|---|---|---|---|
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| 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 : U24PE510ME |
| 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:<br>1. utilise Mathematical programming tool, e.g, MATLAB, Mathematica for mathematical operations using built-in functions.<br>2. formulate matrices and understand matrix operations.<br>3. create and execute script/function files and understand graphical representation using 2-D plots.<br>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 | 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**

| | | | | |
|---|---|---|---|---|
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| 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 OFHUMANITIES & SOCIAL SCIENCES**

## DESIGN THINKING

SYLLABUS FOR B.E.V-SEMESTER

| | | |
|---|---|---|
| L:T:P (Hrs/week):1:0:0 | SEE Marks:40 | Course Code: U24HS530EH |
| Credits :01 | CIE Marks:30 | Duration of SEE:02Hours |

| **COURSE OBJECTIVES**<br>**The course will enable the learners to:** | **COURSE OUTCOMES**<br>**At the end of the course the learners will be able to:** |
|---|---|
| 1. Understand the stages of design thinking and the role of empathy in design.<br>2. Learn techniques to brainstorm and frame problem statements effectively.<br>3. Develop prototyping and feedback techniques for iterative improvements.<br>4. Apply design thinking to solve community challenges and real-world problems. | 1. Students will articulate the stages of design thinking and create empathy maps for user-centered solutions.<br>2. Students will use ideation tools and define clear, actionable problem statements.<br>3. Students will create low-fidelity prototypes and refine solutions based on feedback.<br>4. Students will demonstrate design thinking by creating innovative prototypes for specific challenges. |

**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

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

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

Duration of Internal Tests: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

## MANUFACTURING PROCESSES LAB

SYLLABUS FOR B.E.V-SEMESTER

| | | |
|---|---|---|
| L:T:P(Hrs/week):0:0:2 | SEE Marks:50 | Course Code: U24PC531ME |
| Credits :01 | CIE Marks:30 | Duration of SEE: 03 Hours |

| **COURSE OBJECTIVE** *The objective of this course is to* | **COURSE OUTCOMES** *On completion of the course, students will be able to* |
|---|---|
| manufacture components using various casting, welding and forming methods and to study their defects. | 1 design and prepare mould cavity and determine time taken for solidification.<br>2 evaluate efficiency & performance characteristics of arc welding & gas Welding operations.<br>3 calculate the Ericsson number & Designing metal Forming Dies for forming operations.<br>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 | 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: U24PC551ME |
| Credits :01 | CIE Marks:30 | Duration of SEE: 03Hours |

| **COURSE OBJECTIVE** *The objective of this course is to* | **COURSE OUTCOMES** *On completion of the course, students will be able to* |
|---|---|
| practice assembly of various components and understand how to write the CNC programming. | 1 develop assembly of given components using assembly constraints various features of NX modeling software.<br>2 develop CNC programming using G codes and M codes for the given simple turning and milling operations.<br>3 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 | 1 | 2 | 3 |
| CO1 | 3 | 2 | 2 | 2 | 3 | | | | | | | 3 | 2 | 3 |
| CO2 | 3 | 2 | 2 | 1 | 3 | | | | | | | 3 | 2 | 3 |
| CO3 | 3 | 2 | 2 | 1 | 3 | | | | | | | 3 | 2 | 3 |

**I. CAD:**

1. Introduction to assembly constraints and assembly of journal bearing.
2. Assembly of Flange coupling.
3. Assembly of Plummer block and Universal coupling
4. Assembly of Connecting rod.
5. Motion simulation of mechanisms
6. Motion simulation of manipulator

**II. CAM:**

7. Introduction of manual part programming using G-codes and M-codes.
8. Manual part program for Plain turning and step turning for CNC lathe.
9. Manual part program for taper turning and thread cutting for CNC lathe.
10. Manual part program for linear and circular interpolation for CNC Mill.
11. Manual part program for contouring and pocketing for CNC Mill.

12. Automatic part program generation for a 3-D model using manufacturing module.
13. Manufacture of a 3-D component using additive manufacturing.
14. 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: U24PC561ME |
| Credits :01 | CIE Marks: 30 | Duration of SEE: 03 Hours |

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

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO mapping | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 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: U24PW519ME |
| Credits :01 | CIE Marks: 30 | Duration of SEE: 03 Hours |

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

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO mapping | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 1 | 2 | 3 |
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 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-24)

