

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** 

## **COURSE STRUCTURE AND SYLLABUS**

For

# V18 Regulation

## **B.Tech. MECHANICAL ENGINEERING**

(Applicable for batches admitted from 2018-2019)



DEPARTMENT OF MECHANICAL ENGINEERING (Accredited by NBA)

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

PEDATADEPALLI, TADEPALLIGUDEM - 534 101



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### **DEPARTMENT OF MECHANICAL ENGINEERING**

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

I SEMESTER									
S.No Course Code Course Name				Т	Р	C			
1	V18ENT01	English – I	2	-	-	MNC			
2	V18MAT01	Engineering Mathematics – I	3	1	-	4			
3	V18PHT01	HT01 Optics and Waves		1	-	4			
4	V18EET01	Basic Electrical and Electronics Engineering	3	1	-	4			
5	V18CHT02	Environmental Studies	3	-	-	MNC			
6	V18ENL01	English Communication Skills Lab – I	-	-	2	MNC			
7	V18MEL01	Engineering and IT Workshop	-	-	3	1.5			
8	V18EEL01	Basic Electrical and Electronics Engineering Lab	-	-	3	1.5			
9	9 V18PHL01 Optics and Waves Lab		-	-	3	1.5			
Total			14	3	11	16.5			

Total Contact Hours: 28 Total Credits: 16.5

II SEMESTER								
S.No	<b>Course Code</b>	Course Name	L	Т	Р	C		
1	V18ENT02	English – II	2	-	-	2		
2	V18MAT02	Engineering Mathematics – II	3	1	-	4		
3	V18CHT01	Engineering Chemistry	3	1	-	4		
4	V18CST01	Programming in C for problem solving	3	-	-	3		
5	V18MET01	Engineering Graphics	1	-	3	2.5		
6	V18ENL02	English Communication Skills Lab – II	-	-	2	1		
7	V18CSL01	Programming lab in C for problem solving	-	-	3	1.5		
8	V18CHL01	Engineering Chemistry Lab	-	-	3	1.5		
	Total			2	11	19.5		

Total Contact Hours: 25 Total Credits: 19.5

III Semester								
S.No.	S.No. Course Code Course			Т	Р	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		
	Total				6	21		

Contact hours: 27 Total Credits: 21

IV Semester								
S.No.	<b>Course Code</b>	Course	L	Т	Р	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		
Total				1	6	19		

Contact hours: 27 Total Credits: 19

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

V Semester								
S.No.	Course Code	Course	L	Т	Р	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	0	4	0	MNC		
	<b>Total</b> 17 6 9 21.5					21.5		

Contact hours: 32 Total Credits:21.5

VI Semester								
S.No.	Course Code	Course	L	Т	Р	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	0	4	0	MNC		
	<b>Total</b> 15 5 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.

VII Semester								
S.No. Course Code Course			L	Т	Р	Credits		
1	V18MET20	Automation in manufacturing	3	0	0	3		
2	V18MET21	MET21 Operation Research		0	0	3		
3		Professional Elective – II		0	0	3		
4		Professional Elective – III		0	0	3		
5		Open Elective – II		0	0	3		
6	V18MEL12	Simulation Lab	0	0	3	1.5		
7	V18MEL13	Production Drawing Lab	0	0	3	1.5		
8	8 V18MEL14 Project Work –PART-A		0	0	9	3		
Total				0	15	21		

Contact hours: 30 Total Credits: 21

VIII Semester								
S.No.	S.No. Course Code Course				Р	Credits		
	V18MET28 Automobile Engineering		3	0	0	3		
1		Open Elective – III	3	0	0	3		
2		Professional Elective - IV	3	0	0	3		
3	3 Professional Elective –V		3	0	0	3		
4	V18MEL15	Project Work – PART-B	0	0	18	9		
Total				0	18	21		

Contact hours : 30 Total Credits : 21

	<b>Open Elective –III</b>
Open Elective –II V18MEOE4- Computer Aided Design V18MEOE5- Condition Monitoring & Machine learning	<b>V18MEOE6-</b> Power Plant Engineering <b>V18MEOE7 -</b> Mechatronics

