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-18)
WITH EFFECT FROM 2020-21
(For the students admitted in 2018-19)

DEPARTMENT OF MECHANICAL ENGINEERING

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VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-18)
B.E. – MECH : FIFTH SEMESTER (2020-2021)

Course Code	Name of the Course	L	T	P/D	Duration in Hrs	SEE	CIE	Credits
B.E (MECH) V Semester								
		Scheme of Instruction			**Scheme of Examination**			
		Hours per Week			Duration in Hrs	**Maximum Marks**		Credits
		L	T	P/D		SEE	CIE	
THEORY								
U18HS510EH	Skill Development-III : Soft Skills	1	0	0	2	40	30	1
U18HS020EH	Human Values and Professional Ethics-II	1	0	0	2	40	30	1
U18PC510ME	Heat Transfer	3	0	0	3	60	40	3
U18PC520ME	Metrology and Instrumentation	3	0	0	3	60	40	3
U18PC530ME	Dynamics of Machines	3	0	0	3	60	40	3
U18PC540ME	Manufacturing Processes	3	0	0	3	60	40	3
U18PC550ME	Design of Machine Elements	3	0	0	3	60	40	3
U18PE510ME	Skill Development-III : Technical Skills	1	0	0	2	40	30	1
U18OE5XXXX	Open Elective-III	3	0	0	3	60	40	3
PRACTICALS								
U18PC531ME	Dynamics & Metrology Lab	0	0	2	3	50	30	1
U18PC541ME	Manufacturing Processes Lab	0	0	2	3	50	30	1
U18PW519ME	Mini Project	0	0	2	-	0	30	1
TOTAL		21	0	6		580	420	24
GRAND TOTAL		27				1000		24

1) Student should acquire one online course certificate equivalent to two credits during III to VII semester
2) Left over hours allotted to Sports / Library / Mentor Interaction / CC / RC / TC / CCA / ECA

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

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES
Skill Development-III (Soft Skills)
SYLLABUS FOR B.E. V-SEMESTER

L:T:P (Hrs/Week): 1:1:0	SEE Marks: 40	Course Code: **U18HS500EH**
Credits: 1	CIE Marks: 30	Duration of SEE: 2 Hours

COURSE OBJECTIVES	COURSE OUTCOMES *On completion of the course, students will be able to*
1 This is a foundation course and aims at enhancing employability skills in students. 2 Students will be introduced to higher order thinking skills and problem solving on the following areas - Arithmetic ability, Numerical ability and General reasoning. 3 Students will be trained to work systematically with speed and accuracy while problem solving.	1 Solve questions on the above mentioned areas using short cuts and smart methods. 2 Understand the fundamentals concept of Aptitude skills. 3 Perform calculations with speed and accuracy.

UNIT 1 QUANTITATIVE APTITUDE - NUMERICAL ABILITY
6 hrs

- Introduction to higher order thinking skills
- Speed Maths
- Number systems
- LCM & HCF

UNIT 2 QUANTITATIVE APTITUDE- ARITHMETIC ABILITY FOUNDATION
6 hrs

- Percentage
- Profit loss and discounts
- Ratio proportions Allegations and mixtures
- Averages

UNIT 3 REASONING ABILITY – GENERAL REASONING PART 1

4 hrs
- Cding decoding
- Directions
- Series completions - Letter, Number & Element Series

UNIT 4 REASONING ABILITY- GENERAL REASONING PART 2
4 hrs
- Analogies
- Classification
- Alphabet test
- Blood Relations

UNIT 5 REASONING ABILITY- ARITHMETIC REASONING
4 hrs
- Mathematical operations
- Ranking
- Ages
- Clocks & Calendars

Learning Resources:

1. scoremore.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   : 1 Hour 30 Minutes

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Humanities & Social Sciences

HUMAN VALUES AND PROFESSIONAL ETHICS-II

SYLLABUS FOR B.E. V SEMESTER (COMMON FOR ALL BRANCHES)

L : T : P (Hrs/Week) : 1:0:0	SEE Marks : 40	Course Code:U19HS020EH
Credits: 1	CIE Marks : 30	Duration of SEE : Hours : 02

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to :-	All the end of this course the student will be able to
1. Get a holistic perspective of value- based education. 2. Grasp the meaning of basic human aspirations vis-a-vis the professional aspirations. 3. Understand professionalism in harmony with self and society. 4. Develop ethical human conduct and professional competence. 5. Enrich their interactions with the world around, both professional and personal.	1. Gain a world view of the self, the society and the profession. 2. Start exploring themselves in relation to others and their work –constantly evolving into better human beings and professionals. 3. Inculcate Human values into their profession. 4. Obtain a holistic vision about value-based education and professional ethics.

UNIT-1PERSONAL ETHICS AND PROFESSIONAL ETHICS

a. **PERSONAL ETHICS**:A person 's personal or self-created values and codes of conduct. Civic virtues and Civic sense.

b. **NEED FOR ETHICAL CODES**
Code of Professional Ethics- Observance of the code, Obligations towards the Features of professional ethics: Openness, Transparency, Privacy, Impartiality, Practicality, Loyalty.
Profession, Ethics and Information Security, Deterring Unethical and Illegal Behaviour, Work ethics.

UNIT-2GENDER SENSITISATION

a. Social issues regarding women - Female infanticide and foeticide,
dowry & property rights, violence against women.
b. Impact of globalization on the status of women - Political and legal empowerment
c. Women atwork- Success stories.

{Post independence and current movements in India (Telengana movement 1948-50, Chipko movement 1973, Navnirman movement 1974, question of Representation in Politics)
Change makers- Shashi Deshpande, Taslima Nasreen, Kumkum Sangari, Veena Mazumdar, Neera Desai.

Women's Studies in India--UGC's initiatives -- Centers for Women's Studies- Capacity building for Women leaders in education—Women development cells-- Women's Studies in the XIth Plan.

Women role models-- Case studies– Indira Gandhi, Kiran Mazumdar, Kiran Bedi, Ela Bhatt, Mother Teresa, PT Usha, RukminideviArundale, Annie Beasant, Sarojini Naidu, MedhaPadhkar, Kalpana Chawla, etc.}

MODE Of DELIVERY

• Questionnaires • Quizzes • Case-studies • Observations and practice • Home and classroom assignments	• Discussions • Skits • Short Movies/documentaries • Team tasks and individual tasks • Research based tasks • Viva

Relevant Websites, CD's and Documentaries
  • Value Education website, Http://www.universalhumanvalues.info UPTU website,
    Http://www.uptu.ac.in

- Story of stuff, Http://www.storyofstuff.com
- AlGore, As Inconvenient Truth, Paramount Classics ,USA
- Charlie Chaplin, Modern Times, United Artists, USA
- IIT Delhi, Modern Technology-The Untold story-Anand Gandhi, Right Here Right Now, Cyclewala production.

Learning Resources:
1. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
2. B.L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
3. A.N Tripathy, 2003 Human values, New Age International Publishers.
4. EG Seebauer& Robert L. Berry,2000, Fundamentals of Ethics for Scientists and Engineers, Oxford University Press.

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

1	No. of Internal Tests:	01	Max. Marks for each Internal Test:	20
2	No. of Assignments:	02	Max. Marks for each Assignment:	05
3	No. of Quizzes:	02	Max. Marks for each Quiz Test:	05

Duration of Internal Test: **1 Hour 30 Minutes**

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: **U18PC510ME**
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 practical engineering problems in conduction, convection and radiation heat transfer and their applications.	1	formulate heat conduction problems in rectangular, cylindrical and spherical coordinate system by transforming the physical system into a mathematical model.
	2	predict time dependent heat transfer in solids for engineering applications.
	3	interpret convective heat transfer coefficients in free and forced convection for internal flows & external flows.
	4	design of heat exchangers using the LMTD and ε-NTU approaches for industrial applications and distinguish the mechanisms involved in boiling and condensation.
	5	estimate radiation heat transfer between black and non-black bodies using laws of radiation.