## B.E. – MECH : SIXTH SEMESTER (2026-2027)

| 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** | | | | | | | | |
| U24PC610ME | Metrology and Instrumentation | 3 | - | - | 3 | 60 | 40 | 3 |
| U24PC620ME | Dynamics of Machines | 3 | - | - | 3 | 60 | 40 | 3 |
| U24PC630ME | Machine Design | 3 | - | - | 3 | 60 | 40 | 3 |
| U24PC640ME | Metal Cutting and Machine Tools | 3 | - | - | 3 | 60 | 40 | 3 |
| U24PC650ME | Refrigeration and Air Conditioning | 3 | - | - | 3 | 60 | 40 | 3 |
| U24OE6XXXX | Open Elective-IV | 3 | - | - | 3 | 60 | 40 | 3 |
| U24HS630EH | Skill Development Course-VII (Verbal Ability) | 1 | - | - | 2 | 40 | 30 | 1 |
| U24PE610ME | Skill Development Course-VIII (Technical Skills-III) | 1 | - | - | 2 | 40 | 30 | 1 |
| **PRACTICALS** | | | | | | | | |
| U24PC621ME | Theory of Machines Lab | - | - | 2 | 3 | 50 | 30 | 1 |
| U24PC641ME | Machine Tools and Metrology Lab | - | - | 2 | 3 | 50 | 30 | 1 |
| U24PW619ME | Theme Based Project | - | - | 2 | - | 50 | 30 | 1 |
| **TOTAL** | | **20** | **-** | **6** | | **590** | **390** | **23** |
| **GRAND TOTAL** | | **26** | | | | **980** | | **23** |

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: U24PC610ME |
| Credits :3 | CIE Marks:40 | Duration of SEE:3Hours |

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

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO mapping | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 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 Talyrond, 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. Voltage sensitive potentiometer circuit, Wheatstone bridge circuit, 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. Doeblin, "Measurement Systems application and design", 5th Edition, Tata McGraw Hill, 2004.
2. Thomas G Beckwith, Roy D Marangoni, John H Lienhard V, "Mechanical Measurements", 6th Edition, Pearson Education Asia, 2007.
3. B.C. Nakra, K.K. Chaudhry, "Instrumentation Measurement and Analysis", 3rdEdition, McGraw Hill, 2014.
4. R.K. Jain, "Engineering Metrology", Khanna Publications, 1996.
5. I.C. Gupta "A Text Book of Engineering Metrology",7th Edition, Dhanpat Rai Publications, New Delhi.
6. D. S. Kumar- "Mechanical Measurements & control" S. Chand Publications


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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

## DYNAMICS OF MACHINES

SYLLABUS FOR B.E.VI-SEMESTER

| | | |
|---|---|---|
| L:T:P(Hrs/week):3:0:0 | SEE Marks:60 | Course Code: U24PC620ME |
| Credits :03 | CIE Marks:40 | Duration of SEE:03Hours |

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

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO mapping | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 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 massesin 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 Transmissibilty. Transverse-Free vibrations, Whirling speed. Torsional-Free vibrations.

**Learning Resources:**

1. R.L.Norton, "Kinematics and Dynamics of Machinery "Tata McGraw Education Pvt. Ltd., New Delhi 2009.
2. Thomas Bevan,"The Theory of Machines",CBSPublishers&Distributors,2004.
3. S.S.Rattan, "Theory of Machines", TataMcGraw Education Pvt. Ltd., New Delhi2010.
4. John J. Uicker, Jr., Gordon R. Pennock, Joseph E. Shigley, "Theory of Machines and Mechanisms", Oxford University Press,2003.

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

## MACHINE DESIGN

SYLLABUS FOR B.E.VI-SEMESTER

| | | |
|---|---|---|
| L:T:P(Hrs/week):3:0:0 | SEE Marks:60 | Course Code: U24PC630ME |
| Credits :03 | CIE Marks:40 | Duration of SEE: 03Hours |

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

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO mapping | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 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", 4th Edition, McGraw–Hill Publications, 2017.
2. M.F. Spotts, "Design of Machine Elements", 7thEdition, Pearson Education, 2003.
3. P.C. Sharma & D.K. Aggarwal, "Machine Design", 10th Edition, S.K. Kataria & Sons, 2003.
4. J.E. Shigley, C.R. Mischke, R.G Budynas "Mechanical Engineering Design", 6th Edition, Tata McGraw Hill Publications, 2003.
5. N.C Pandya and CS Shah, "Machine Design" Charotar publishing House, 2006.

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

## METAL CUTTINGAND MACHINE TOOLS

SYLLABUS FOR B.E.VI-SEMESTER

| | | |
|---|---|---|
| L:T:P(Hrs/week):3:0:0 | SEE Marks:60 | Course Code: U24PC640ME |
| Credits :03 | CIE Marks:40 | Duration of SEE:03Hours |

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

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO mapping | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 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 Mallic k, "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: U24PC650ME |
| Credits :03 | CIE Marks:40 | Duration of SEE:03Hours |

| **COURSE OBJECTIVE** *The objective of the course is to* | **COURSE OUTCOMES** *On completion of the course, students will be able to* |
|---|---|
| dwell into the basic principles of Refrigeration and Air Conditioning together with their Engineering Applications. discuss basics of refrigeration and describe the working of different types of refrigeration systems; explain the principles of psychrometry, list different equipment used in air conditioning plant. | 1. classify the refrigerants and analyze the performance of air refrigeration.<br>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.<br>3. explain the working principles of VAR and SJR systems, compare VAR and VCR systems and explain working principles of various refrigeration systems.<br>4. define different properties of psychrometry.<br>5. compute sensible and latent heat loads and cooling loads of an air conditioning building and explain working of different Air Conditioning Systems and explain the working principles of typical Air Conditioning Systems |

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

**UNIT-I**

**Introduction to Refrigeration:** Definition of Refrigeration and Air–conditioning –Necessity of Refrigeration and its applications – Methods of

Refrigeration, unit of Refrigeration and COP. Reversed Carnot cycle – limitations.
**Refrigerants:** Classification, Nomenclature and Desirable properties.
**Air refrigeration System:** Analysis of Bell Coleman cycle/reversed Brayton cycle, open and dense air system.