<ul> <li>Professional Elective –II</li> <li>V18MET22 - Industrial Engineering and Management</li> <li>V18MET23 - Composite Materials</li> <li>V18MET24 - Refrigeration &amp; Air Conditioning</li> </ul>	Professional Elective –III V18MET25 -Total Quality Management V18MET26 - Finite Element Methods V18MET27 - Micro Electro Mechanical Systems (MEMS)
<b>Professional Elective –IV</b> <b>V18MET31</b> – Process Planning & Cost Estimation <b>V18MET32</b> - Non Destructive Evaluation <b>V18MET33</b> - Industrial Hydraulics and Pneumatics	Professional Elective –V V18MET34 - Computational Fluid Dynamics V18MET35- Production Planning and Control V18MET36 - Energy Conservation and Management

#### SYLLABUS ENGLISH-I (Common to All Branches)

		(common to m branches)			
I Semester			L	Т	Р
Course Code	: V18ENT01		2	0	0
Credits	: MNC				

#### **Course Outcomes:**

- **CO-1:** Understand human resources and their contribution to the society, listen to and read a text to comprehend, interpret and answer questions, and use prepositions and tenses appropriately.
- **CO-2:** Appraise the problems of transport and the solutions, write the gist of a short-story, know the etymological roots of words, use prefixes and exhibit basic skills in writing.
- **CO-3:** View Solar Energy as a viable alternative source, and read for comprehension, analysis and interpretation and present narratives in writing.
- **CO-4:** Evaluate various alternative sources of energy, spell words appropriately, pronounce them with proper stress, punctuate sentences correctly and narrate instances and stories.
- **CO-5:** Realize the value of our living environment, describe animals, birds, objects, events, processes, etc., write paragraphs coherently and use connectors effectively.
- **CO-6:** Grasp the vital role of training in industrial organizations, use prepositions, take notes, follow the office etiquette and write impressive narrations.

#### Unit-1:

**Human Resources:** (From 'English for Engineers and Technologists'), Human resources and their contribution to the society, Word Stress, Simple Present Tense and Simple Past Tense, Using Present Continuous Tense, Role-play, Prepositions and Verb forms : Correct usage, Phrases and Clauses, Reading Skills development, Paragraph writing : Cohesion

**An Ideal Family:** A short story by **Catherine Mansfield** (From 'Panorama: A Course on Reading') Vocabulary

#### Unit-2:

**Transport: Problems and Solutions** (From 'English for Engineers and Technologists') Etymological roots, Prefixes, Pronunciation, Parts of Speech, Useful expressions, Writing Skills development, Writing Minutes of Meeting

War: A short story by Luigi Pirandello (From 'Panorama: A Course on Reading') Vocabulary Unit-3:

**Evaluating Technology** (From 'English for Engineers and Technologists'), Writing, Reading Comprehension

**The Verger**: A short story by **Somerset Maugham** (From 'Panorama: A Course on Reading'), Vocabulary, Antonyms and abbreviations

Unit-4:

**Energy: Alternative Sources** (From 'English for Engineers and Technologists'), Word Stress, Antonyms, Suffixes, Comprehension, Spelling and Punctuation, Sentence structures

**The Scarecrow**: A short story by **Satyajit Ray**, (From 'Panorama: A Course on Reading'), Vocabulary

Unit-5:

**Our Living Environment** (From 'English for Engineers and Technologists'), Connectors, Describing an animal/ a bird, Verb forms: practice, Reading Skills development, Writing Skills development, Making notes

A Village Lost to the Nation: A short story by Krishna Chandra Pujari (From 'Panorama: A Course on Reading'), Vocabulary

### Unit-6:

**Industry: Safety and Training** (From 'English for Engineers and Technologists'), Taking notes, Prepositions, Reading Skills development, Word formation: Etymological Roots, Writing Skills development, Office Etiquette

Martin Luther King and the African: A short story by Chinua Achebe

(From 'Panorama: A Course on Reading'), Vocabulary

Books Prescribed:English for Engineers and Technologists, Orient BlackSwan Pvt Ltd.Panorama: A Course on Reading, Oxford University Press (Prescribed for I<br/>B.Tech students of the JNTUK, Kakinada under R16 Regulation)

### Suggested Readings from AICTE

1. Practical English Usage. Michael Swan, OUP. 1995

2. Remedial English Grammar, F.T. Wood. Macmillian, 2007

3. On Writing Well. William Zinsser.Harper Resource Book. 2001

4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press 2006

5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press.2011

6. Exercises in Spoken English. Parts, I-III. CIEFL, Hyderabad Oxford University Press

### **Books for further reference**

1. The Oxford guide to Writing & Speaking – John Seely

2. Technical Communication: Principles and practice – Meenakshi Raman & Sangeetha Sharma, Oxford University Press, New Delhi, 2014. (For Gujarat Technological University)

3. Business communication Concepts, Cases and Application – P.D. Chaturvedi and Mukhesh Chaturvedi, Pearson Education, Delhi, 2006.

