Sri Vasavi Engineering College (Autonomous)

(Sponsored by Sri Vasavi Educational Society)

(Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada)

(Accredited by NBA & NAAC with 'A' Grade, Recognized by UGC Under Section 2(f) & 12(B))

Pedatadepalli, Tadepalligudem, W.G.Dt, A.P-534101

Department of Mechanical Engineering

Agenda of the 3rd BOS meeting of the department on 03-06-2020

Item No.1

Review of course structure for V & VI semesters of B. Tech under V18 Regulations.

Item No.2

Approval of syllabi for the courses offered in V & VI semesters B. Tech under V18 Regulation.

Item No.3

Approval of list of courses offering under Open Elective- I in VI semester B. Tech under V18 Regulation for all other branches and the approval of their detailed syllabi.

Item No.4

Approval for offering minor degree in DATA SCIENCE offered by Department of Computer Science and Engineering for B. Tech Mechanical Engineering students under V18 Regulation

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Department of Mechanical Engineering

Date:03-06-2020

Third meeting of BOS in Mechanical Engineering department along with external members is held on 03/06/2020 at 10.00 AM in online mode through GoTo meeting app in view of COVID-19 pandemic.

The following members are present.

S. No	Name of the BOS Members
1.	Dr.N. Mohan Rao, Professor &CE, JNTUK,Kakinada
2.	Dr. R.V. Chalam, Professor,NIT,Warangal
3.	Dr. A. Krishnaiah, Professor, Osmania University, Hyderabad
4.	Sri S.S. SubramanyaSastry, Director Projects,Renprotech Solutions Pvt. Ltd., Bangalore.
5.	Sri A.Sai Krishna, Alumni,Maruthi design and engg. Pvt.ltd ,Bangalore
6.	Dr. G.V.N.S.R. RatnakaraRao, Professor &Principal, SVEC
7.	Dr. M.V. Ramesh, Chairman & HOD, SVEC
8.	All the BOS internal members

Minutes of meeting

Chairman welcomed all the BOS members and introduced to all the BOS-internal members.

Item No. 1: Review of course structure for V & VI semesters of B. Tech under V18 Regulations.

- Lab course named Python Programming Lab (course code. V18CSL05) was included in V semester.
- Theory of Machines Lab (V18MEL08) is shifted from V semester to VI semester,
- The MNC Course Essence of Indian Traditional Knowledge **(**V18ENT08) was replaced with Intellectual Property Rights and Patents (V18MET46) in V semester.
- The credits of Operations Research (V18MET21) and that of Elective in VII semester are reduced from 4 to 3 credits.
- The approved revised course structure is attached in **Annexure-I.**

Item No. 2: Approval of syllabi for the courses offered in V & VI semesters B. Tech under V18 Regulation.

- The approved syllabi for the courses are attached in **Annexure-II.**

Item No. 3: Approval of list of courses offering under Open Elective- I in VI semester B. Tech under V18 Regulation for all other branches and the approval of their detailed syllabi.

- Introduction to Robotics theory course (V18MEOE3) was included in Open Elective-I of VI semester.
- The course codes of Open Elective-1, Basic Mechanical Engineering V18MET39 & Green Engineering Systems V18MET40 have been changed to V18MEOE1 & V18MEOE2.
- The approved courses and their syllabi is attached in **Annexure-III.**

Item No. 4: Approval for offering minor degree in DATA SCIENCE offered by Department of Computer Science and Engineering for B. Tech Mechanical Engineering students under V18 Regulation.

- Approved by the BOS members.

Chairman (Head –ME)
Head of the Department
Mechanical Engineering
Sri Vasavi Engineering College
TADEPALLIGUDEM-534101

Annexure - I

Course Structure of Mechanical Engineering - V18 Regulation
(For 2018 – 2019 Admitted Batch)

I SEMESTER						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	**V18ENT01**	English – I	2	0	0	MNC
2	**V18MAT01**	Engineering Mathematics – I	3	1	0	4
3	**V18PHT01**	Optics And Waves	3	1	0	4
4	**V18EET01**	Basic Electrical and Electronics Engineering	3	1	0	4
5	**V18CHT02**	Environmental Studies	3	0	0	MNC
6	**V18ENL01**	English Communication Skills Lab - I	0	0	2	MNC
7	**V18MEL01**	Engineering & IT Workshop	0	0	3	1.5
8	**V18EEL01**	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
9	**V18PHL01**	Optics And Waves Lab	0	0	3	1.5
Total			14	3	11	16.5

Total Contact Hours: 28 Total Credits: 16.5

II SEMESTER						
S.No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	**V18ENT02**	English – II	2	0	0	2
2	**V18MAT02**	Engineering Mathematics – II	3	1	0	4
3	**V18CHT01**	Engineering Chemistry	3	1	0	4
4	**V18CST01**	Programming in C for problem solving	3	0	0	3
5	**V18MET01**	Engineering Graphics	1	0	3	2.5
6	**V18ENL02**	English Communication Skills Lab – II	0	0	2	1
7	**V18CSL01**	Programming lab in C for problem solving	0	0	3	1.5
8	**V18CHL01**	Engineering Chemistry Lab	0	0	3	1.5
Total			12	2	11	19.5

Total Contact Hours: 25 Total Credits: 19.5

- V18MET02 - Introduction to Engineering Mechanics (EEE)

II B.Tech.

III Semester						
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**Credits**
1	**V18MAT04**	Probability & Statistics	3	1	0	4
2	**V18MET03**	Engineering Mechanics	3	1	0	4
3	**V18MET04**	Thermodynamics	3	1	0	4
4	**V18MET05**	Fluid Mechanics & Fluid Machines	3	0	0	3
5	**V18MET09**	Materials Engineering	3	0	0	3
6	**V18MEL02**	Machine Drawing	0	0	3	1.5
7	**V18MEL03**	Fluid Mechanics & Fluid Machines Lab	0	0	3	1.5
8	**V18ENT03**	Professional Communication Skills-I	3	0	0	MNC
			18	**3**	**6**	**21**

Contact hours: 27Total Credits: 21

IV Semester						
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**Credits**
1	**V18MET07**	Applied Thermodynamics	3	0	0	3
2	**V18MET08**	Mechanics of Solids	3	1	0	4
3	**V18MET06**	Theory of Machines – I	3	0	0	3
4	**V18MET14**	Manufacturing Processes	3	0	0	3
5	**V18MET11**	Instrumentation & Control Systems	3	0	0	3
6	**V18MEL05**	Mechanics of Solids & Materials Engineering Lab	0	0	3	1.5
7	**V18MEL11**	Manufacturing Process Lab	0	0	3	1.5
8	**V18ENT11**	Constitution of India	2	0	0	MNC
9	**V18ENT04**	Professional Communication Skills-II	3	0	0	MNC
			20	**1**	**6**	**19**