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

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

Working principle of Steam Jet Refrigeration System.

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

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

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

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

**Learning Resources:**
1. Stocker W.F. and A.L. Jones "Refrigeration & Air Conditioning", 2nd Edition, Tata McGraw-Hill, New Delhi, 1985.

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

**Data Book:**

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

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

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

Duration of Internal Test: 90 Minutes

| B.E. VI SEM OPEN ELECTIVE-IV COURSES | | | |
|---|---|---|---|
| **Dept.** | **Course Name** | **Code No.** | **Credits** |
| MECH. | Autonomous Mobile Robots (Stream: Robotics) | U24OE610ME | 3 |
| | Additive Manufacturing and its Applications (General Pool) | U24OE620ME | 3 |
| Civil | Project Management | U24OE610CE | 3 |
| CSE | Fundamentals of Machine Learning (Stream- Artificial Intelligence & Machine Learning) | U24OE620CS | 3 |
| | Fundamentals of Database Management Systems (General Pool) | U24OE610CS | 3 |
| EEE | Introduction to Batteries and Battery management System (General Pool) | U24OE610EE | 3 |
| ECE | Automatic Train Protection System –Kavach (General Pool) | U24OE630PH | 3 |
| IT | Introduction to Machine Learning (Stream- Artificial Intelligence & Machine Learning) | U24OE620IT | 3 |
| | Web Application Development and Security (General Pool) | U24OE610IT | 3 |
| Physics | Introduction to Nanotechnology (General Pool) | U24OE610PH | 3 |
| HSS | Business Intelligence (Stream: Banking Finance, Securities and Investments) | U24OE620EH | 3 |
| | Strategic Management for Engineering (General Pool) | U24OE610EH | 3 |
| | Introduction to Psychology (General Pool) | U24OE630EH | 3 |
| | Advanced course in Entrepreneurship (General Pool) | U24OE650EH | 3 |

# VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

## DEPARTMENT OF MECHANICAL ENGINEERING

## AUTONOMOUS MOBILE ROBOTS

(Stream: Robotics) (Open Elective-IV)

SYLLABUS FOR B.E VI Semester

| | | |
|---|---|---|
| L:T: P (Hrs./week):3: 0 : 0 | SEE Marks:60 | Course Code : U24OE610ME |
| Credits: 03 | CIE Marks:40 | Duration of SEE : 03 Hours |

| **COURSE OBJECTIVES**<br>The objectives of the course is to | **COURSE OUTCOMES**<br>On completion of the course, students will be able to |
|---|---|
| • Provide students with fundamental understanding of mobile robots and their operation in real-world environments.<br>• Introduce concepts of robot motion, navigation, and interaction with surroundings.<br>• Develop analytical understanding of robot positioning, movement, and path planning.<br>• Familiarize students with basic autonomous decision-making in robotic systems. | • Understand different types of mobile robots and analyze their motion mechanisms. (CO1)<br>• Apply kinematic relationships to determine position and velocity of mobile robots. (CO2)<br>• Estimate robot position using basic localization techniques. (CO3)<br>• Analyze path planning methods for navigating structured environments. (CO4)<br>• Understand fundamental navigation and obstacle avoidance strategies in autonomous robots. (CO5) |

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

### UNIT-I

### Introduction to Mobile Robots:

Definition and classification of mobile robots. Comparison between fixed and mobile robots. Applications of mobile robots in industry and service sectors. Types of locomotion: wheeled, tracked, and legged robots. Degrees of freedom and mobility. Basic concepts of robot motion and constraints.

**UNIT-II**

**Kinematics of Mobile Robots:**

Kinematic modeling of wheeled mobile robots. Differential drive and skid-steer mechanisms. Forward and inverse velocity relationships. Instantaneous center of rotation. Motion analysis of mobile robots under simple constraints.

**UNIT-III**

**Localization of Mobile Robots:**

Introduction to robot localization. Dead reckoning and odometry. Position estimation using wheel encoders. Sources of error in localization. Basic techniques for improving position estimation. Concept of probabilistic localization.

**UNIT-IV**

**Path Planning Techniques:**

Introduction to path planning. Representation of environment: grid-based and graph-based methods. Shortest path concepts. Basic algorithms for path planning. Trajectory generation for mobile robots. Planning under simple constraints.

**UNIT-V**

**Navigation and Obstacle Avoidance:**

Autonomous navigation concepts. Reactive and deliberative navigation. Obstacle detection and avoidance strategies. Line following robots. Basic potential field method. Introduction to behavior-based robotics.