UNIT-I: INTRODUCTION
Different modes of Heat Transfer, Rate equations and Applications; General heat conduction equation: Cartesian, cylindrical and spherical coordinate systems. Steady-state One-dimensional heat conduction through slabs, cylinders and spheres without and with internal heat generation; Numerical problems; Thermal resistance in composite systems, Overall heat transfer coefficient, Thermal contact resistance, Critical thickness of insulation; Numerical Problems.

UNIT-II
Fins (extended surfaces): classification and applications, analysis of fin - rectangular and circular fins, temperature distribution and heat transfer rate calculations, fin efficiency and effectiveness; Numerical Problems.
Transient 1-D heat conduction: lumped system, infinite body – Numerical Problems using Heisler and Grober charts for infinite slabs, cylinders and spheres.

UNIT-III: CONVECTION
Dimensional analysis, Buckingham π - theorem and its applications to forced and free convection, Non-dimensional parameters and their significance; Boundary layer theory concept: velocity and thermal boundary layers; Reynold's analogy for a flat surface; Free and forced convection: calculation of heat transfer coefficient and heat transfer rate in laminar and turbulent flows over flat plates, cylinders and spheres; Numerical Problems on external and internal flows using empirical equations.

UNIT-IV
Heat Exchangers: classification and applications of heat exchangers, overall heat transfer coefficient, Fouling, definition of LMTD, effectiveness and NTU, analysis of Shell and Tube heat exchangers (parallel, counter and Cross flow) using analytical equations and charts; Boiling phenomenon - definition, types, pool boiling curve, critical heat flux and problem solving; Condensation phenomenon - definition, types, film condensation, drop wise condensation, Numerical Problems.

UNIT-V
Radiation: Fundamental principles – Gray, White, Opaque, Transparent and Black bodies, Spectral emissive power, Wien's, Rayleigh-Jeans and Max Planck's laws, Hemispherical emissive power, Stefan-Boltzmann law for total emissive power of a black body, Emissivity and Kirchhoff's laws, Radiation view (shape) factor, View factor algebra, Total emissive power, Radiation heat exchange between two gray surfaces, Thermal circuit for radiation heat exchange between infinite parallel plates and between concentric cylinders, Enclosures with black and gray surfaces, Radiation shields - Numerical Problems.

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. Sachadeva R.C., "Fundamentals of Engineering Heat and Mass Transfer", New Age International (P) Ltd Publishers, New Delhi, 2010.
4. Rajput R.K., "Heat and Mass Transfer", S. Chand & Company Ltd., New Delhi, 2004.
5. Necati Ozisik M, "Heat transfer – A basic approach", McGraw-Hill, New York, 2005.

Data Book:

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

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

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

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

Duration of Internal Test: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
METROLOGY AND INSTRUMENTATION
SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: **U18PC520ME**
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The *objective of this course is*	*On completion of the course, students will be able to*
measurement of various mechanical features using metrology principles, instrumentation with sensors and transducers.	1 demonstrate the working of gauges and other devices used in measurement by following the principles of metrology. 2 measuring component features considering physical and mathematical aspects on the basis of their application and limitations. 3 learn instrumentation by classifying various Sensors and transducers based on the aspect of their sensitivity and working range. 4 study strain gauges, Load cells and dynamometers by estimating their performance during working conditions. 5 study the seismic transducers for the measurement of displacement, acceleration, pressure and temperature and choose a specific transducer based on working and ambient conditions.

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, sine bar and sensitivity of spirit level.

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

Surface Roughness Measurements – Numerical assessments, parameters as per ISO indices. Profilometer, Taylor Hobson Talysurf.
Gear measurement – Gear tooth thickness, Parkinson tester, General Geometric tests for testing machine tools – Lathe, drilling and milling machines.

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

UNIT-IV
Displacement transducers. LVDT. Strain measurement – wire and foil type resistance strain gauges. Rosette Gauges. Adjacent arm and self-compensating gauges. Proving ring. Strain gauge load cells, measurement of axial load and torsion by strain gauges. Piezo-electric load cell, Torque cells, dynamometers

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

Learning Resources:
1. Doeblin, "Measurement Systems application and design", 5th Edition, Tata McGraw Hill, 2004.
2. Thomas G Beckwith, Roy D Marangoni, John H Lienhard V, "Mechanical Measurements", 6th Edition, Pearson Education Asia, 2007.
3. B.C. Nakra, K.K. Chaudhry, "Instrumentation Measurement and Analysis", 3rd Edition, McGraw Hill, 2014.
4. R.K. Jain, "Engineering Metrology", Khanna Publications, 1996.
5. I.C. Gupta – "A Text Book of Engineering Metrology",7th Edition,Dhanpat Rai Publications, New Delhi.

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: **1 Hour 30 Minutes**

Department of Mechanical Engineering

DYNAMICS OF MACHINES
SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: **U18PC530ME**
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES	
The *objective of this course is to*	*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 forces arise in planar mechanisms using laws of equilibrium, calculate the gyroscopic couple and interpret its effect in designing engineering systems.
	2	balancing of reciprocating and rotating machinery by addition or removal of masses by reducing inertia forces.
	3	calculate frictional torque and power by applying load in clutches and brakes etc.
	4	estimate the operational characteristics in Governors and design of Flywheels.
	5	Estimate the vibration characteristics of single degree of freedom sysems

UNIT-I
Static and Dynamic Force analysis: Four bar and slider crank mechanisms. Study of dynamically equivalent system, inertia forces on connecting rod.
Gyroscope: Gyroscopic couple, gyroscopic effects in vehicles.

UNIT-II
Balancing: Forces due to rotating shaft carrying several masses in several planes. Rotary balancing on single plane and multiple planes, Shaking forces in single cylinder engine, Partial balancing of reciprocating masses. Balancing of multi cylinder in-line engines, V type engines and Radial engines.

UNIT-III
Friction: Screw threads, pivots, collars, clutches
Brakes and Dynamometers: Block, band, block and band, internally expanding shoe brakes. Prony brake, rope brake, belt transmission, epicyclic gear transmission, torsion dynamometers.

UNIT-IV
Governors: Classification of governors, Watt, Porter, Hartnell and Hartung governors, Controlling Force, Stability, Isochronism, Sensitivity, Power and Effort of governors.
Flywheels: Functions, Differences between flywheel and governor. Turning moment diagrams, flywheel analysis for I.C. Engines and Presses.

UNIT-V:
Introduction to Mechanical Vibrations: Basic concepts of simple Harmonic motion, Free Vibrations, Forced Vibrations and Damped Vibrations of single degree of freedom systems

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: **1 Hour 30 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: **U18PC540ME**
Credits :03	CIE Marks:40	Duration of SEE: 03Hours

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

UNIT-I: **CASTING PROCESS**
Casting terms, pattern materials, types of patterns, pattern allowances, colour code for patterns, Moulding sands, core sands, properties of moulding sand and its ingredients, different types of moulding machines, Directional solidification, use of chaplets, chills, riser and gating design , Numerical problems on Pouring Time, Riser Design and Time taken to fill the mould in different gating systems.

UNIT-II: **SPECIAL CASTING PROCESSES**
Shell moulding, Co2 moulding, die casting, centrifugal casting, investment or lost wax process; Casting defects, causes and remedies, Inspection and testing of casting. Processing of plastics - Extrusion, Injection moulding, Blow moulding and Thermoforming.

UNIT-III: **WELDING PROCESSES**
Solid state welding processes - Friction welding, Forge welding, Explosive welding and ultrasonic welding, Gas welding, Arc welding- SMAW, SAW, GMAW, GTAW, PAW, Atomic hydrogen welding,Numerical Problems on Arc Welding characteristics, Duty cycle, welding efficiency, Welding defects, principle of Soldering and Brazing.

UNIT-IV: **SPECIAL WELDING PROCESSES**
Laser beam welding, Electron beam welding, Thermit welding, and Electro slag welding. Resistance welding processes - Spot welding, Projection welding, Seam welding, Butt welding, weldability, Numerical problems on Resistance welding.