Contact hours: 27Total Credits: 19

- V18MET12 – THPM (FOR EEE BRANCH)
- V18MEL07 – THPM LAB (FOR EEE BRANCH)

III B.Tech

V Semester						
S.No.	Course Code	Course	L	T	P	Credits
1	V18MET13	Heat Transfer	3	1	0	4
2		Professional Elective – I	3	0	0	3
3	V18MET15	Theory of Machines – II	3	1	0	4
4	V18MET16	Design of Machine Elements- I	3	0	0	3
5	V18MET17	Metal Cutting & Machine Tools	3	0	0	3
6	V18MEL10	Thermal Engineering Lab	0	0	3	1.5
7	V18MEL16	Metal Cutting & Machine Tools Lab	0	0	3	1.5
8	V18CSL05	Python Programming Lab	0	0	3	1.5
9	V18MET46	Intellectual Property Rights and Patents	2	0	0	MNC
10	V18ENT05	Professional Communication Skills-III	4	0	0	MNC
			21	2	9	21.5

Contact hours:32Total Credits:21.5

VI Semester						
S.No.	Course Code	Course	L	T	P	Credits
1	V18MET10	Metrology	3	0	0	3
2	V18MET18	Design of Machine Elements –II	3	1	0	4
3	V18MET19	Robotics	3	0	0	3
4	V18MBET51	Managerial Economics and Financial Analysis	3	0	0	3
5		Open Elective-I(From other Dept.s)	3	0	0	3
6	V18MEL06	Metrology and Instrumentation & Control Systems Lab	0	0	3	1.5
7	V18MEL08	Theory of Machines Lab	0	0	3	1.5
8	V18MEL09	Heat Transfer Lab	0	0	3	1.5
9	V18ENT06	Professional Communication Skills-IV	4	0	0	MNC
			19	1	9	20.5
Contact hours: 29 Total Credits:20.5						

Professional Elective –I	**Open Elective –I**
V18MET37- Internal Combustion Engines V18MET38- Nanotechnology	V18MEOE1- Basic Mechanical Engineering V18MEOE2- Green Engineering Systems V18MEOE3- Introduction to Robotics.

IV B.Tech

VII Semester						
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**Credits**
1	**V18MET20**	Automation in manufacturing	3	0	0	3
	V18MET21	Operation Research (Humanities)	3	0	0	3
	ELECTIVE-1	**V18MET22-**Industrial Engineering and management **V18MET23-**Composite Materials **V18MET24-**Refrigeration & Air Conditioning	3	0	0	3
.2	**ELECTIVE-2**	**V18MET25 -**Total Quality Management **V18MET26 -** Finite Element Methods **V18MET27 -** Micro Electro Mechanical Systems	3	0	0	3
5		**Open Elective-II**	3	0	0	3
6	**V18MEL12**	Simulation Lab	0	0	3	1.5
7	**V18MEL13**	Production Drawing Lab	0	0	3	MNC
8	**V18MEL14**	Project Work –PART-A	0	0	9	4.5
			15	**0**	**15**	**21**

Contact hours: 30 Total Credits: 21

VIII Semester						
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**Credits**
1		**OPEN ELECTIVE-III**	3	0	0	3
2	**ELECTIVE-3**	**V18MET28 -** Automobile Engineering **V18MET29 -** Mechatronics **V18MET30 -** Gas Dynamics and Jet Propulsion	3	0	0	3
3	**ELECTIVE-4**	**VV18MET31 –** Process Planning & Cost Estimation **V18MET32 -** Non Destructive Evaluation **V18MET33 -** Industrial Hydraulics and Pneumatics	3	0	0	3
4	**ELECTIVE-5**	**V18MET34 -** Computational Fluid Dynamics **V18MET35-** Production Planning and Control **V18MET36 -** Energy Conservation and Management	3	0	0	3
5	**V18MEL15**	Project Work –PART-B	0	0	18	9
			12	**0**	**18**	**21**

Contact hours: 30 Total Credits: 21

Open Elective –II	**Open Elective –III**
V18MET41- Unconventional Machining Process **V18MET42-** Computer Aided Design **V18MET44-** Condition Monitoring & Machine learning **V18MET45-** Entrepreneurship	**V18MET43-** Power Plant Engineering **V18MBET54**- Principles of Management

Annexure - II

Syllabi for the courses offered in V & VI semesters B. Tech under V18 Regulation for the Academic Year 2020-2021

V Semester

V18MET13	HEAT TRANSFER	L	T	P	C
		3	1	0	4

Note: Heat transfer data books are allowed

Course Outcomes:

After successful completion of the course, the student will be able to

CO1	Illustrate the basic modes of heat transfer, basic laws of heat transferand to develop solution for one dimensional steady state heat conduction problems.	K3
CO2	Interpret theheat transfer through extended surfaces, to findsolution for one dimensional extended surfaces and unsteady state heat conduction problems.	K3
CO3	Illustrate convective heat transfer and to apply Dimensional analysis concept to convective heat transfer.	K3
CO4	Apply empirical correlations for forced and free convection tocompute values for the convection heat transfer coefficient.	K3
CO5	Apply empirical correlations for phase change process to calculate values for the convection heat transfer coefficient and to Illustrate Heat Exchangers.	K3
CO6	Employ the principles of radiation heat transfer, to find the shape factor and heat transfer rate through radiation.	K3

UNIT-I

Introduction: Different Modes of Heat Transfer, Governing Laws of Heat Transfer, Applications of Heat Transfer.

Conduction heat transfer:

General Heat Conduction Equation: Derivation of the equation in (i) Cartesian, (ii) Polar and (iii) Spherical Co-ordinate Systems.

Steady-state one-dimensional heat conduction in Cartesian System: Steady-state one-dimensional heat conduction problems (i) with and without heat generation and (ii) with and without variable thermal conductivity, Thermal Resistances in Series and in Paralleland Numerical Problems.

Steady-state radial heat conduction in Polar and spherical Systems: Steady-state one-dimensional heat conduction problems (i) with and without heat generation and (ii) with and without varying thermal conductivity, Thermal Resistances in Series and Numerical Problems.

Critical Thickness of Insulation: Concept, Derivation and Numerical Problems.

UNIT – II

Extended Surfaces (Fins): Classification, Applications, Straight Rectangular Fins - long fin, fin with insulated tip and short fin, Temperature Distribution and Heat Transfer Calculations, Fin Efficiency and Effectiveness and Numerical Problems.

One dimensional Transient (Unsteady-state) conduction heat transfer: Definition, Systems with negligible internal resistance, Numerical Problems, Heisler and Grober charts: Solutions to various one-dimensional problems using the charts, Numerical problems.