**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 ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

## DEPARTMENT OF MECHANICAL ENGINEERING

## ADDITIVE MANUFACTURING AND ITS APPLICATIONS

(General Pool)

(Open Elective-IV)

SYLLABUS FOR B.E VI Semester

| | | |
|---|---|---|
| L:T: P (Hrs./week):3: 0 : 0 | SEE Marks:60 | Course Code : U24OE620ME |
| 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:<br>1. Understand the fundamentals of prototyping and the various data formats used in Additive Manufacturing.<br>2. Study the principle, process, advantages, limitations and case studies of liquid based AM systems.<br>3. Study the principle, process, advantages, limitations and case studies of solid based AM systems.<br>4. Study the principle, process, advantages, limitations and case studies of powder based AM systems.<br>5. Study the applications of AM in various engineering industries as well as the medical field. |

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

### UNIT-I

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

**UNIT-II**

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

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

**UNIT-III**

**Solid based systems**: Laminated object manufacturing (LOM): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies.

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

**UNIT-IV**

**Powder Based Systems**: Selective laser sintering (SLS): Models and specifications, process, materials**,** working principle, applications, advantages and disadvantages, case studies.

Three dimensional printing (3DP): Models and specification, process, working principle, applications, advantages and disadvantages, case studies.

**UNIT-V**

Applications of AM systems: Applications in Design**,** aerospace industry, automotive industry, jewellery industry, coin industry, GIS Application, arts and architecture.

RP medical and bio engineering Application: planning and simulation of complex surgery, customized implant and prosthesis, design and production of medical devices, forensic science and anthropology, visualization of bio-molecules.

**Learning Resources:**

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

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

Ibrahimbagh, Hyderbad-500031

**DEPARTMENT OF CIVIL ENGINEERING**

## PROJECT MANAGEMENT

(General Pool)

(Open Elective-IV)

SYLLABUS FOR B.E.VI-SEMESTER

| | | |
|---|---|---|
| L:T: P (Hrs/Week):3:0:0 | SEE Marks: 60 | Course Code:U24OE610CE |
| Credits: 03 | CIE Marks: 40 | Duration of SEE : 03 Hours |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| Objectives of this course are to: | Upon the completion of this course the students will be expected to: |
| 1. Learn the concept of project management along with function and objectives.<br>2. Understand the various techniques used for project planning such as bar charts, CPM, PERT and crashing of networks.<br>3. Acquire knowledge on various types of contracts, tenders. | 1. understand the objectives, functions and principles of management in projects.<br>2. practice the network techniques like CPM and PERT for better planning and scheduling of engineering works.<br>3. analyse the importance of cost and time in network analysis and planning the work accordingly.<br>4. Knowledge on Contracts, Tenders, and Work orders related to the projects.<br>5. Interpret the concept of Linear Programming and solve problems by Graphical and Simplex methods. |

**UNIT-I**

**Significance of Project Management:** Importance of Project Management, Types of projects, Project Management Cycle, Objectives and functions of project management, management team, principles of organization and types of organization.

**UNIT-II**

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

**UNIT-III**

**Time Cost Analysis:** Cost time analysis in network planning, updating

**UNIT-IV**

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

**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. Punmia B.C., and Khandelwal, PERT and CPM, Laxmi Publications, 2023.
2. Srinath L.S., PERT and CPM: Principles and Application, Vision IAS, 2020.
3. Kumar NeerajJha., Construction Project Management: Theory and Practice, Pearson Education, India, reprint 2020.
4. Peret, F, Construction Project Management an Integrated approach, Taylor and Francis, Taylor and Francis Group, London & New York, 2019.
5. Gahloj. P.S. and Dhiv. B.M., Construction Planning and Management, Wiley Eastern Ltd., 2018.
6. Seetharaman S., Construction Engineering and Management, Umesh Publications, 2017.

**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 :U24OE620CS |
| Credits : 3 | CIE Marks : 40 | Duration of SEE : 3 Hours |

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

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

**UNITIV:**

**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, Firstedition.
3. ChristopherBishop,—PatternRecognitionandMachinelearning‖,Springer(2006).
4. StephenMarsland,‖MachineLearning–analgorithmicperspective‖,CRCPress.
5. Danielawitten,TrevorHastieRobertTibshiraniandGarethJames,—Anintroductiontos tatisticalLearningwithapplicationsin R,Springer2013
6. https://onlinecourses.nptel.ac.in/noc18_cs26/preview
7. https://www.coursera.org/learn/machine-learning


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

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

Duration of Internal Tests : 90 Minutes

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

# FUNDAMENTALS OF DATABASE MANAGEMENET SYSTEMS

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

| | | |
|---|---|---|
| L:T:P (Hrs./week): 3:0:0 | SEE Marks : 60 | Course Code :U24OE610CS |
| Credits : 03 | CIE Marks : 40 | Duration of SEE : 03 Hours |

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

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

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

## 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, 6thEdition(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. Ramez Elmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems, 4th Edition(2006), Pearson Education.
5. Peter rob, Carlos coronel, Database Systems, (2007), Thomoson.
6. http://nptel.ac.in/courses/106106093/