UNIT-V: **FORMING PROCESSES**
Cold & Hot working, Yield criteria, Process description of Forging, Rolling, Extrusion, Wiredrawing, Blanking, Piercing, Bending, Deep drawing, Stretch forming, Spinning. Numerical problems on Rolling, drawing, shearing and deep drawing operations.

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

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

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

Duration of Internal Test: **1 Hour 30 Minutes**

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

DEPARTMENT OF MECHANICAL ENGINEERING
DESIGN OF MACHINE ELEMENTS
SYLLABUS FOR B.E. V-SEMESTER

Instruction : 3 Hours / week	SEE Marks : 60	Course Code : U18PC550ME
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

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

UNIT-I
Design considerations of Machine Elements: Materials used in machine design and their specifications according to Indian Standards. Codes and standards used in design. Important mechanical properties of materials used in design. Preferred numbers. Manufacturing considerations in design. Review of types of loads and simple stresses. Stresses due to Bi-axial and Tri-axial loads. Factor of safety. Theories of failures. Design of components subjected to impact loading.

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

UNIT-III
Design of shafts: solid, hollow and splined shafts under torsion and bending loads. ASME code for design of shafts. Design of keys. Design of couplings - Muff, Split muff, Flange, Flexible, Marine type couplings. Design of pulleys and chain drives.

UNIT-IV
Design of Bolts and nuts, locking devices for nuts, bolts of uniform strength, bolted joints under eccentric loads.
DesignofCotter and Knuckle joints.

UNIT-V
Design of Screws: Design of power Screws and screw jack. Differential and Compound Screws.
Design of riveted and welded joints under direct and eccentric loads.

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

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

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

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

Duration of Internal Test: 1 Hour 30 Minutes

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

Department of Mechanical Engineering

SKILL DEVELOPMENT-III: TECHNICAL SKILLS
SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):1:0:0	SEE Marks:40	Course Code: **U18MC510ME**
Credits :01	CIE Marks:30	Duration of SEE: 02 Hours

COURSE OBJECTIVE	COURSE OUTCOMES	
The objective of the course is to	*On completion of the course, students will be able to*	
formulate script files and plots using MATLAB and develop programs and solve differential equations.	1	utilise MATLAB for mathematical operations using built-in functions.
	2	formulate matrices for solution of equations using MATLAB.
	3	develop 2-D plots using MATLAB for graphical representation.
	4	develop programs using conditional statements.
	5	solve differential equations using MATLAB.

UNIT –I
Starting MATLAB, MATLAB Windows., Working in Command Windows, Working with Arithmetic operations with scalars, order of preference, using MATLAB as a calculator, Display of formats, Elementary Math-building functions, Assignment operators, rules about variables, Examples of MATLAB applications, Problems.

UNIT-II
Creating Arrays and matrices, matrix operations, Examples of Applications.

Unit III
Script files, Creating, saving and running a script file, Global variables, input and output commands. 2D plots, Plots with special graphics, multiple plots, examples. Creating a function file, running function file, feval command, examples and mathematical applications.

Unit IV
Progamming in Mat lab, conditional statements, loops, nested loops, Examples, Polynomials, curve fitting and interpolation, Examples and Applications, 3D plots, line plots, mesh and surface plots, plots with special graphics., view command, Examples.

Unit V
Differentiation and integration, Solving ordinary Equations with one variable, Finding minimum and maximum of a function, Numerical integration, solving Ordinary differential equations, Non-linear equations.

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

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

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

Duration of Internal Test: **1 Hour 30 minutes**

DYNAMICS AND METROLOGY LAB
SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code: **U18PC531ME**
Credits :01	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The *objective of this course is to*	*On completion of the course, students will be able to*
1 understand the dynamic behaviour of mechanical systems like governors, cams, gyroscope, rotating machines and spring-mass systems; 2 apply principles of metrology in the measurement using various instruments and transducers.	1 analyze the cam profile for different motion characteristics. 2 determine the vibration response of free and forced vibrating systems. 3 make use of the inspection gauges and various measuring instruments for applications such as measuring angles of a single point cutting tool and parameters of screw thread. 4 compare the performance of various thermocouples for temperature measurement and also learn about calibration of displacement transducer.

LIST OF EXPERIMENTS
DYNAMICS LAB
1 To study the motion characteristics of the follower with the given profile of the cam.
2 To study the gyroscopic effect on a disc subjected to precessional motion.
3 To study the controlling force curves in dead weight and spring controlled centrifugal governors.
4 To determine the static and dynamic balancing masses in a rotating mass system.
5 Determination of critical speed of the shaft and to study free vibrations of spring mass system with and without damping.
6 To study the undamped and damped forced vibration of SDOF system.
7 To study the undamped and damped forced vibration of MDOF system.

METROLOGY LAB

8 To conduct linear, angular & surface roughness measurements.
9 To conduct angular measurements.
10 To perform the design of snap gauge.
11 To find the chordal thickness of a gear tooth using Gear tooth vernier
12 Determination of screw thread angles using Toolmakers microscope
13 Determination of Tool Angles using Profile Projector
14 To make alignment test on lathe machine.

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

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

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 **Hours**			

Department of Mechanical Engineering

MANUFACTURING PROCESSES LAB
SYLLABUS FOR B.E.V-SEMESTER

L:T:P(Hrs/week):2:0:0	SEE Marks:50	Course Code: **U18PC541ME**
Credits :01	CIE Marks:30	Duration of SEE: 02 Hours

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

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
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:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 **Hours**			

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:--	Course Code: **U18PW519ME**
Credits :01	CIE Marks:50	Duration of SEE: -----

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

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:	-	Max. Marks for Internal Test:	-
Marks for assessment of Mini Project using Rubrics			50

OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS IN
B.E. V SEMESTER (2020-21)

Semester	OE No.	Code No.	Course Name	Credits
V-Semester	OE-III	U18OE510ME	Introduction to Robotics	3
		U18OE520ME	Introduction to Automobile Engineering	3

INTRODUCTION TO ROBOTICS (Open Elective-III)

Instruction : 3 Hours	SEE Marks	: 60	Course Code	: U18OE510ME
Credits : 3	CIE Marks:	: 40	Duration of SEE	: 3 Hours

Course objectives	Course Out comes
The objectives of this course are to: Identify robots and its peripherals for satisfactory operation and control of robots for industrial and non-industrial applications.	On completion of the course, the student will be able to 1. understand the anatomy of the robot and various robot configurations for it's selection depending on the task. 2. classify the end effectors , understand different types of joints, various types of mechanical actuation and robot drive systems for carrying out the assigned job effectively. 3. analyze a planar manipulator through forward kinematics and understand the control of robot manipulator for better reliability and efficiency. 4. classifythe various sensors used in robots for proper selection to an application. 5. summarize various industrial and non-industrial applications of robots for their selection to a particular task.

UNIT-I
ROBOT BASICS
Robot-Basic concepts, Need, Law, History, Anatomy, specifications.
Robot configurations-cartesian, cylindrical, polar ,articulated and SCARA.
Robot wrist mechanism, Precision and accuracy of robot.

UNIT-II
ROBOT ELEMENTS
End effectors-Classification, Types of Mechanical actuation, Gripper design, Robot drive system types: Electrical, pneumatic and hydraulic. Position and velocity feedback devices, Robot joints and links-Types, Motion interpolation.

UNIT-III
ROBOT KINEMATICS AND CONTROL
Robot kinematics – Basics of direct and inverse kinematics, Robot trajectories, 2D and 3D Transformation-Scaling, Rotation and Translation, Homogeneous transformation. D-H matrix. Forward kinematics for a 2-link RR planar manipulator.
Control of robot manipulators – Point to point and Continuous Path Control. Robot programming.

UNIT-IV
ROBOT SENSORS
Sensors in robots – Touch sensors-Tactile sensors – Proximity and range sensors. Force sensors, Light sensors, Pressure sensors.
Introduction to Machine Vision and Artificial Intelligence.