UNIT – III

Convective heat transfer: Classification of convective heat transfer, dimensional analysis – application of Buckingham Pi Theorem for forced and free convection, Significance of non-dimensional numbers, concepts of continuity, momentum and Energy Equations, boundary layer theory.

UNIT –IV

Forced convection:

External flows: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer over flat plates, cylinders, spheres and Numerical Problems.

Internal flows: Concepts about hydrodynamic and thermal boundary layer – division of internal flow based on this –use of empirical relations for horizontal pipe flow, annulus flow and Numerical Problems.

Free convection: Development of hydrodynamic and thermal boundary layer along a vertical plate – useof empirical relations for vertical plates, vertical tubes, horizontal tubes and Numerical Problems.

UNIT V

Heat transfer with phase change:

Boiling: Definition, types, regimes of Pool boiling - Numerical Problems on nucleate boiling, critical heat flux and film boiling using empirical correlations.

Condensation: Definition, Film wise and drop wise condensation, Numerical Problems on film condensation over vertical and horizontal cylinders using empirical correlations.

Heat Exchangers: Definition, Classification, LMTD method, Effectiveness - NTU method, overall heat transfer coefficient, fouling factor and Numerical Problems.

Chart Solution Procedures for solving Heat Exchanger problems: Correction Factor Charts and Effectiveness-NTU Charts and Numerical Problems.

UNIT VI

Radiation heat transfer:Fundamental principles - Gray, White, Opaque, Transparent and Black bodies, Emissivity, Planck's distribution law, Wien's displacement law, Kirchoff's law, Lambert's cosine law and the Stefan-Boltzmann law, Irradiation, total and monochromatic quantities, concepts of shape factor, heat exchange between two black bodies, heat exchange between grey bodies, radiation shields, electrical analogy for radiation networks and Numerical problems.

TEXT BOOKS:

1. Heat Transfer, JP HOLMAN,Tata McGraw HillPublications,Special Indian edition.
2. Heat Transfer, P.K.Nag, Tata McGraw Hill Publications.
3. Fundamentals of Engineering Heat and Mass Transfer, R.C.Sachdeva, New AgeInternational Publications.

REFERENCES:

1. Heat and Mass Transfer, Cengel, McGraw Hill Publications.
2. Heat and Mass Transfer /Arora and Domkundwar/Dhanpatrai& sons
3.Principles of Heat Transfer, Frank Kreith, R. M. Manglik& M. S. Bohn, Cengage learning publishers.
4. Heat and Mass Transfer /D.S.Kumar / S.K.Kataria& Sons
5. Heat and mass transfer, R.K. Rajput, S. Chand Publications, Revised edition

V18MET37	INTERNAL COMBUSTION ENGINES (ELECTIVE-I)	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of the course, the student will be able to

CO1	Understand the affects of various losses that occur in the actual engine operation and the working principles of I.C.Engines.	K2
CO2	Illustrate the function of fuel supply and ignition systems.	K2
CO3	Understand the function and necessity of lubrication, cooling and governing systems.	K2
CO4	Interpret the combustion phenomena in S.I. and C.I. Engines and effect of various engine operating parameters on it.	K3
CO5	Calculate the performance parameters of I.C.Engines.	K3
CO6	Assess the emission parameters and alternate fuels used in I.C.Engines.	K3

UNIT I

Air standard and actual cycles:

Comparison of cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down, Loss due to gas exchange process, Loss due to Rubbing Friction.

Basics of IC Engines:

Classification, Nomenclature of engine , working principles of two stroke and four stroke S.I. and C.I.Engines, comparison, Valve timing and port timing diagrams, Scavenging of two stroke engines.

UNIT II

Elements of Fuel supply system and Ignition system in IC Engines:

Requirements of fuel supply system, components and working of simple and modern carburettor, Simple carburetor limitations, components and working of electronic fuel Injection system, types of diesel injection system, requirements of ignition system, types ofignition systems.

UNIT III

Sub Systems of IC Engines:

Supercharger, methods of supercharging, supercharging limits, Turbochargers, methods of turbocharging, effect of engine variables on engine friction, types of lubrication systems, Introduction to engine cooling, types of cooling system, governing of IC engine.

UNIT IV

Combustion in IC Engines:

Combustion in S.I. Engine and C.I. Engines: Normal Combustion and abnormal combustion, Stages of combustion in S.I. Engine, Types of Abnormal combustion, Pre-ignition and knocking , Fuel requirements, fuel rating, Anti knock additives, . Detonation and its Control. Stages of combustion in C.I. Engines, Delay period, Factors influencing delay period, Diesel knock, Control of diesel knock, types of combustion chamber, Fuel requirements and fuel rating.

UNIT-V

Measurement, Testing and Performanceof IC Engines:

Engine performance Parameters, Measurement of engine power , determination of IP,BP, FP, IMEP, BMEP, various efficiencies, engine performance characteristics and affecting variables, preparation of the Heat balance sheet.

UNIT VI

Emissions fromIC Engines:

Sources of SI and CI engine emissions. Harmful effects.Emissions measurement methods.Methods for controlling emissions in SI and CI engine.catalytic converters, exhaust gas recirculation, EURO/ Bharat Stage emission norms.

Alternate Fuels For IC Engines: Need for use of alternate fuels. Use of alcohol fuels.Biodiesel.Biogas and Hydrogen in engines.

TEXT BOOKS:

1. Internal Combustion Engines, Ganesan,V., Tata McGraw Hill Publishing Company.
2. A Course in Internal Combustion Engines, Mathur, M.L. and Sharma, R.P., DhanpatRaiandSons.
3. I.C. Engines Fundamentals, Heywood J.McGraw Hill publications.

REFERENCE BOOKS:

1. Thermal Engineering, R.K.Rajput, Lakshmi Publications.
2. Heat engines, Vasandani, Kmar Publications.
3.Thermal Engineering, PL Ballany, Khanna Publications.

V18MET38	NANO TECHNOLOGY (ELECTIVE-I)	L	T	P	C
		3	0	0	3

Course Outcomes:
After successful completion of the course, the student will be able to

CO1	Understand the essential concepts used in nanotechnology	K2
CO2	Identify the various nanomaterialsproperties	K2
CO3	Describe the syntheses and fabrication methods	K2
CO4	Expand the various characterization Techniques	K2
CO5	Examine the Carbon nano technology and applications	K3
CO6	Use of the various applications of Nano technology	K3

UNIT-I :
INTRODUCTION:History of nano science, definition of nano meter, nano materials, nano technology. Classification of nanomaterials.Crystal symmetries, crystal directions, crystal planes.Band structure.

UNIT-II :
PROPERTIES OF MATERIALS:Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, opto electronic properties. Effect of size reduction on properties, electronic structure of nano materials.