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

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

Duration of Internal Tests : 90 Minutes

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

**Introduction to Batteries and Battery Management System**
(General Pool)
(Open Elective-IV)
SYLLABUS FOR B.E. VI SEMESTER

| | | |
|---|---|---|
| L: T: P (Hrs/Week):3:0:0 | SEE Marks: 60 | Course Code: U24OE610EE |
| Credits:3 | CIE Marks: 40 | Duration of SEE: 03Hours |

| **COURSE OBJECTIVES**<br>The course will enable the students to: | **COURSE OUTCOMES**<br>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<br>1. Interpret the role of battery management system.<br>2. Identify the requirements of Battery Management System.<br>3. Interpret the concept associated with battery charging/ discharging process.<br>4. Calculate the various parameters of battery and battery pack.<br>5. Design the model of battery pack. |

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

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

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

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

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

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

**Learning Resources:**

1. Plett, Gregory L. Battery management systems, Volume I : Battery modeling. 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 BookSeries2002.
4. Davide Andrea, "Battery Management Systems for Large Lithium-ion Battery Packs "ArtechHouse, 2010.

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

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

Duration of Internal Tests : 90 Minutes

# VASAVI COLLEGE OF 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: U24OE630PH |
| Credits : 03 | CIE Marks : 40 | Duration of SEE : 03 Hours |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| 1. To provide comprehensive knowledge of automatic train protection systems with emphasis on the Kavach architecture and working.<br>2. To develop understanding of onboard and wayside subsystems, communication protocols, and signaling interfaces in Kavach.<br>3. To familiarize students with design aspects including station layouts, survey, estimation, and implementation strategies for Kavach deployment.<br>4. To impart knowledge on operational concepts such as braking curves, speed profiles, movement authority, and communication mechanisms.<br>5. To enable students to simulate, test, and validate Kavach system configurations ensuring safety, reliability, and compliance. | On completion of the course, students will be able to<br>1. Explain the concepts of train protection systems and the working principles of the Kavach system.<br>2. Analyze the components and subsystems of Kavach including onboard and wayside equipment.<br>3. Apply design principles to develop layout plans and implementation strategies for Kavach deployment.<br>4. Evaluate operational parameters such as speed profiles, braking curves, and communication protocols in Kavach.<br>5. Demonstrate the ability to simulate, test, and validate Kavach configurations using testbench environments. |

**CO-PO/PSO Mapping**

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

### 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, SpeedSensors, RFID Reader, Onboard Computer, Brake Interface Unit,Pre-commissioning Checklist, Testing

**Practicals at IRISET Laboratory (12 Hours)**

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

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

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

Duration of Internal Tests: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

IBRAHIMBAGH, HYDERABAD – 500 031

## DEPARTMENT OF INFORMATION TECHNOLOGY

## INTRODUCTION TO MACHINE LEARNING

(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: U24OE620IT |
| Credits : 03 | CIE Marks: 40 | Duration of SEE : 03Hrs |

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

**UNIT-I:**

**Introduction to AIML:** Foundations of AI, Sub areas of AI, Applications. Introduction to learning, Types of Learning: Supervised Learning, Unsupervised Learning, Reinforcement Learning.

**Introduction to Python and ML libraries:** intro to python data types, control flow, loops, functions, modules & packages. Intro to NumPy&Scikit-learn.

**UNIT-II:**

**Supervised learning:** ML Task, ML Experience or Data, ML Performance metric, Linear Regression, Linear regression Simulator, Logistic Regression.

**Supervised Non-parametric learning:** Introduction to Decision Trees, K-Nearest Neighbor, Feature Selection.

**UNIT-III:**

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

**UNIT-IV:**

**Supervised Parametric learning:** Support Vector Machine, Kernel function and Kernel SVM.

**Supervised Parametric Bayesian learning:** Introduction, Naive Bayes Classification, Bayesian Network.

**UNIT-V:**

**Unsupervised leaning:** Clustering, K-means Clustering, DBSCAN

**Learning Resources:**

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

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

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

Duration of Internal Tests : 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

IBRAHIMBAGH, HYDERABAD – 500 031

## DEPARTMENT OF INFORMATION TECHNOLOGY

## WEB APPLICATION DEVELOPMENT AND SECURITY

(General Pool)

(OPEN ELECTIVE-IV)

SYLLABUS FOR B.E VI- SEMESTER

| | | |
|---|---|---|
| L:T:P(Hrs./week): 3:0:0 | SEE Marks : 60 | Course Code : U24OE610IT |
| Credits : 3 | CIE Marks : 40 | Duration of SEE : 3 Hrs |

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

**UNIT-I: Introduction**

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

**UNIT-II: Basics of JavaScript**

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

**UNIT-III: Bootstrap**

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

**UNIT-IV: XML**

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

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

**UNIT-V: Web Security Fundamentals**

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

**Learning Resources:**

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

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

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

Duration of Internal Tests : 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD-31