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

Learning Resources:
1. MikellP. Groover, Mitchell Weiss, Roger N Nagel and Nicholas G Odrey, "Industrial Robotics Technology, Programming and Applications", TataMcGraw-Hill Publishing Company Limited , 2008.
2. Deb.S.R and Sankha Deb, "Robotics Technology and Flexible Automation", Tata McGraw HillPublishing Company Limited, 2010.
3. KlafterR.D, Chmielewski T.A, and Negin. M, "Robotic Engineering: An Integrated Approach", Prentice Hall of India Pvt. Ltd.,1994.

4. K.S. Fu,R.C. Gonzalez and C.S.G.Lee , "Robotics control, sensing, vision and intelligence",TataMcGraw-Hill Publishing Company Limited, 2008
5. R.K. Mittal and I.J.Nagrath"Robotics and Control", Tata McGraw-Hill Publishing Company Limited,2003.

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

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

Duration of Internal Test: **1 Hour**

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

DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E. V-SEMESTER
INTRODUCTION TO AUTOMOBILE ENGINEERING (OE-III)

Instruction : 3Hours	SEE Marks : 60	Course Code : U18OE520ME
Credits : 3	CIE Marks : 40	Duration of SEE : 3 Hours

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

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

UNIT-II
Fuel system: Fuel supply system for SI engines and CI engines. Simple carburettor, Introduction to Multipoint fuel injection system (**MPFI**) of petrol engines and Introduction to **CRDI** system for diesel engines.
Cooling system: air cooling, water cooling: Thermo syphon, pump circulation system.
Lubrication system: Petroil System, splash system, pressure lubrication: Wet sump and Dry Sump.
Ignition system: Battery Ignition System, Magneto Ignition System and Electronic Ignition System.

UNIT-III
Suspension system: Rigid axle, Independent suspension system:Double wish bone type, Macpherson strut system, Air suspension system.
Steering system: front axle, wheel alignment, steering geometry: camber, caster, toe-in, toe-out, steering linkage for vehicle with rigid axle front suspension, steering linkage for vehicle with independent front suspension, Ackermann steering mechanism.

UNIT –IV
Power Train: Single plate clutch, Multi plate clutch. Manual Gear Box: sliding mesh gear box, constant mesh gear box, synchromesh gear box and Automatic Gear Box. Working principle of Differential.
Brakes: Types: Drum and Disc brakes, Mechanical and Hydraulic Brakes, **ABS** system.

UNIT –V
Wheels and Tyres: Types of Wheels: wire wheels, disc wheels, alloy wheels. Types of tyres: Tube type, tubeless type. **SRS** Airbag system.
Automobile Emissions and control: Automobile pollutants and sources of pollution. Pollution Control Techniques: Catalytic Converters, EGR and PCV. Bharath emission Norms.

Learning Resources:
1. Crouse & Anglin, "Automobile Engineering", 10th Edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi,. 2007.
2. Kirpal Singh, "Automobile Engineering", Vol.I& II, 13th Edition, Standard Publishers, New Delhi 2013.
3. R.B Gupta, "Automobile Engineering" 7th Edition, Satya Prakashan, New Delhi, 2015.
4. Joseph Heitner, "Automotive Mechanics", 2nd Edition, Affiliated East West Pvt. Ltd., 2013.

5. C.P. Nakra, "Basic Automobile Engineering", 7th Edition, Dhanpat Rai Publishing C (P) Ltd., 2016.

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

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

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION (R-18)
B.E. – MECH : SIXTH SEMESTER (2020-2021)

Course Code	Name of the Course	L	T	P/D	Duration in Hrs	SEE	CIE	Credits
B.E (MECH) VI Semester								
		Scheme of Instruction (Hours per Week)				Scheme of Examination (Maximum Marks)		
THEORY								
U18HS610EH	Skill Development-IV : Soft Skills	1	0	0	2	40	30	1
U18PC620ME	CAD/CAM	3	0	0	3	60	40	3
U18PC630ME	Machine Design	3	0	0	3	60	40	3
U18PC640ME	Metal Cutting and Machine Tools	3	0	0	3	60	40	3
U18PE6x0ME	Professional Elective - I	3	0	0	3	60	40	3
U18PE610ME	Skill Development-IV: Technical Skills	1	0	0	2	40	30	1
U18OE6XXXX	Open Elective-IV	3	0	0	3	60	40	3
U18MC010CE	Environmental Science	2	0	0	3	60	40	0
PRACTICALS								
U18PC621ME	CAD/CAM Lab	0	0	2	3	50	30	1
U18PC641ME	Machine Tools Lab	0	0	2	3	50	30	1
U18PW619ME	Theme Based Project	0	0	2	-	0	30	1
TOTAL		19	0	6		540	390	20
GRAND TOTAL		25				930		20

1) Student should acquire one online course certificate equivalent to two credits during III to VII semester
2) Left over hours allotted to Sports / Library / Mentor Interaction / CC / RC / TC / CCA / ECA

List of Professional Electives - Stream wise (R-18)												
		Design engineering		Manufacturing engineering		Thermal engineering		Industrial engineering		Automobile Engineering	
		Course Code	Title	Course Code	Title	Course Code	Title	Course Code	Title	Course Code	Title
Sem VI	**PE-I**	U18PE610ME	Vibration Analysis and Noise Control	U18PE620ME	Production Drawing	U18PE630ME	Renewable Energy	U18PE640ME	Operations Research	U18PE650ME	Automotive Chassis Components

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

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES
Skill Development-IV (Soft Skills)

SYLLABUS FOR B.E. VI-SEMESTER

L:T : P (Hrs/Week) : 1	SEE Marks : 40	Course Code: **U18HS600EH**
Credits: 1	CIE Marks : 30	Duration of SEE : 2 Hours

COURSE OBJECTIVES	COURSE OUTCOMES *On completion of the course, students will be able to*
1 This is a foundation course and aims at enhancing employability skills in students. 2 Students will be introduced to higher order thinking skills and problem solving on the following areas - Arithmetic ability, Numerical ability and General reasoning. 3 Students will be trained to work systematically with speed and accuracy while problem solving.	1 Solve questions on the above mentioned areas using short cuts and smart methods. 2 Understand the fundamentals concept of Aptitude skills. 3 Perform calculations with speed and accuracy.

UNIT 1 QUANTITATIVE APTITUDE- ARITHMETIC ABILITY ADVANCED
8 hrs

- Time speed and distance
- Time and work
- Interest calculations

UNIT 2 REASONING ABILITY- LOGICAL REASONING
6hrs

- Arrangements- Linear; Circular; Complex
- Puzzles
- Venn diagrams
- Syllogism
- Cubes & Cuboids
- Dices

UNIT 3 REASONING ABILITY- NON VERBAL REASONING 4hrs

- Figure Series
- Figure Completion
- Mirror Images
- Water Images
- Paper Cutting
- Paper Folding
- Embedded Images

UNIT 4 REASONING ABILITY- CRITICAL REASONING PART 1 2hrs

- Statement Assumptions
- Statement Arguments

UNIT 5 REASONING ABILITY- CRITICAL REASONING PART 2 4hrs

- Course Of Action
- Cause & Effect
- Inferences

Learning Resources:

1. scoremore.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   :   1 Hour 30 Minutes

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: **U18PC620ME**
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	compare the different types of modeling techniques and explain the central role solid models play in the successful completion of CAD/CAM-based product development.
	2	develop transformations for 2D geometric modeling.
	3	explain the basic concepts of CNC machines and their programming.
	4	explain the importance of group technology, computer aided process planning, flexible manufacturing system.
	5	understand the latest technologies in computer aided manufacturing.

UNIT-I
Introduction to computer aided design and manufacturing.
Geometric modeling: Wire frame modeling:wire frame entities and their definitions. Interpolation and approximation of curves. Concept of parametric and non–parametric representation of circle and helix curves, **Synthetic Curves**: Parametric representation of cubic spline, Bezier and B– spline curves, continuity, properties and characteristics of splines. Concepts of NURBS.