UNIT-III :
SYNTHESIS AND FABRICATION: Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for preparation of nano particle – Bottom Up Approach – sol gel synthesis, hydro thermal growth, thin film growth, PVD and CVD; Top Down Approach – Ball milling, micro fabrication, lithography. Requirements for realizing semiconductor nano structures, growth techniques for nano structures.

UNIT-IV :
CHARECTERIZATION TECHNIQUES:X-Ray diffraction and Scherrer method, scanning electron microscopy, transmission electron microscopy, scanning probe microscopy, atomic force microscopy, piezoresponse microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy.

UNIT-V :
CARBON NANO TECHNOLOGY: Characterization of carbon allotropes, synthesis of diamond – nucleation of diamond, growth and morphology. Applications of nanocrystalling diamond films, grapheme, applications of carbon nano tubes.

UNIT-VI :
APPLICATIONS OF NANO TECHNOLOGY:Applications in material science, biology and medicine, surface science, energy and environment. Applications of nano structured thin fins, applications of quantum dots.

TEXT BOOKS:
1. Nano science and nano technology by M.S Rama Chandra Rao, Shubra Singh, Wiley publishers.

REFERENCE BOOKS:
1. Introduction to Nano Technology by Charles P. Poole, Jr., Frank J.Owens, Wiley publishers.
2. Nanotechnology by Jermy J Ramsden, Elsevier publishers.
3. Nano Materials- A.K.Bandyopadhyay/ New Age Introdu.
4. Nano Essentials- T.Pradeep/TMH.
5. Nanotechnology the Science of Small by M.A Shah, K.A Shah, Wiley Publishers.
6. Principles of Nanotechnology by Phani Kumar, Scitech.

V18MET17	METAL CUTTING &MACHINE TOOLS	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of the course, the student will be able to

CO1	Examine the mechanism of chip formation in machining and explain different parameters involved in machining process	K3
CO2	Describe various types of lathe machines and their operations	K3
CO3	Explain the construction and working of shaper, slotter, planar, drilling and boring.	K2
CO4	Explain the construction and working of various milling and grinding machines	K2
CO5	Illustrate the basic principle and working of Ultrasonic machining, Abrasive jet machining and Electrochemical machining.	K3
CO6	Illustrate the basic principle and working of Electric discharge machining, electron beam machining, Laser beam machining.	K3

UNIT I:

FUNDAMENTALS OF MACHINING:

Elementary treatment of metal cutting theory – element of cutting process –geometry of single point tool angles, chip formation and types of chips – built up edge and its effects chip breakers, mechanics of orthogonal cutting –Merchant's force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, coolants, tool materials.

UNIT II:

LATHE MACHINES:

Engine lathe, principle of working, specification of lathe, types of lathe, work holders tool holders, taper turning, thread turning for lathes and attachments. Turret and capstan lathes, collet chucks, other work holding, tool holding devices.

UNIT III:

SHAPING, SLOTTING AND PLANNING MACHINES:

Principles of working – principal parts – specifications, operations performed, machining time calculations.

DRILLING & BORING MACHINES:

Principles of working, specifications, types, operations performed – tool holding devices – twist drill– Boring Machines – fine Boring Machines – jig boring machine, deep hole Drilling machine.

UNIT IV:

MILLING MACHINES:

Principles of working , specifications , classification of Milling Machines, Principle features of horizontal, vertical and universal Milling Machine, machining operations, types of cutters, methods of indexing.

FINISHING PROCESSES:

Theory of grinding, classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations.

UNIT V:

Need for non-traditional machining methods-classification of modern machining processes.

Ultrasonic machining :

Basic principle, equipment, applications, advantages and limitations.

Abrasive jet machining :

Basic principle, equipment, advantages ,limitations. and applications

Electro-chemical machining:

Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing, advantages, limitations and applications.

UNIT VI:

Electric Discharge Machining:

Basic principle, equipment of Electric Discharge Machining, and wire EDM, advantages, limitations and applications.

Electron Beam Machining, Laser Beam Machining :

Basic principle and theory, advantages, limitations and applications.

TEXT BOOKS :

1. Production Technology by R.K. Jain and S.C. Gupta.
2. Workshop Technology – B.S. Raghuwanshi – Vol II/DhanpatRai& Co. (P) Ltd
3. Elements of Workshop Technology Vol 2- S K Hajrachoudhury/Asia Publishing House
4. Advanced machining processes/ VK Jain/ Allied publishers.

REFERENCES:

1. Metal cutting Principles by M.C. Shaw
2. Metal cutting and machine tools by Boothroyd
3. Production Technology by H.M.T. (Hindustan Machine Tools).
4. Modern Machining Process / Pandey P.C. and Shah H.S./ TMH.
5. New Technology / Bhattacharya A/ The Institution of Engineers, India 1984.

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V18MET15	THEORY OF MACHINES – II	L	T	P	C
		3	1	0	4

Course Outcomes:

After successful completion of the course, the student will be able to

CO1	Apply gyroscopic effect for stabilization of sea vehicles, aircrafts and automobilevehicles etc.,	K3
CO2	Compute friction for torque transmission of mechanical systems	K3
CO3	Interpret dynamic force analysis of slider crank mechanism in designof flywheel.	K3
CO4	Examine the performance of different types of Governors	K3
CO5	Illustrate balancing of reciprocating and rotary masses.	K3
CO6	Calculate the natural frequencies of Discretesystems starting from the general equation of displacement.	K3

UNIT – I

PRECESSION: Gyroscopes, effect of precession motion on the stability ofmoving vehicles such as motor car, motor cycle, aero planes and ships.

UNIT – II

FRICTION: Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis.

CLUTCHES: Friction clutches- single disc or plate clutch, multiple disc clutch, cone clutch, centrifugal clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle, **Band and Block Brake.** General description and operation of dynamometers: Prony, Rope brake, Epicyclic, Bevis Gibson and belt transmission.

UNIT – III

TURNING MOMENT DIAGRAMS: Dynamic force analysis of slider crank mechanism, inertia torque, angular velocity and acceleration of connecting rod, crank effort and turning moment diagrams, fluctuation of energy, fly wheels and their design.

UNIT – IV

GOVERNERS: Watt, porter, proellandHartnell governors, sensitiveness, isochronisms and hunting.

UNIT – V

BALANCING: Balancing of rotating masses single and multiple, single and different planes, use analytical and graphical methods. Primary and secondarybalancing of reciprocating masses.analytical and graphical methods, unbalanced forces and couples, examination of "V" multi cylinder in line and radial engines for primary and secondary balancing.Balancing machines for single plane and two plane balancing.

UNIT – VI

VIBRATIONS: Free Vibration of spring mass system, oscillation of pendulums, centers of oscillation and suspension. Transverse loads, Natural frequency, types of damping, damped free vibration. Vibrations of beams with concentrated and distributed loads. Dunkerly's methods, Raleigh's method, whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems, Simple problems on forced damped vibration, vibration isolation and transmissibility.