## DEPARTMENT OF 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: U24OE610PH |
| Credits :03 | CIE Marks:40 | Duration of SEE: 03Hours |

| **Course Objectives**<br>The objectives of this course are to | **Course Outcomes**<br>On completion of the course the student will be able to |
|---|---|
| 1. Learn bulk, thin and nano structures.<br>2. Acquire knowledge on properties of nano materials.<br>3. Appreciate fabrication techniques of nano materials.<br>4. Learn nanomaterial characterization techniques. | 1. Distinguish bulk, thin and nano materials from the point of view of size effects.<br>2. List various properties of nano materials.<br>3. Narrate various nanomaterial preparation techniques.<br>4. Describe characterization techniques of nano materials.<br>5. Write various applications of CNTs & nano structures |

### UNIT-I: INTRODUCTION TO NANOSCIENCE

The distinction between bulk, thin films and nano materials-surface to volume ratio, change of electronic structure, density of states of nano materials, quantum confinement-quantum size effect, Quantum wells, Quantum wires, Quantum dots.

### UNIT-II: PROPERTIES OF NANO MATERIALS

Electrical properties: conductivity, ballistic transport, Magnetic properties: soft and permanent magnetic nano materials, Giant Magneto Resistance (GMR), 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, Sol-gel method, top-down methods: ball milling, Nanolithography.

**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 Emission Microscope (FEM).

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

Graphene, Elementary ideas on Carbon nanotubes, 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 and space Applications.

**Learning Resources:**

1. K.K. Chattopadhyay and A.N. Benerjee, Introduction to Nanoscience and Nanotechnology, PHI, 2019.
2. Nanomaterials and their Properties, IIT-Kanpur, NPTEL Course

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEEING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES**

## 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 : U24OE620EH |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| The course will enable he leaners to<br>1. To introduce the concepts and architecture of Business Intelligence (BI) systems.<br>2. To familiarize students with data warehousing, data mining, and analytics tools.<br>3. To provide insights into BI implementation and its role in decision-making. | By the end of this course, students will be able to : -<br>1. Define the architecture, evolution, and benefits of Business Intelligence.<br>2. Explain data warehousing and mining techniques, and apply them in real-time data environments.<br>3. Use Business Performance Measurement (BPM) tools and performance dashboards for managerial decision-making.<br>4. Employ Business Analytics and data visualization techniques in business contexts.<br>5. Discuss the challenges in BI implementation and emerging trends such as social BI and reality mining. |

**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.

DataVisualization: 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, McGrawHill Education-Indian Edition.
4. BusinessIntelligence-AhandsonapproachbyN.Rajeshwari,1stEdition,PHI
5. Ramesh Sharda, TurbanE,BusinessIntelligenceandanalytics,10th Edition,PearsonBooks
6. Bernard Marr, "Data strategy" Kogan Page publishing
7. Anoop V KKumar, "Business Intelligence demystified" 1st edition2022, 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 ENGINEEING (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 : U24OE610EH |
| Credits: 3 | CIE Marks:40 | Duration of SEE : 3 Hours |

| COURSE OBJECTIVES | COURSE OUTCOMES |
|---|---|
| The course will enable the learners to:<br>1. To introduce the fundamentals of strategic management and its relevance to engineering and technology.<br>2. To develop analytical skills for assessing internal and external business environments.<br>3. To explore strategic planning, implementation, and performance evaluation in engineering contexts.<br>4. To understand the role of innovation, competition, and sustainability in strategic decisions.<br>5. To prepare engineers to contribute to strategic decision-making in technical organizations. | At the end of the course the learners will be able to: -<br>1. Explain key strategic management concepts and frameworks (e.g., SWOT, PESTEL, Porter's Five Forces).<br>2. Analyze organizational strengths, weaknesses, opportunities, and threats in engineering-driven firms.<br>3. Develop strategic plans aligned with technical, operational, and business objectives.<br>4. Evaluate strategic alternatives in terms of risk, competitiveness, and long-term sustainability.<br>5. Contribute effectively to strategic discussions in interdisciplinary engineering teams. |

**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, 2nd 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: U24OE630EH |
| Credits :03 | CIE Marks:40 | Duration of SEE: 03Hours |

| **Course Objectives**<br>The objectives of this course are to | **Course Outcomes**<br>On completion of the course the student will be able to |
|---|---|
| 1. Introduce students to the foundational concepts, theories, and branches of psychology.<br>2. Develop an understanding of human behaviour and mental processes through scientific approaches.<br>3. Encourage critical thinking and analytical reasoning in the study of psychological phenomena.<br>4. Foster awareness of the biological, cognitive, and socio-cultural influences on behaviour.<br>5. Equip students with basic research skills and ethical considerations in psychological practice. | 1. Explain core psychological theories and their relevance to everyday life.<br>2. Analyze behaviour using major psychological perspectives (e.g., behavioural, cognitive, humanistic, etc.).<br>3. Apply psychological principles to real-world situations such as learning, motivation, and social interaction.<br>4. Demonstrate basic skills in psychological research, including hypothesis formulation, data collection, and analysis.<br>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 | | | | | 1 | | | 2 | | | 3 | 3 | | | |
| CO2 | | | | | 1 | | | 2 | | | 3 | 3 | | | |
| CO3 | | | | | 1 | | | 2 | | | 3 | 3 | | | |
| CO4 | | | | | 1 | | | 2 | | | 3 | 3 | | | |
| CO5 | | | | | 1 | | | 2 | | | 3 | 3 | | | |