UNIT-II
Surface Modeling: Analytical surfaces: Definitions of planar, surface of revolution, Tabulated cylinder. Synthetic surfaces: Cubic and Bezier surfaces.
Solid modeling: C– rep and B– rep and feature instancing approaches.
2D Transformation and their mathematics: Translation, scaling, rotation, shearing and reflection about arbitrary points. Concatenated transformations.
CAD Database and Data exchange: CAD Database and structure, IGES and PDES format.

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, Introduction to FANUC, SINUMERIC controllers.
Industrial Robots: Robot Anatomy, Configurations, Controls, Drivers, Programming methods and applications.

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

Learning Resources:

1. Arvid R. Eide, Roland D. Jenison, Lane H. Mashaw, Larry L. Northup, "Introduction to Engineering Design", Mc Graw– Hill, 1998.
2. Ibrahim Zeid, "CAD/CAM, Theory and Practice", McGraw Hill Inc. New York, 2011.
3. Grover, MP and Zimmers E.W., CAD/CAM, Prentice Hall of India, 1989.
4. Rao P.N., "CAD/CAM: Principles and Applications", 2nd Edition, Tata McGraw Hill, New Delhi, 2004.
5. 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: **1 Hour 30 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: **U18PC630ME**
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 condition.
	2	design of helical and leaf springs under direct and eccentric loading for various applications.
	3	design of gears under strength and wear conditions for power transmission.
	4	design sliding and rolling contact bearings for supporting shafts /axles.
	5	estimate the stresses in I.C. Engine parts under strength and thermal loading conditions.

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
Types of gears and materials used. Standards for gear specifications. Design of spur, 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 thrust loads.

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

UNIT-V: I.C. ENGINE PARTS
Design of piston, connecting rod and crank shafts (single throw and overhang).

Learning Resources:

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

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

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

Duration of Internal Test: **1 Hour 30 Minutes**

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

Department of Mechanical Engineering

METAL CUTTING AND MACHINE TOOLS
SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: **U18PC640ME**
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVE	COURSE OUTCOMES	
The *objective of this course is to*	*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 and their constructional features.
	2	identify and use flat surface generating machines and able to perform gear cutting operations.
	3	understand the importance of surface finishing methods, work holding devices.
	4	compute forces in machining operations based on tool material and tool geometry and non conventional machining methods for various machining applications.
	5	interpret functioning of coolants in metal cutting and its thermal effect on tool wear and tool life.

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

UNIT-II
Shaping, **Planning and Slotting**: Principle and quick return mechanisms used, operations and comparison, machining time calculations.
Milling Machine: Kinematic structure of Milling, Operations dividing head, Indexing Methods.

UNIT-III
Surface finishing: Units of surface finish, types of grinding, Abrasives and bonds used for grinding wheels, specifications and selection of grinding wheels. Broaching, Lapping, Honing, Super finishing and Burnishing.
Jigs and fixtures: Design principles of jigs and fixtures, location and clamping. Quick clamping devices, Types of Jigs and Fixtures.

UNIT – IV
Non-traditional machining: working principle process parameters, applications and material removal rate of USM, AJM, EDM, ECM, LBM, and EBM.
Cutting tool materials: Tools material properties. High carbon steel, HSS, Stellites, Carbides, Coated carbides, Diamonds.
Machining: Orthogonal and Oblique cutting, chip formation, types of chips, chip breakers Mechanics of metal cutting, Merchant analysis, Shear angle, Solutions of Merchant and Lee & Shafer. Numerical problems.

UNIT-V
Tool geometry: Nomenclature of single point cutting tool by ASA and ORS systems and conversions. Geometry of drills, milling cutters.
Thermal aspects of metal cutting: Sources of heat generation and heat distribution, various methods of temperature measurement, Cutting fluids and applications.
Tool wear, **tool life and machinability:**Types of wear, mechanism of tool wear, Tool life and Machinability, Machinability index, Taylor's tool life equation. Numerical problems on economics of machining.

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

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

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

Duration of Internal Test: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
VIBRATION ANALYSIS AND NOISE CONTROL (PE-I)
SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: **U18PE610ME**
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES	
The *objective of this course is to*	*On completion of the course, students will be able to*	
formulate mathematical model and determine the characteristics of multi DOF and continuous system vibration; demonstrate the basics of sound in space, classify noise measuring devices and noise control procedures	1	construct the equations of motion and solve for the motion and natural frequency.
	2	solve for the motion and the natural frequency for vibration of a multi degree of freedom damped or undamped system.
	3	develop the equation of motion for continuous systems and find the natural frequencies and mode shapes based on the given boundary conditions.
	4	explain various characteristics of sound, it's propagation and levels in space and compute the acoustic properties at a required point in space.
	5	understand working principle of various noise measurement devices and noise control procedures to avoid the damage caused by Noise on humans.

UNIT-I: INTRODUCTION
Relevance of and need for vibrational analysis – Basics of SHM - Mathematical modelling of vibrating systems - Discrete and continuous systems - single-degree freedom systems - free and forced vibrations, damped and undamped systems.

UNIT-II: MULTI DEGREE FREEDOM SYSTEMS
Free and forced vibrations of multi-degree freedom systems in longitudinal, torsional and lateral modes - Matrix methods of solution-normal modes - Orthogonality principle-Energy methods, Eigen values and Eigen vectors

UNIT-III: CONTINUOUS SYSTEMS
Torsional vibrations - Longitudinal vibration of rods - transverse vibrations of beams - Governing equations of motion - Natural frequencies and normal modes - Energy methods, Introduction to non linear and random vibrations.

UNIT-IV: BASICS OF ACOUSTICS
Speed of Sound, Wavelength, Frequency, and Wave Number, Acoustic Pressure and Particle Velocity, Acoustic Intensity and Acoustic Energy Density, Spherical Wave propagation, Directivity Factor and Directivity Index, Levels and the Decibel, Addition and subtraction of Sound levels, Octave Bands, Weighted Sound Levels.

UNIT-V: NOISE MEASUREMENT AND CONTROL
Sound Level Meters, Intensity Level Meters, Octave Band Filters Acoustic Analyzers, Dosimeter, Measurement of Sound Power, Impact of noise on humans, A-Weighting, Noise control strategy, sound absorption and insulation.

Learning Resources:
1. S.S.Rao, "Mechanical Vibrations ", 5th Edition, Prentice Hall, 2011.
2. L.Meirovitch, "Elements of vibration Analysis", 2nd Edition, McGraw-Hill, New York, 1985.
3. W.T. Thomson, M.D. Dahleh and C Padmanabhan, "Theory of Vibration with Applications", 5th Edition, Pearson Education, 2008.
4. M.L.Munjal, "Noise and Vibration Control", World Scientific, 2013.
5. Beranek and Ver, "Noise and Vibration Control Engineering: Principles and Applications", John Wiley and Sons, 2006.
6. Randall F. Barron, "Industrial Noise Control and Acoustics", Marcel Dekker, Inc., 2003.

Web Resources:
http://www.nptel.ac.in/courses/112103111
http://www.nptel.ac.in/courses/112103112

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: **1 Hour 30 Minutes**

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

Department of Mechanical Engineering

PRODUCTION DRAWING (PE-I)
SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: **U18PE620ME**
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*	
practice the conventional representation of machine elements; limits, fits and tolerances; surface finish and surface treatments; make production drawings and process sheets for a given assembly.	1	Familiar with conventional representation.
	2	understand the use of limits fits and surface finish symbols.
	3	prepare production drawings and process sheets.

UNIT-I: **INTRODUCTION**
Need for a production drawing, Drawing sheet layout, title block, conventional representation of materials, machine components, welding symbols, hydraulic and pneumatic symbols, draughting abbreviations and surface treatment symbols.

UNIT-II: **LIMITS**, **TOLERANCES AND FITS**
Limit systems, Tolerances, Fits, Tolerances of form and position, and their indication on a drawing, material condition(MMC and LMC), Geometrical tolerancing for MMC.