TEXT BOOKS:

1. Theory of Machines / S.S Rattan/ Mc. Graw Hill Publ.
2. Mechanism and machine theory by Ashok G. Ambedkar, PHI Publications.

REFERENCE BOOKS:

1. Mechanical Vibrations / R.Venkatachalam/ PHI publishers
2. Theory of Machines / Shiegly / MGH
3. Theory of Machines / Thomas Bevan / CBS Publishers
4. Theory of machines / Khurmi / S.Chand.
5. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age.

V18MET16	DESIGN OF MACHINE ELEMENTS- I	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of the course, the student will be able to

CO1	Calculate the stresses in the design of machine elements.	K3
CO2	Develop various criteria for designing the machine elements subjected to varying loads	K3
CO3	Examine the strength of bolted joints under different loads	K3
CO4	Examine the strength of welded and riveted joints under different loads	K3
CO5	Illustrate design of various types of Keys and different joints	K3
CO6	Apply different type of loads on shafts and different couplings	K3

UNIT – I

Design Methods: The art and science of machine design, types of design methods, stages in machine design, selection of materials, types of loads, factor of safety, Design for strength and rigidity, preferred numbers.

Theories of Failure: Maximum Principal stress theory, Maximum shear stress theory, Maximum principal strain theory, Maximum strain energy theory, Maximum distortion energy theory, impact loads, problems.

UNIT – II

Strength of Machine Elements : Stress Concentration, theoretical stress concentration factor, fatigue stress concentration factor, notch sensitivity, design for fluctuating stresses, endurance limit, Estimation of endurance strength, S-N curves, Goodman's line, soderberg's line, modified Goodman's line, Gerber parabola, related problems.

UNIT – III

Bolted Joints: Advantages , types of Bolted joints, stresses in bolts, bolts of uniforms strength bolted joints under eccentric loading, , locking devices.

UNIT – IV

Riveted Joints: Types of riveted joints, modes of failure, strength and efficiency of riveted joints, pitch of the rivets, design stresses, boiler joints, diamond joints, and riveted joints under eccentric loading.
Welded Joints: Types of welded joints, strength of welds, Design of simple welded joints &Design of welded joints subjected to eccentric loading.

UNIT – V

Keys, Cotters and Knuckle Joints: Types of Keys, stresses in Keys, design of rectangular, square and taper Keys, design of spigot and socket, sleeve and cotter, jib and cotter joints and knuckle joints.

UNIT – VI

SHAFTS: Design of solid and hollow shafts for strength and rigidity – design of shafts for combined bending and axial loads – shaft sizes – BIS code.

SHAFT COUPLING: Rigid couplings – muff, split muff and flange couplings, flexible couplings – flange coupling (modified).

Note: Design data book is NOT Permitted for examination

TEXT BOOKS :

1. Machine Design, R.K. Jain , Khanna Publishers, New Delhi.
2. Design of Machine Elements, V.B.Bhandari , TMH Publishers, New Delhi.

REFERENCE BOOKS :

1. Machine Design, Schaum’series , TMH Publishers, New Delhi.
2. Machine Design,Sadhu Singh, Khanna Publishers, New Delhi.
3. Mechanical Engineering Design,Joseph E. Shigely, TMH Publishers, New Delhi.
4. Design of Machine Elements,M.F. Spotts, PHI Publishers, New Delhi.
5. Machine Design,Pandya and Shah, Charotar Publishers, Anand.

Data Hand Book :1. Machine Design Data Hand Book,Mahadevan and Balaveera Reddy [1996], CBS Publishers, New Delhi.

V18MEL10	THERMAL ENGINEERING LAB	L	T	P	C
		0	0	3	1.5

Course Outcomes:

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Demonstrate the valve timing diagram & port timing diagram of IC engines	K3
CO2	Test the performance of I.C.Engines.	K4
CO3	Test the performance of compressors.	K4

1. Draw the valve timing diagram of 4-stroke diesel engine
2. Draw the port timing diagram of 2-stroke petrol engine
3. Plot the performance characteristics of single cylinder diesel engine for different loads
4. Draw the heat balance sheet of multi cylinder petrol engine
5. Determine the efficiency of single cylinder petrol engine
6. Conduct economical speed test on SI engine
7. Find the indicated power of individual cylinders of an engine by using morse test
8. Determine the volumetric efficiency of air compressor
9. Conduct performance test on variable compression ratio engine
10. Study on dismantling and assembly of engines
11. Study of boilers

V18MEL16	Metal Cutting & Machine Tools Lab	L	T	P	C
		0	0	3	1.5

Course Outcomes:

After successful completion of the course, the student will be able to

CO1	Examine the various mechanisms used in different machine tools	K3
CO2	Operate different machine tools to prepare different jobs	K3
CO3	Demonstration of simulation of metal cutting	K3

List of experiments:

1. Introduction of general purpose machines: lathe, drilling machine, milling machine, shaper, planing machine, slotting machine, cylindrical grinder, surface grinder and tool and cutter grinder.
2. Step turning and taper turning on lathe machine
3. Thread cutting and knurling on -lathe machine.
4. Drilling and tapping on drilling machine
5. Plane the surface using shaper
6. Preparation of key way using slotter
7. Gear blank preparation using milling machine
8. Ground the cylindrical pieces with cylindrical grinder
9. Finish the blocks with surface grinder
10. Preparation of tool angles using Tool and cutter grinder

Add-on experiments: Metal cutting simulation demonstration

V18MET46	INTELLECTUAL PROPERTY RIGHTS AND PATENTS	L	T	P	C
		2	0	0	MNC

Course Outcomes:

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Understand the different types & basics of Intellectual Property Rights .	K2
CO2	Understand the principle and registration of copyrights.	K2
CO3	Understand the principle and registration of patents.	K2
CO4	Understand the principle and registration of trademark.	K2
CO5	Understand the principle and registration of trade secrets.	K2
CO6	Understand IT Act and Cyber Law.	K2

UNIT-I

Introduction to Intellectual Property Law, IntellectualProperty Law Basics, Types of Intellectual Property, InnovationsandInventions of Trade related Intellectual Property Rights, AgenciesResponsible for Intellectual Property Registration, Infringement, Over use or Misuse of Intellectual Property Rights.

UNIT-II

Introduction to Copyrights, Principles of Copyright, Rights Afforded by Copyright Law –Copyright Ownership, Transfer and Duration, Rights ofDistribution, Rights of performers, Copyright Formalities and Registration, International Copyright Law.

UNIT-III

Introduction to Patent Law, Rights and Limitations, Patent Requirements, Ownership and Transfer , Patent ApplicationProcess and Granting of Patent, Patent Infringement and Litigation, International Patent Law PatentCooperation Treaty.