## 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 Saundra 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: U24OE650EH |
| Credits :03 | CIE Marks:40 | Duration of SEE: 03Hours |

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

**CO-PO Mapping**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | 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. 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. Introduction to building the A-team. 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, 1st 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 OFHUMANITIES & SOCIAL SCIENCES**

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

| | | |
|---|---|---|
| L:T:P (Hrs./week) : 2:0:0 | SEE Marks : 40 | Course Code: U24HS630EH |
| Credits : 1 | CIE Marks : 30 | Duration of SEE : 2 Hours |

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

**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

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

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

Duration of Internal Tests: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

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

SYLLABUS FOR B.E.VI-SEMESTER

| | | |
|---|---|---|
| L:T:P(Hrs/week):1:0:0 | SEE Marks:40 | Course Code: U24PE610ME |
| Credits :01 | CIE Marks:30 | Duration of SEE:02Hours |

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

**UNIT-I:**

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

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

**UNIT-II:**

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

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

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

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

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

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

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

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

| | | | | |
|---|---|---|---|---|
| 1 | No. of Internal Tests (along with II int): | 01 | Max.Marks for the Internal Test: | 20 |
| 2 | No. of Assignments: | -- | Max. Marks for each Assignment: | -- |
| 3 | No. of Quizzes: | 01 | Max. Marks for each Quiz Test: | 10 |

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

## THEORY OF MACHINES LAB

SYLLABUS FOR B.E.VI-SEMESTER

| | | |
|---|---|---|
| L:T:P(Hrs/week):2:0:0 | SEE Marks:50 | Course Code: U24PC621ME |
| Credits :01 | CIE Marks:30 | Duration of SEE: 03 Hours |

| **COURSE OBJECTIVES** *The objective of this course is to* | **COURSE OUTCOMES** *On completion of the course, students will be able to* |
|---|---|
| understand the kinematic analysis of the cams, gears etc, and the dynamic behaviour of mechanical systems like governors, cams, gyroscope, rotating machines and spring-mass systems. | 1 analyze the cam profile for different motion characteristics.<br>2 analyze the motion using gears.<br>3 analyse the forces in Governors, Gyroscope and a system of rotating masses in different planes.<br>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 | 1 | 2 | 3 |
| CO1 | 2 | 2 | 2 | 3 | | | | | 1 | | 2 | 3 | 2 | 3 |
| CO2 | 3 | 2 | 3 | 3 | | | | | 2 | | 2 | 3 | 3 | 2 |
| CO3 | 2 | 2 | 2 | 3 | | | | | 1 | | 2 | 2 | 2 | 2 |
| CO4 | 3 | 3 | 2 | 3 | | | | | 2 | | 2 | 3 | 3 | 3 |

## LIST OF EXPERIMENTS

1 To study the motion characteristics of the follower with the given profile of the cam.
2 To study the effect of Coriolis acceleration.
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 friction characteristics using journal bearing apparatus.
9 To study the Axial free vibrations of a spring mass system with and without damping.
10 To study the forced vibrations using a cantilever beam under harmonic excitation.
11 Determination of critical speed of the shaft using different supports.

12 To analyze impact test on cantilever beam.
13 To analyze a 1- DOF system subjected to un damped and damped Free Vibrations using MATLAB and SIMULINK.
14 Vibration analysis of spring mass system experiment by using virtual lab.

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

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

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

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

## MACHINE TOOLS AND METROLOGY LAB

SYLLABUS FOR B.E.VI-SEMESTER

| | | |
|---|---|---|
| L:T:P(Hrs/week):0:0:2 | SEE Marks:50 | Course Code: U24PC641ME |
| Credits :01 | CIE Marks:30 | Duration of SEE: 03Hours |

| **COURSE OBJECTIVES** *The objective of this course is to* | **COURSE OUTCOMES** *On completion of the course, students will be able to* |
|---|---|
| 1. familiarize the student with various machining forces and analyze the machining forces.<br>2. apply principles of metrology in the measurement using various instruments and transducers. | 1 compute Various kinds of forces involved in turning operations.<br>2 interpret and grind Single Point Cutting Tool to the required Geometry, Multi Point cutting Tool Geometries<br>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.<br>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 | 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: U24PW619ME |
| Credits :01 | CIE Marks:30 | Duration of SEE: VIVA |