4. The Students' Companion – Wilfred D. Best (New Edition) – Harper, Collins Publishers, 2012.

### **MATHEMATICS-I**

(Common to All Branches)

I Semester		L	Т	Р
Course Code	: VI8MAT01	3	1	0
Credits	: 4			

#### **Course Outcomes:**

#### At the end of the course student will be able to:

**CO1:** Apply matrix technique to solve system of linear equation.

**CO2:** Find Eigenvalues and Eigen vectors

**CO3:** Solve the ordinary differential equations of first order & first degree

CO4: Solve the linear differential equations of higher order

**CO5:** Calculate maxima and minima of functions of two variables

**CO6:** Solve first order partial differential equations.

#### **UNIT I: Linear system of equations:**

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination – Gauss Jordon-Gauss Jacobi and Gauss Seidal methods.

Applications: Finding the current in electrical Circuits.

#### UNIT II: Eigen values - Eigen vectors and Cayley-Hamilton theorem:

Eigenvalues - Eigen vectors - Properties - Cayley-Hamilton theorem (without proof) - Inverse and powers of a matrix by using Cayley-Hamilton theorem.

#### UNIT-III: Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact differential equations.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal Trajectories.

#### UNIT IV: Linear differential equations of higher order:

Linear non homogeneous differential equations of higher order with constant coefficients involving RHS term of the type e ax, sin ax, cos ax, polynomials in x, e ax V(x), xV(x)- method of variation of parameters.

#### **UNIT V: Partial differentiation:**

Introduction- Homogeneous function-Euler's theorem-total derivative-chain rule-generalized mean value theorem for single variable (without proof)-Taylor's and Maclaurin's series expansion of functions of two variables (without proof)– Functional dependence- Jacobian.

**Applications**: maxima and minima of functions of two variables without constraints and Lagrange's method (with constraints).

### UNIT VI: First order Partial differential equations:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation.

#### **Text Books:**

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.

2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

### **Reference Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India

- 2. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
- 3. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.
- 4. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

### **OPTICS AND WAVES**

(For CE & ME)

I Semester		2	L	Т	Р
Course Code	: V18PHT01		3	1	0
Credits	4				

#### A student who successfully fulfills the course requirements will be able to:

1. Correlate the engineering concepts based on fundamental Physical Optics with Coherent source. Furthermore, students will be able to solve problems connected with the operation of optical instruments.

2. Study the sound waves & Use modern physics techniques and tools.

3. Illustrate the fundamental concepts of magnetism and dielectrics.

#### UNIT-I

**INTERFERENCE:** Introduction- Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton's rings – construction and working principle of Michelson Interferometer.

#### **UNIT-II**

**DIFFRACTION:** Introduction- Fraunhofer diffraction at single slit - double slit and N-slits (qualitative only)-Grating equation – Rayleigh's criterion for resolving power- Resolving power of a grating.

#### <u>ŬNIT-ĬII</u>

POLARIZATION: Types of Polarization - Double refraction, Nicol Prism -Quarter wave plate and Half Wave plate.

**LASERS:** Characteristics- spontaneous emission and Stimulated emission of radiation – Einstein's Transition Probabilities- population inversion- pumping schemes-Ruby laser-He-Ne LASER -Applications of laser **UNIT-IV** 

ACOUSTICS: Introduction - Types of Acoustics - Sound Absorption - Absorption Coefficient -Reverberation time- Factors Effecting the Reverberation Time - Sabine's Formula- Eyring's Formula - Acoustics of Concert Hall.

#### **UNIT-V**

**ULTRASONICS:** Introduction- Ultrasonic Transducers - Piezoelectric and Magnetostriction Transducers – Production of Ultrasonic Waves Using Piezoelectric Effect And Magnetostriction Method- Non-Destructive Testing - Pulse Echo Technique – Scan A, Scan B & Scan C Techniques. <u>UNIT-VI</u>

MAGNETIC PROPERTIES: Introduction- Origin of Magnetic Moment, Classification of Magnetic Materials – Ferromagnetism- Hysteresis – Soft and Hard Magnetic Materials

**DIELECTRIC PROPERTIES:** Introduction, types of polarizations- Electronic, Ionic and Orientation polarizations (qualitative only), - Internal field - Clausius- Mossoti Equation-Dielectric in alternative fields (Dielectric loss, Strength and Breakdown.)