UNIT-IV

Introduction to Trade Mark , Trade Mark Registration Process, Postregistration procedures, Trade Mark maintenance, Transfer of rights, Dilution of Ownership of Trade Mark, Likelihood of confusion , Trade Marks Litigation , International Trade Mark Law.

UNIT-V

Introduction to Trade Secrets, Maintaining Trade Secret ,Employee Access Limitation, Employee Confidentiality Agreement , Trade Secret Law, Trade Secret Litigation, Breach ofContract .

UNIT-VI

Introduction to Cyber Law, Information Technology Act, Cyber Crime andE-commerce, Data Security, Confidentiality, Privacy, Internationalaspects of Computer and Online Crime.

TEXT BOOKS:

1. Deborah E.Bouchoux: Intellectual Property. Cengagelearning ,New Delhi.
2.PrabhuddhaGanguli: Intellectual Property Rights Tata Mc-GrawHill, New Delhi.
3. Cyber Law. Texts & Cases, South-Western's Special TopicsCollections.

REFERENCE BOOKS:

1. KompalBansal&ParishitBansal, Fundamentals of IPR forEngineers, BS Publications.
2. R. Radha Krishnan, S. Balasubramanian: Intellectual PropertyRights, Excel Books. New Delhi.
3. M.Ashok Kumar and Mohd.Iqbal Ali: Intellectual Property Right, Serials Pub.

VI Semester

V18MET10	METROLOGY	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of the course, the student will be able to

CO1	Apply tolerances and fits for selected product quality.	K3
CO2	understand the standards of length, angles and various limit gauges	K2
CO3	Understand the optical measuring instruments and their applications	K2
CO4	Explain the measurement of surface finish with various comparators	K2
CO5	Use appropriate method and instruments for inspection of various gear elements and thread elements.	K3
CO6	Describe the flatness measurement and machine tool alignment tests	K2

UNIT-I

SYSTEMS OF LIMITS AND FITS: Introduction, nominal size, tolerance, limits, deviations, fits -Unilateral and bilateral tolerance system, hole and shaft basis systems- interchangeability, selective assembly. International standard system of tolerances, selection of limits and tolerances for correct functioning.

UNIT-II

LINEAR MEASUREMENT: Length standards, end standards, slip gauges- calibration of the slip gauges, dial indicators, micrometers.

MEASUREMENT OF ANGLES AND TAPERS: Different methods – bevel protractor, angle slip gauges- angle dekkor- spirit levels- sine bar- sine table, rollers and spheres used to measure angles and tapers.

LIMIT GAUGES:Taylor's principle – design of go and no go gauges; plug, ring, snap, gap, taper, profile and position gauges.

UNIT-III

OPTICAL MEASURING INSTRUMENTS: Tools maker's microscope and uses – autocollimators, optical projector, optical flats and their uses.

INTERFEROMETRY: Interference of light, Michaleson's interferometer, NPL flatness interferometer, and NPL gauge interferometer.

UNIT-IV

SURFACE ROUGHNESS MEASUREMENT:Differences between surface roughness and surface waviness –Numerical assessment of surface finish-CLA, Rt., R.M.S. Rz, R10 values, Method of measurement of surface finish – Profilograph, Talysurf, ISI symbols for indication of surface finish.

COMPARATORS: Types – mechanical, optical , electrical and electronic, pneumatic comparators and their uses.

UNIT – V

GEAR MEASUREMENT:Nomenclature of gear tooth, tooth thickness measurement with gear tooth vernier, pitch measurement, total composite error and tooth to tooth composite errors, rolling gear tester, involute profile checking.

SCREW THREAD MEASUREMENT: Elements of measurement – errors in screw threads- concept of virtual effective diameter, measurement of effective diameter, angle of thread and thread pitch, and profile thread gauges.

UNIT – VI

FLATNESS MEASUREMENT:Measurement of flatness of surfaces- instruments used- straight edges- surface plates – auto collimator.

MACHINE TOOL ALIGNMENT TESTS:Principles of machine tool alignment testing on lathe, drilling and milling machines.

TEXT BOOKS:

1. Engineering Metrology by R.K.Jain / Khanna Publishers
2. Engineering Metrology by Mahajan / DhanpatRai Publishers

REFERENCE BOOKS:

1. Dimensional Metrology, Connie Dotson, Cengage Learning.
2. Engineering Metrology by I.C.Gupta / DhanpatRai Publishers.
3. Precision Engineering in Manufacturing by R.L.Murthy / New Age.
4. Engineering Metrology and Measurements by NV Raghavendra, L Krishna murthy, Oxford publishers.
5. Engineering Metrology by KL Narayana, Scitech publishers.

V18MET18	DESIGN OF MACHINE ELEMENTS- II	L	T	P	C
		3	1	0	4

Course Outcomes:
After successful completion of the course, the student will be able to

CO1	Apply the concepts of different types of Bearings for design	K3
CO2	Illustrate the design concept of IC Engine Parts	K3
CO3	Employ the design conceptsto curved beams	K3
CO4	Examine differentTransmissions Systems and power screws	K2
CO5	Analyze the design of Spur & Helical Gears	K4
CO6	Calculate various parameters of mechanical springs	K3

UNIT –I
Design Of Bearings: Applications and types of Journal bearings, Lubrication, Bearing Modulus, clearance ratio, bearing materials, journal bearing design, Ball and roller bearings, Static loading of ball & roller bearings, bearing life, Failure of bearings.Selection of Anti-friction bearings

UNIT- II
Design of Engine Parts: Design of piston, forces acting on piston. Design of Cylinder, Cylinder block. Design of Connecting Rod, stress due to whipping action on connecting rod
ends. Design of Cranks and Crank shafts-Centre and over hung cranks.

UNIT –III
Design of Curved Beams: Introduction, Stresses in curved beams, Expression for radius of neutral axis for rectangular, circular, trapezoidal and T-Section. Design of crane hooks, C –clamps, problems.

UNIT- IV
POWER TRANSMISSIONS SYSTEMS, PULLEYS: Transmission of power by belt and rope drives, transmission efficiencies, belts – flat and V types, ropes, pulleys for belt and rope drives, materials, chain drives, problems. Selection of V-Belts

DESIGN OF POWER SCREWS: Design of screws - square, ACME and buttress, design of nut, possible failures, problems.

UNIT – V
Spur & Helical Gear drives: Spur gears, Helical gears, Load concentration factor, Dynamic load factor, Surface compressive strength, Bending strength, Design analysis of spur and Helical gears, Estimation of centre distance, module and face width, Check for dynamic and wear considerations, problems.