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

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO mapping | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 1 | 2 | 3 |
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 |
| CO3 | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 1 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 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-24)
## B.E. (ME) Honours Degree Program in Robotics
## (2026-2028)

| 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 2026-27** | | | | | | | | |
| U24PC560ME | Introduction to Robotics and Automation | 3 | - | - | 3 | 60 | 40 | 3 |
| U24PC570ME | Control Engineering | 3 | - | - | 3 | 60 | 40 | 3 |
| **VI-Semester AY 2026-27** | | | | | | | | |
| U24PC660ME | Embedded C Programming | 3 | - | - | 3 | 60 | 40 | 3 |
| **VII-Semester AY 2027-28** | | | | | | | | |
| U24PC760ME | Robotics and Control | 3 | - | - | 3 | 60 | 40 | 3 |
| U24PC770ME | Robotics Lab | - | - | 2 | 3 | 50 | 30 | 1 |
| U24PW729ME | 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 : U24PC560ME |
| Credits : 3 | CIE Marks: : 40 | Duration of SEE : 3 Hours |

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

**UNIT-I**

**ROBOT BASICS**

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

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

**ROBOT APPLICATIONS**

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

**UNIT-II**

**ROBOT ELEMENTS**

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

types, Robot drive system types: Electrical, pneumatic and hydraulic. Position 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 : U24PC570ME |
| Credits : 3 | CIE Marks: : 40 | Duration of SEE : 3 Hours |

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

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO mapping | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 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 translator 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 2nd order systems, Response of 2nd order systems to Step input. Steady state error, Static Error constants.

Hands on Experience:

Experiment to find the time response of second order system

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

**UNIT-III**

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

Frequency Response, Bode plots. Gain and Phase Margins.

Hands on Experience:

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

**UNIT-IV**

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

Hands on Experience:

Experiment on temperature control system

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

**UNIT-V**

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

Hands on Experience:

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

**Learning Resources:**

1. R.C. Dorf, "Modern Control Systems", Addison Wesley, 1989
2. M. Gopal, "Control Systems", Tata McGraw-Hill, 2004.
3. Ogata, K. "Modern Control Engineering", Prentice Hall, 2004
4. Norman S. Nise, "Control Systems Engineering", John Wiley & Sons, Inc., 2001.

5. William J. Palm, III, Modelling, Analysis, and Control of Dynamic Systems, John Wiley & Sons Inc., 2nd Edition, 1999.
6. Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, Giuseppe Oriolo, Robotics: Modelling, Planning and Control, Springer Science & Business Media, 2008

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

## EMBEDDED C PROGRAMMING

SYLLABUS FOR B.E. VI-SEMESTER

| | | |
|---|---|---|
| Instruction : 3 Hrs /week | SEE Marks : 60 | Course Code : U24PC660ME |
| Credits : 3 | CIE Marks: : 40 | Duration of SEE : 3 Hours |

| COURSE OBJECTIVES<br>The objectives of the course is to | COURSE OUTCOMES<br>On completion of the course, students will be able to |
|---|---|
| 1. Describe the developments of embedded C programming<br>2. Interfacing of various sensors along with displays using Embedded 'C'<br>3. Develop the various applications using embedded development board | 1. Analyze the various functions used in embedded C programming.<br>2. UnderstandtheevaluationofArduinofamilyandit sdevelopmentboarddetails<br>3. Interface the sensors and various /o devices to embedded development board<br>4. Apply the concepts of IoT to embedded development board<br>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 | 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 one line static message display, Runningmessagedisplay,.Interfacing-humiditysensor,temperaturesensor, gas detection sensor, PIR Sensor, Ultrasonic Sensor, Flex Sensor

**UNIT –IV**

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

**UNIT – V**

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

**Learning Resources:**

1. Simon Monk, "Programming Arduino: Getting Started with Sketches", McGraw-Hill Education, Second Edition, 2016.
2. Massimo Banzi, "Getting Started with Arduino: The Open Source", Shroff Publishers & Distributors Pvt Ltd, 2014
3. MichaelJ.Pont,"EmbeddedC",2nd Edition,PearsonEducation,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 : U24PC760ME |
| Credits : 3 | CIE Marks: : 40 | Duration of SEE : 3 Hours |

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

| CO-PO and CO-PSO mapping | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO mapping | | | | | | | | | | | PSO mapping | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 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", 1st Edition, John Wiley and sons,1990.
3. R.K.Mittal and I.J.Nagrath, "Robotics and Control", Tata McGraw-Hill, 2003.
4. Subir Kumar Saha, "Introduction to Robotics", Tata McGraw-Hill Education, 2014.
5. Howie M. Choset, Seth Hutchinson, Kevin M. Lynch, "Principles of Robot Motion: Theory, Algorithms, and Implementation", MIT Press, 2005.

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

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

Duration of Internal Test: 90 Minutes

# VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

**Department of Mechanical Engineering**

## ROBOTICS LAB

SYLLABUS FOR B.E. VII-SEMESTER

| | | |
|---|---|---|
| Instruction : 2 Hours /week | SEE Marks : 50 | Course Code : U24PC731ME |
| Credits : 1 | CIE Marks: : 30 | Duration of SEE : 2 Hours |

| **COURSE OBJECTIVE**<br>The objective of the course is to | **COURSE OUTCOMES**<br>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.<br>2. Designing and controlling of robotic path using various sensors.<br>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 | 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: U24PW729ME |
| Credits : 3 | CIE Marks: 50 | Duration of SEE: 3 Hours |

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

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