UNIT-III: **SURFACE ROUGHNESS**
Surface Roughness, surface roughness number, surface roughness expected from manufacturing processes, indication of surface roughness, special surface roughness characteristics, direction of lay.

UNIT-IV: **PROCESS SHEET**
Process sheet, its details and uses, process sheet for various machine components like tenon, bearing brass, slip bush, helical gear, flange, main spindle etc.

UNIT-V: **PRODUCTION DRAWING**
Production drawings from assembly drawings indicating conventions of flange coupling, Universal coupling, foot-step bearing, eccentric, stuffing box, hydraulic cylinder, petrol engine connecting rod, cross head, piston and screw jack.

N.B.: Tolerance charts to be provided in the examination hall for calculation of limits.

Learning Resources:

1. K.L. Narayana, P. Kannaiah and K. Venkata Reddy, "Production Drawing", New Age International Pvt. Ltd., Revised Ed. 1997.
2. T. Narasimha Reddy, T. A. Janardhan Reddy and C. Srinivasa Rao, "Production Drawing Practice", Hitech Publishers, 2001.
3. R.K. Jain, "Engineering Metrology", Khanna Publishers, 2009.

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: **1 Hour 30 Minutes**

Department of Mechanical Engineering

RENEWABLE ENERGY (PE-I)
SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: **U18PE630ME**
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*	
study the availability and applications of various renewable energy systems like solar energy, photovoltaic energy, wind energy, geothermal energy, ocean thermal energy, tidal and wave energy, fuel cell energy and biomass energy.	1	use the knowledge of solar energy conversion techniques and calculate conversion efficiency
	2	design wind and geothermal energy systems that are economically feasible and eco-friendly.
	3	understand working of ocean thermal, tidal and wave energy power plants.
	4	understand major components of various fuel-cells.
	5	understand major components of bio-mass energy conversion systems.

UNIT I
Solar Energy: Availability of solar energy, Measurement of sunshine, solar radiation data, estimation of average solar radiation, solar energy selection, selective surfaces, construction of solar flat plate and evacuated tube collectors, solar heating and cooling; other solar thermal applications.
Photo-voltaic Energy: Solar cells – Photo-voltaic conversion efficiency, performance characteristics of solar cells as a function of light intensity, temperature and cell area, Solar cell response under normal condition, solar cell arrays.

UNIT II
Wind Energy: Wind mills and wind turbine systems; classification of wind machines: horizontal & vertical axis configuration; High and low solidity rotors, elements of wind mills and wind turbine systems; Aerodynamic models, Rankine Froud Actuator disc model.
Geo-thermal Energy: Earth as source of heat energy, stored heat and renewability of earth's heat; Nature and occurrence of geo-thermal field; Classification of thermal fields; Model of Hyper-thermal fields & Semi-thermal fields.

UNIT III
Ocean Thermal Energy: Ocean thermal energy sources, Ocean thermal energy power plant development; Closed and open cycles: advantages and operating difficulties.
Tidal & Wave Energy: Tidal power sources; conventional and latest design of tidal power system, the ocean wave, oscillating water column (Japanese) and the Dam.

UNIT IV
Fuel Cell Energy: Description, properties and operation of fuel cells; major components & general characteristics of fuel cells; description of low power fuel cell systems and molten carbonate fuel cell systems.

UNIT V
Bio-mass Energy: Types of conversion techniques for the production of solid, liquid and gaseous fuels by chemical and bio-chemical methods - Bio-gastechnology, principles and feed stock, design of bio-gas plants.

Learning Resources:
1. Twidell J.W. & Weir A., "Renewable Energy Sources", 2nd Edition, EFN Spon Ltd., UK, 1986.
2. G.D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers, New Delhi, 2009.
3. S.P. Sukhatme, "Solar Energy", 3rd Edition, Tata McGraw Hill Pub. Co. Ltd., 2008.
4. Johnson Gary L., "Wind Energy Systems", 2nd Edition, Prentice Hall, New York, 1995.
5. Hall D.D. & Grover R.P., "Biomass Regenerable Energy", 1st Edition, John Wiley, 1989.
6. Leemann&Meliss, "Renewable Energy Sources & Conversion Technology", 4th edition, TMH, 1993.
7. S.Hasan Saeed,D.K.Sharma, "Non –conventional energy Resources", 3rd Edition, S.K.Kataria& Sons, 2012.
Web Resources:
1. www.renewable-energy-sources.com/

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

1	No. of Internal Tests:	02	Max. Marks for each Internal Tests:	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: **1 Hour 30 Minutes**

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

OPERATIONS RESEARCH (PE-I)
SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):3:0:0	SEE Marks:60	Course Code: **U18PE640ME**
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES	
The *objective of this course is to*	*On completion of the course, students will be able to*	
understand the application of mathematics for real time problem solving to LPP, sensitivity analysis under set of constraints, applying mathematical techniques to solve transportation problem and assignment problems, applying time value money and ignoring the same to find the optimal replacement of machines, applying Johnsons rules to find the best sequence to minimize elapsed time and minimum no of servers to minimize waiting time of the customers and optimal utilisation of servers.	1	Optimization of resources in multi disciplinary areas through linear programming under different conditions.
	2	Sensitivity analysis of a linear programming problem as per customer requirements to suit various Organizations.
	3	Minimization of total cost to apply for transportation techniques for the transshipment of Goods and products.
	4	Optimum replacement of a machine by considering or ignoring time value of moneyusing individual/group replacement policy.
	5	Minimization of total elapsed time for sequencing problem processed through different. Minimize waiting time of the customer and optimization of no. of servers.

UNIT – I
Introduction: Definition and scope of operations research.
Linear programming: Introduction, Formulation of linear programming problems, graphical method of solving LP problem, Simplex method, maximization and minimization, degeneracy in LPP, unbounded and infeasible solutions. Introduction of software to solve LPP.

UNIT – II
Duality: Definition, Relationship between optimal primal and dual solutions. Economic interpretation, Post optimal analysis (restricted to variation of resources i.e., RHS), Dual simplex method.

UNIT-III
Transportation model: Finding an initial feasible solution– north west corner method, least cost method, Vogel's approximation method, finding the optimal solution, optimal solution by stepping stone and MODI methods, special cases in transportation problems – Unbalanced transportation problem.
Assignment Problem: Hungarian method of assignment problem, maximization in assignment problem, unbalanced problem, problems with restrictions, travelling salesman problems.

UNIT-IV
Replacement models: Introduction, replacement of items that deteriorate ignoring change in money value, replacement of items that deteriorate considering change in money value with time, replacement of items that fail suddenly – individual replacement policy, group replacement policy.
Game theory: Introduction, 2 person zero sum games, maximin– minimax principle, principle of dominance, solution for mixed strategy problems graphical method for 2 x n and m x 2 games.

UNIT-V
Sequencing models: Introduction, general assumptions, processing n jobs through 2 machines, processing 'n' jobs through m machines processing 2 jobs through m machines.
Queuing theory: Introduction, single channel – poission arrivals – exponential service times with infinite population and finite population.

Learning Resources:
1. Hamady A. Taha, "Operations Research – An introduction", 6th Edition, PHI Pvt. Ltd., 1997.
2. S.D. Sharma, "Operations Research", Kedarnnath, Ramnath& Co., Meerut, 2009.
3. Harvey M. Wagner, "Principles of Operations Research", 2nd Edition, PHI Pvt. Ltd., 1980.
4. V.K. Kapoor, "Operations Research", S. Chand Publishers, New Delhi, 2004.
5. S.S. Rao, "Engineering optimisation – Theory and Practice", 4th Edition, John Wiley & Sons Inc., 2009 .