UNIT- VI
Mechanical Springs: Stress and deflections of helical Springs, Compression springs, Springs for fatigue loading, Natural frequency of helical springs, Energy storage capacity. Shear stress multiplication Factor, Wahl correction factor and design of helical springs under static and dynamic loads.Design of leaf springs, co-axial springs, related problems.

Note: Design data book is permitted for examination

TEXT BOOKS:
1. Machine Design/V.Bandari/TMH Publishers
2. Machine Design/ NC Pandya& CS Shaw/ Charotar publishers
3. Design data book.

REFERENCES:
1. Machine Design: An integrated Approach / R.L. Norton / Pearson Education
2. Mech. Engg. Design / JE Shigley/Tata McGraw Hill education
3. Design of machine elements- spots/Pearson Publications
4. Machine Design-Norton/Pearson Publications

V18MET19	ROBOTICS	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of the course, the student will be able to

CO1	Describe various robot configuration and components	K2
CO2	Select appropriate actuators and sensors for a robot based on specific application	K3
CO3	Apply kinematic and dynamic analysis for simple serial kinematic chains	K3
CO4	Explain trajectory planning for a manipulator	K2
CO5	Understand the Robot Actuators And Feed Back Components	K2
CO6	Illustrate various applications of robots in manufacturing	K3

UNIT-I

INTRODUCTION: Automation principle in Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications. classification by coordinate system.

UNIT – II

COMPONENTS OF THE INDUSTRIAL ROBOTICS:Function line diagram representation of simple Robot, Components. Degrees of freedom – Requirements and challenges of end effectors.Mechanical, Electrical and hydraulic grippers.

UNIT – III

MOTION ANALYSIS:Homogeneous transformations as applicable to rotation and translation – problems. MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.Differential transformation and manipulators, Jacobians – problems Dynamics

UNIT – IV

GENERAL CONSIDERATIONS IN PATH DESCRIPTION AND GENERATION: Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language.

UNIT V

ROBOT ACTUATORS AND FEED BACK COMPONENTS:Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors.
FEEDBACK COMPONENTS:Position sensors – potentiometers, resolvers, encoders and Velocity, proximity sensors.

UNIT VI

ROBOT APPLICATIONS IN MANUFACTURING:Material Transfer – Material handling, loading and unloading- Processing – spot and continuous arc welding & spray painting – Assembly and Inspection.

TEXT BOOKS:

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robotics and Control / Mittal R K &Nagrath I J / TMH.

REFERENCES:

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3.Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science.
4. Introduction to Robotics / John J Craig / Pearson Edu.

V18MEL06	METROLOGY AND INSTRUMENTATION & CONTROL SYSTEMS LAB	L	T	P	C
		0	0	3	1.5

CO1	Experiment and examine errors in calibration of various instruments	K3
CO2	Explain the working principle of metrology and measuring equipments.	K2
CO3	Compute distance, angle and surface finish by using standard measuring equipments	K3

METROLOGY

List of experiments :

1. Measurement of length, height and diameter by vernier calipers, micrometer and height gauge
2. Surface roughness measurement using talysurf
3. Taper angle measurement
4. Tool makers microscope
5. Measurement of bores using dial bore indicator
6. Measurement of thickness of gear tooth by vernier tooth caliper

INSTRUMENTATION & CONTROL SYSTEMS LAB

List of experiments :

1. Study and calibration of LVDT transducer for displacement measurement
2. Calibration of pressure gauge
3. Angular Measurement using angular sensor
4. Measurement of speed using opto-coupler pickup
5. Calibration of strain gauge
6. Study & calibration of resistance temperature detector (RTD) transducer for temperature measurement
7. Study and calibration of a rotameter for water flow measurement
8. Vibration measurement trainer

V18MEL08	THEORY OF MACHINES LAB	L	T	P	C
		0	0	3	1.5

Course Outcomes:

After successful completion of the course, the student will be able to

CO1	Understand the concepts on various machine elements such as governors, springs, flywheel and cam & follower	K2
CO2	Examine the motion of gyroscope and static & dynamic balancing of masses	K3
CO3	Apply the principles of various power transmission systems such as shafts, gears and belt & pulley	K3

List of experiments :

1.To determine whirling speed of shaft theoretically and experimentally.

2. To determine the position of sleeve against controlling force and speed of a Hartnell governor and to plot the characteristic curve of radius of rotation.

3. To analyse the motion of a motorized gyroscope when the couple is applied along its spin axis

4. To determine the frequency of undamped free vibration of an equivalent spring mass system.

5. To determine the frequency of damped force vibration of a spring mass system

6. To study the static and dynamic balancing using rigid blocks.

7. To find the moment of inertia of a flywheel

8. To plot follower displacement vs cam rotation for various Cam Follower systems.

9. To find coefficient of friction between belt and pulley.

10. To study simple and compound screw jack and determine the mechanical advantage, velocity ratio and efficiency

11. To study various types of gears- Spur, Helical, Worm and Bevel Gears

V18MEL09	HEAT TRANSFER LAB	L	T	P	C
		0	0	3	1.5

Course Outcomes:

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Evaluate the amount of heat exchange in various modes of heat transfer for several geometries.	K4
CO2	Evaluate the amount of heat exchange in condensation & boiling processes and for heat exchangers.	K4

List of experiments :

1. Determination of overall heat transfer co-efficient of a composite slab.
2. Determination of efficiency of a pin-fin.
3. Determination of heat transfer rate through a lagged pipe.
4. Determination of thermal conductivity of a metal rod.
5. Determination of Thermal conductivity of liquids and gases.
6. Determination of heat transfer rate through a concentric sphere.
7. Determination of heat transfer coefficient in natural and forced convection
8. Determination of emissivity of a given surface.
9. Determination of Stefan Boltzman constant.
10. Determination of effectiveness of parallel and counter flow heat exchangers.
11. Determination of heat transfer rate in drop and film wise condensation.
12. Determination of critical heat flux.

Add-on experiments:Heat transfer modeling of a simple component used in a heat exchanger using Ansys in the lab (Virtual lab)

Annexure- III

List courses offered under Open Elective -I in VI semester under V18 Regulation for all other branches:

S.No.	Course Code	Name of the Course
1	V18MEOE1	Basic Mechanical Engineering
2	V18MEOE2	Green Engineering Systems
3	V18MEOE3	Introduction to Robotics

Syllabi for the Courses offering under Open Elective - I

V18MEOE1	BASIC MECHANICAL ENGINEERING (OPEN ELECTIVE-I)	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of the course, the student will be able to,

CO1	Understand classification and working of major components in thermal power plants.	K2
CO2	Discuss various metal joining processes	K2
CO3	Classify types of air compressors and refrigeration systems.	K2
CO4	Illustrate the working of internal combustion engines	K2
CO5	Understand basics of heat transfer	K2
CO6	Discuss about functions and operations of machine tools including milling, shaping, grinding and lathe machines	K2

UNIT-I

Steam boilers: Definition, Classification of boilers, essentialities of boilers, working of boilers, boiler mountings and accessories.

UNIT-II

Metal casting- Pattern design, types of sands, moulding tools and mould making.
Metal joining: Arc welding, gas welding, brazing and soldering.
Sheet metal operations: Rolling and extrusion principles.

UNIT-III

Reciprocating and rotary air compressors: uses of compressed air, types, working principle, work done, simple problems. Refrigeration: concepts, principle of refrigeration and types of refrigeration.

UNIT-IV

Internal combustion engines: Classification of IC engines, basic engine components and nomenclature, working principle of engines- Four stroke and two stroke petrol and diesel engines, comparison of CI and SI engines, comparison of four stroke and two stroke engines, problems on indicated power, brake power, friction power, specific fuel consumption, brake thermal efficiency, indicated thermal efficiency and mechanical efficiency.

UNIT-V

Heat Transfer: Modes and governing laws of heat transfer, Thermal Resistance Concept, Composite Walls, Cylinders, Overall Heat Transfer Co-efficient, simple Problems on Heat Transfer.

UNIT-VI

Machine Tools and Machining Processes: Lathe Machine, types, Lathe Operations, Milling Machine-Types, Milling Operations, Drilling Machine,types, Operations, Grinding Machine, types, Operations.

TEXT BOOKS:

1. Elements of Mechanical Engineering – M. L. Mathur, F. S. Mehta and R. P. Tiwari, Jain Brothers, New Delhi.
2. Engineering Heat Transfer - Gupta &Prakash, Nem Chand & Brothers, New Delhi.
3. Workshop Technology (Vol. 1 and 2) – B. S. Raghuvanshi, DhanpathRai and Sons, New Delhi.
4. Mechanical Engineering Science K R Gopala Krishna, Subhas publications

REFERENCE BOOKS:

1. Thermal Engineering, Ballaney,P.L., Khanna Publishers, 2003
2. Elements of Mechanical Engineering, A.R.Asrani, S.M.Bhatt and P.K.Shah, B.S. Publs.
3. Production Technology by P.N.Rao by I& II McGraw-Hill publications

V18MEOE2	GREEN ENGINEERING SYSTEMS (OPEN ELECTIVE-I)	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of the course, the student will be able to,

CO1	Understand about solar radiation and its collection	K2
CO2	Discuss about various solar energy storage systems and applications.	K2
CO3	Explain about bio-mass, geothermal energy and ocean energy	K2
CO4	Classify the energy efficient systems.	K2
CO5	Describe different energy efficient processes.	K2
CO6	Discuss about features of green buildings	K2

UNIT-I

INTRODUCTION: SOLAR RADIATION: Role and potential of new and renewable sources, Environmental impact of solar power, structure of the sun, the solar constant, instruments for measuring solar radiation. Photo voltaic energy conversion – types of PV cells.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, advanced collectors.

UNIT – II

SOLAR ENERGY STORAGE AND APPLICATIONS: Sensible, latent heat, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

WIND ENERGY: Sources, basic principle of wind energy conversion, basic components, horizontal and vertical axis windmills.

UNIT – III

BIO-MASS: Principles of bio-conversion, types of bio-gas plants, bio fuels.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy.

OCEAN ENERGY: OTEC, Principles of utilization, OTEC plants.

Tidal and wave energy: Tidal power plants, hydel power plants.

UNIT–IV

ENERGY EFFICIENT SYSTEMS:

(A) ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, controls for HVAC (heating, ventilation and air conditioning), demand site management.

(B) MECHANICAL SYSTEMS: Fuel cells- principle, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

UNIT-V

ENERGY EFFICIENT PROCESSES: Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, vegetable based cutting fluids, zero waste manufacturing.

UNIT – VI

GREEN BUILDINGS: Definition, features and benefits. Sustainable site selection and planning of buildings for maximum comfort. Environmental friendly building materials like bamboo, timber, rammed earth, hollow blocks, lime & lime pozzolana cement, agro materials and industrial waste, Ferro cement and Ferro-concrete, alternate roofing systems, paints to reduce heat gain of the buildings. Energy management.

TEXT BOOKS:

1. Solar Energy – Principles of Thermal Collection and Storage,Sukhatme S.P. and J.K.Nayak, TMH.
2. Non-Conventional Energy Resources,Khan B.H., Tata McGraw Hill, New Delhi, 2006.
3. Green Manufacturing Processes and Systems, Edited by J. Paulo Davim, Springer 2013.

REFERENCES:

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Ra.
2. Principles of Solar Energy / Frank Krieth& John F Kreider.
3. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Renewable Energy Technologies/ G.D Roy

V18MEOE3	INTRODUCTION TO ROBOTICS (OPEN ELECTIVE-I)	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of the course, the student will be able to,

CO1	Explain various automations and components.	K2
CO2	Discuss the anatomy of the robot with its components	K2
CO3	Illustrate robot configurations	K3
CO4	compute trajectory planning system	K3
CO5	Discuss various robot actuation and feedback sensors	K2
CO6	Explain different robot applications in industrial purpose	K2

UNIT-I

INTRODUCTION: Automation principle and objectives, Reasons for automation, steps in automation strategy, drawbacks of conventional Manufacturing, elements of automation system, input/output devices for discrete data, application of automation.

UNIT – II

ROBOTICS: Definition of Robot, History of robotics, Robotics market and the future prospects, Robot Anatomy, Robot motions, Joints, Work volume, work space, Robot drive systems.

UNIT – III

Robot configurations: Polar, Cartesian, cylindrical and Jointed-arm configuration. Precision of movement – Spatial resolution, Accuracy, Repeatability, End effectors – Tools and grippers, Degrees of freedom – Asimov's laws of robotics dynamic stabilization of robots.

UNIT IV

TRAJECTORY: Introduction to trajectory, path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion.

UNIT –V

Robot actuation and feedback components

Position sensors – Potentiometers, resolvers, encoders, velocity sensors.Proximity and tactile sensor in robotics.Actuators - Pneumatic and Hydraulic Actuators, Electric Motors, Stepper motors, Servomotors, Power Transmission systems.

UNIT –VI

Robots Technology of the future: Artificial Intelligence, Goals of AI research, Telepresence and related technologies, Mechanical design features, Mobility, locomotion and navigation, system integration and networking.

TEXT BOOKS:

1. Automation, Production systems, and computer integrated manufacturing-MikellP.Groover 3rd edition, Pearson 2009
2. Industrial Robotics-Groover, Weiss, Nagel, McGraw Hill International, 2nd edition, 2012

REFERENCES:

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall.
3. Robot Analysis and Intelligence / Asada and Slow time / Wiley InterScience.