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: **1 Hour 30 Minutes**

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

Department of Mechanical Engineering

AUTOMOTIVE CHASSIS COMPONENTS (PE-I)
SYLLABUS FOR B.E.VI-SEMESTER

L:T:P (Hrs/week): 3:0:0	SEE Marks:60	Course Code: **U18PE650ME**
Credits :03	CIE Marks:40	Duration of SEE:03Hours

COURSE OBJECTIVES	COURSE OUTCOMES	
The objective of this course is to	*On completion of the course, students will be able to*	
study the various components of the power transmission system of an automobile.	1	describe the chassis layouts and their construction.
	2	describe the engine front axle and steering system.
	3	study various power drives for power transmission.
	4	analyse the working principle and operation of differential and rear axle.
	5	know the details of suspension system of an automobile.

UNIT-I : INTRODUCTION
Types of chassis layout with reference to power plant locations and drives, vehicle frames, various types of frames, constructional details, materials, testing of vehicle frames, unitized frame body construction.

UNIT-II : FRONT AXLE AND STEERING SYSTEM
Types of front axles, construction details, materials, front wheel geometry: castor, camber, king pin inclination, toe-in. conditions for true rolling motion of wheels during steering, steering geometry, Davis steering system and Ackermann, constructional details of steering linkages, different types of steering gear boxes, steering linkages and layouts, turning radius, wheel wobble, power assisted steering, steering of crawler tractors.

UNIT-III: DRIVE LINE
Effect of driving thrust and torque reactions, Hotchkiss drive, torque tube drive and radius rods, propeller shaft, universal joints, front wheel drive, different types of final drive, double reduction and twin speed final drives.

UNIT-IV
Differential principle, construction details of differential unit, non-slip differential, differential locks, differential housings, construction of rear axles, types of loads acting on rear axles, fully floating, three quarter floating and semi floating rear axles, rear axle housing, construction of different types of axle housings, multi axle vehicles.

UNIT-V: SUSPENSION SYSTEM
Need of suspension system, types of suspension systems. Suspension springs and constructional details. Characteristics of leaf springs, coil springs and torsion bar. Independent suspension, rubber suspension, pneumatic suspension, shock absorbers.

Learning Resources:

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

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

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

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Mechanical Engineering
SKILL DEVELOPMENT-IV : TECHNICAL SKILLS
SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):1:0:0	SEE Marks:40	Course Code: **U18MC610ME**
Credits :01	CIE Marks:30	Duration of SEE:02Hours

COURSE OBJECTIVES	COURSE OUTCOMES	
The *objective of this course is to*	*On completion of the course, students will be able to*	
acquire necessary skills to design solution for a given problem using CATIA, Hyperworks and Python Programming.	1	construct solid models and assemblies using Catia software for engineering applications
	2	analyse the mechanical components using Hyperworks software for engineering applications.
	3	acquire knowledge in basic and object oriented python for application to engineering problems.

UNIT-I: HYPERWORKS
Introduction of CAD/CAE and short cut keys, Geometry clean-up - Creating of nodes- Temporary nodes-checking of distance points, Lines and Line edit- using of tool options (translate, rotate, mid surface etc.), HYPERMESH 1D, 2D, 3D elements- meshing- use short cut keys, Introduction of meshing- How to do sheet metal meshing, 2D Meshing, 2D Meshing with and without surface- FEM Checks, BIW meshing with rules and quality checks

UNIT-II: HYPERWORKS (Contd.)
3D Meshing, HEXA meshing, Short notes on linear static and nonlinear analysis, Stress strain curve for ductile and brittle Materials , assign material properties - Boundary conditions, rigid, OptiStruct - Different types of analysis of sheet metal and solid, Tool Test on Assembly Component

UNIT-III: CATIA V5
Introduction to CATIA VS, Sketcher & Part Design · Profile Creation · Basic, Additional and Dress up Features · Reusing Data · Finalizing Design Intent, Assembly Design Content- Managing Parts & Appling Constraints- Saving Assembly Files- Managing Product Structure- Design in Context,
Drafting- Use of ISO Standards Creation of Sheets- Title block Views- Creation Dimensioning and Annotations

UNIT-IV: CATIA V5 (Contd.)
Generative Shape Design- Introduction- Surface Design- Creating Wire frame - Geometry reference- wire frame elements- create simple surfaces- Surface Operation.
Important case studies and practice models discussed during Training which are related to Aerospace, Automotive and Mechanical Domain.

UNIT-V: PYTHON PROGRAMMING
Python fundamentals, syntax, REPL and command line handling, if/else/elif blocks, Loops (while and for with and without else, how to break or continue loops) , Data Types, Operators in python, Objects in python , Mutable and immutable objects, List/Tuples/Dictionaries (how to use and types of operations)

Functions (how to define functions, type of positional or keywords arguments, default arguments, calling functions, returning values, pass by reference and/or value, variable length arguments), Modules and Packages (definitions, how to use modules, import & from statement , how to write your own modules), Classes in Python (definition, how to write a class, instance creation, role of init and self, data members, methods and it's invocations), String Handling, Exceptions (try/except/raise)

File Handling (read / write / append / seek / tell), Binary numbers - bitwise and/or etc., List comprehensions and it' applications, Lambda functions, Nested objects (List of dictionaries, List of lists etc.), Variables and its scope (global and nonlocal etc.), Boolean and/or etc, Type conversions (string toint/float etc.), Debugging python code.

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

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

Duration of Internal Test: **1 Hour 30 Minutes**

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

ENVIRONMENTAL SCIENCE
SYLLABUS FOR B.E. VI-SEMESTER

L : T : P (Hrs./week): 2 : 0 : 0	SEE Marks:60	Course Code: U18MC010CE
Credits : - - -	CIE Marks:40	Duration of SEE: 3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
In this subject the students will	*Upon the completion of this course students will be able to*
1. Describe various types of natural resources available on the earth surface. 2. Explain the concepts of an ecosystem and the biotic and abiotic components of various aquatic ecosystems. 3. Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity. 4. Explain the causes, effects and control measures of various types of environmental pollutions. 5. Describe the methods for water conservation, the causes, effects of global warming, climate change, acid rain, ozone layer depletion, population explosion.	1. Describe the various types of natural resources. 2. Differentiate between various biotic and abiotic components of ecosystem. 3. Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India. 4. Illustrate causes, effects, control measures of various types of environmental pollutions. 5. Explain the methods of water conservation, causes, effects of climate change, global warming, acid rain and ozone layer depletion, population explosion.

UNIT-I: Environmental Studies: Definition, importance of environmental studies. Natural resources: Water resources; floods, drought, conflicts over water, dams-benefits and problems. Food resources; Effects of modern agriculture, fertilizer-pesticide problems, water logging salinity. Energy resources: Renewable and non-renewable energy resources. Land Resources, soil erosion and desertification.

UNIT-II: Ecosystems: Structure and function of an ecosystem, producers, consumers and decomposers, food chains, food webs, ecological pyramids, aquatic ecosystems (ponds, oceans, estuaries).

UNIT-III: Biodiversity: Genetic, species and ecosystem diversity. Values of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT-IV: Environmental Pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and solid waste & e-waste management.

UNIT-V: Social Aspects and the Environment: Water conservation, Climate change, global warming, acid rain, ozone layer depletion. Environmental Impact Assesment, population explosion.

Learning Resources:

1. Deswal S. and Deswal A., A Basic Course on Environmental studies, Dhanpat Rai & Co Pvt. Ltd. 2013.
2. Benny Joseph, Environmental Studies, Tata McGraw-Hill, 2006.
3. Suresh K. Dhameja, Environmental Studies, S.K. Kataria & Sons, 2010.
4. De A.K., Environmental Chemistry, New Age International, 2003.
5. Odum E.P., Fundamentals of Ecology, W.B. Sunders Co., USA, 2004.
6. Sharma V.K., Disaster Management, National Centre for Disaster Management, IIPE, Delhi, 2013.
7. Rajagopalan R., Environmental Studies, Second Edition, Oxford University Press, 2013.

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	:	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

Department of Mechanical Engineering

CAD / CAM LAB
SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):2:0:0	SEE Marks:50	Course Code: **U18PC621ME**
Credits :01	CIE Marks:30	Duration of SEE: 03 Hours

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

I. **CAD**:
1. 2-D Sketching, annoatations of simple views.
2. Constraining of 2-D sketches.
3. Constraining of 2-D complex sketches.
4. Development of sectional views and assigning of materials.
5. Introduction to development of 3-D components.
6. Development of 3-D components using sweeping, extrusion and revolve etc.
7. Introduction and assembly of Flange coupling.
8. Assembly of Plummer block and Universal coupling
9. Assembly of Connecting rod.

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

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

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 **Hours**			

Department of Mechanical Engineering

MACHINE TOOLS LAB
SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks:50	Course Code: **U18PC641ME**
Credits :01	CIE Marks:30	Duration of SEE: 03Hours

COURSE OBJECTIVES	COURSE OUTCOMES	
The *objective of this course is to*	*On completion of the course, students will be able to*	
familiarise the student with various machine tools, machining operations and analyse the machining process.	1	classify different types of machine Tools based on metal cutting operation.
	2	compute Various kinds of forces involved in turning operations.
	3	interpret and grind Single Point Cutting Tool to the required Geometry, Multi Point cutting Tool Geometries
	4	perform various operations on Lathe, Shaper, Milling , Drilling &planing Machines to produce required component.

List of Experiments

1. Eccentric turning operation on a lathe

2. Thread cutting and boring on a lathe

3. To make rectangular and 'V' grooves on a shaper.

4. To manufacture a spur gear using simple indexing on a milling machine.

5. Experimental determination of shear angle by measuring thickness and length of chips on a lathe

6. Measuring the cutting forces using Lathe tool dynamometer

7. Experimental determination of Taylor's constant and exponent for HSS and carbide tools

8. Measurement of cutting temperature using thermocouple on a lathe

9. Grinding of HSS tool using tool and cutter grinder to a given geometry.

10. PCD drilling on radial drilling machine and tapping.

11. Grinding of flat surfaces and measurement of surface finish.

12. Estimation of MRR using Electric Discharge Machine (EDM),

13. Manufacturing a component using 3D printing machine.

14. Demonstration of planing process on a planer machine.

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

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

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for day-to-day laboratory class work			18
Duration of Internal Test: 2 **Hours**			

Department of Mechanical Engineering

THEME BASED PROJECT
SYLLABUS FOR B.E.VI-SEMESTER

L:T:P(Hrs/week):0:0:2	SEE Marks:0	Course Code: **U18PW619ME**
Credits :01	CIE Marks:30	Duration of SEE: ---

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 and define the problem.
	2	Plan the activities for carrying out the research work in teams to solve the problem.
	3	Obtain the skills to conduct investigations on the chosen problem and submit the report.

The theme based project can be assigned on individual basis or to a group consisting of maximum three students per batch.

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.

No. of Internal Tests:	-	Max. Marks for Internal Test:	-
Marks for assessment of Theme based Project using Rubrics			30

OPEN ELECTIVES OFFERED BY VARIOUS DEPARTMENTS IN
B.E. VI SEMESTER (2020-21)

Semester	OE No.	Code No.	Course Name	Credits
VI-Semester	OE-IV	U18OE610ME	Additive manufacturing and its applications	3
		U18OE620ME	Industrial Administration and Financial Management	3

VASAVI COLLEGE OF ENGINEEING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E VI Semester (2020-21)
Additive Manufacturing and its Applications (Open Elective-IV)

Instruction: 3 Hours / week	SEE Marks:60	Course Code : U18OE610ME
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

Course objectives	Course Outcomes
The objectives of this course are to : understand the fundamentals of various additive manufacturing technologies and their applications in Engineering Industry.	On completion of the course the student will be able to: 1. understand the fundamentals of prototyping. 2. study the principle, process, advantages and limitations of liquid based AM systems. 3. study the principle, process, advantages and limitations of solid based AM systems. 4. study the principle, process, advantages and limitations of powder based AM systems. 5. study the applications of AMT in various engineering industries.

UNIT-I

Introduction, Prototyping fundamentals, Historical development, Fundamentals of rapid prototyping, Advantages of Rapid prototyping, Commonly used terms, Rapid prototyping process chain, 3D modelling, Data Conversion, and transmission, Checking and preparing, Building, Post processing, AM data formats, Classification of AM process

UNIT-II

Liquid based AM systems: Stereolithography Apparatus(SLA): Models and specifications, Process, Working principle, photopolymers, Photopolymerisation, 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 AM 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 AM systems: Selective laser sintering(SLS): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies.
Three dimensional printing (3DP): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies.

UNIT-V

Applications of AM systems: Applications in 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. abd LIM C.S., "World Rapid prototyping : Principles and Applications", 2nd Editon, Scientific Publications, 2004
2. D.T.Pham and S.S.Dimov, "Rapid Manufacturing", Springer, 2001.
3. AmithabaGhose, "Rapid prototyping", Eastern Law House, 1997.
4. Paul F.Jacobs, "Stereolithography and other RP & M Technologies", ASME Press, 1996.
5. Paul F.Jacobs, "Rapid Prototyping & Manufacturing", ASME Press, 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: **1 Hour 30 Minutes**

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS FOR B.E VI Semester (2020-21)
Industrial Administration and Financial Management (Open Elective-IV)

Instruction: 3 Hours / week	SEE Marks:60	Course Code : U18OE620ME
Credits: 3	CIE Marks:40	Duration of SEE : 3 Hours

Course objectives	Course Out comes
The objectives of this course are to:	*On completion of the course, the student will be able to:*
1. aware about types of business forms, organization structures, plant layouts, merits, demerits and applications.	1. understand business forms, organization structures and plant layouts.
2. understand method study procedure, PME, time study techniques and wage incentives.	2. implementation of method study and estimation of standard time.
3. importance of PPC and improving quality by control charts and sampling plants.	3. understand types of production, functions of PPC, quality control by charts and sampling.
4. optimization of inventory to minimize total cost and other optimization techniques like LPP, project management techniques.	4. implement optimization techniques like LPP, assignment and project management techniques.
5. estimate selling price of a product, TVM and budgeting techniques, depreciation methods.	5. understand BEA, estimation of depreciation, selling price of a product and capital budgeting techniques.

UNIT – I
Industrial Organization : Types of various business organisations. Organisation structures and their relative merits and demerits. Functions of management.
Plant location and layouts: Factors affecting the location of plant and layout. Types of layouts and their merits and demerits.

UNIT – II
Work study: Definitions, Objectives of method study and time study. Steps in conducting method study. Symbols and charts used in method study. Principles of motion economy. Calculation of standard time– by– time study and work sampling. Performance rating factor. Types of ratings. Jobs evaluation and performance appraisal. Wages, incentives, bonus, wage payment plans.

UNIT – III
Inspection and quality control: Types and objectives of inspection S.Q.C., its principles quality control by chart and sampling plans. Quality circles, introduction to ISO.
Production planning and control: Types of manufacture. Types of production. Principles of PPC and its function. Production control charts.

UNIT – IV
Optimisation: Introduction to linear programming and graphical solutions. Assignment problems.
Project Management: Introduction to CPM and PERT. Determination of critical path.
Material Management: Classification of materials. Materials planning. Duties of purchase manager. Determination of economic order quantities. Types of materials purchase.

UNIT – V
Cost accounting: elements of cost. Various costs. Types of overheads. Break even analysis and its applications. Depreciation. Methods of calculating depreciation fund. Nature of financial management. Time value of money. Techniques of capital budgeting and methods. Cost of capital. financial leverage.
Learning Resources:
1. Pandey I.M., "Elements of Financial Management", Vikas Publ. House, New Delhi, 1994
2. Khanna O.P., "Industrial Engineering and Management", Dhanapat Rai & Sons.
3. Everrete E Admaa & Ronald J Ebert , "production and Operations Management", 5th Ed. , PHI , 2005
4. S N Chary, "Production and Operations Management", 3rd Ed. , Tata McGraw Hill, , 2006
5. Pannerselvam, "production and Operations Management", Pearson Education, 2007
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