#### **Text Books:**

- 1. M. Armugam, Engineering Physics
- 2. Dr.P.Sreenivasa Rao, Engineering Physics

#### **Reference Books:**

- 1. S. Mani Naidu, Engineering Physics.
- 2. S.O.Pillai, Solid State Physics.
- 3. DK Bhattacharya, Engineering Physics.
- 4. Ajoy Ghatak, Optics.
- 5. A.J. Dekker, Solid State Physics.

## **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

(For CSE, ME & CE)

I Semester		-	-	L	Т	Р
Course Code	: V18EET01			3	1	0
Credits	: 4					

#### Module 1 : DC Circuits

Electrical circuit elements (R, L and C), Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Maximum Power Transfer, Thevenin and Norton Theorems.

#### Module 2: AC Circuits

Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance.

#### Module 3:

#### **DC Machines**

Introduction-Working principle of DC generator–Magnetization characteristics of D.C. Shunt generator–Types of DC motors – applications – three point starter.

#### Transformers

Classification, working principle of ideal and practical transformer, losses in transformers, regulation and efficiency, OC& SC test on single phase transformer.

#### **Module 4: AC Machines**

Construction and working of a three-phase induction motor, torque-slip characteristics. Loss components and efficiency, starting and speed control of induction motor.Construction and Working principle of synchronous generators.

#### **Module 5: Semiconductor Devices and Rectifiers**

Introduction – Classification – PN junction diode characteristics a) Forward bias b) Reverse bias - Diode acts as a switch - Half-wave and Full-wave rectifiers – Concepts of ripple factor, voltage regulation and efficiency - Simple problems.

#### **Module 6: Transistors**

Types of Transistors - Transistor acts as an amplifier - CB, CE and CC configurations and characteristics-feedback amplifier.

#### **Text Books**

- 1. T. K. Nagsarkar, M. S. Sukhija, "Basic Electrical Engineering", Oxford University Press, 2005
- 2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
- 3. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
- 4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

#### **Reference Books**

- 1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
- 2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
- 3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
- 4. S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson Education India, 2011
- 5. S. K. Sahdev, "Fundamentals of Electrical Engineering & Electronics", DhanpatRai& Company, 2001

### **ENVIRONMENTAL STUDIES**

(Common to All Branches)

I Semester		L	Т	Р
Course Code Credits	: V18CHT02 : MNC	3	0	0

#### **Course Outcomes:**

At the end of the course, the student should be able to:

CO1: Identify the global environmental challenges and the possible means to combat them.

CO2: Examine the natural resources, their availability for the sustenance of the life and conservation.

CO3: Assess the concepts of the ecosystem and the need for protecting various ecosystems.

CO4: Discuss the biodiversity, threats and conservation practices to protect the biodiversity

CO5: Explain various attributes of the pollution and waste management practices.

CO6: Outline the environmental management and environmental legislations in India.

**UNIT I: FUNDAMENTALS OF ENVIRONMENTAL STUDIES:** Definition and components of environment, Global Environmental Challenges: Global warming and climate change- Kyoto protocol, Acid rains, Ozone layer depletion -Population explosion and effects.

**UNIT II: NATURAL RESOURCES AND ASSOCIATED PROBLEMS:** Forest resources: Use and over exploitation - Deforestation: Timber extraction, Mining, dams and other effects on forest and tribal people. Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water - Dams: Benefits and problems.

Mineral resources: Use and exploitation - Environmental effects of extracting and using mineral resources. Energy resources: Renewable and Non-renewable energy sources.

Land resources: Land degradation, Wasteland reclamation.

**UNIT III: ECOSYSTEMS** Concept of an ecosystem - Structure and function of an ecosystem: Producers, consumers and decomposers - Energy flow in the ecosystem – Food chains, food webs and Ecological pyramids. Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems -Introduction, types, characteristic features.

**UNIT IV: BIODIVERSITY AND ITS CONSERVATION** Definition-Values of biodiversity: Consumptive use, Productive use, Social use. Hot-spots of biodiversity - Threats to biodiversity: Habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity.

**UNIT V: ENVIRONMENTAL POLLUTION** Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution and Nuclear Pollution.

Solid Waste Management: Sources, classification, effects and control measures of municipal and industrial solid wastes.

**UNIT VI: ENVIRONMENTAL LEGISLATION AND THE MANAGEMENT** Human Rights to a clean environment provided by Constitution. Environmental Protection Act, 1986 - Air (Prevention and Control of Pollution) Act, 1981 - Water(Prevention and Control of Pollution) Act, 1974 -Wildlife (Protection) Act, 1972 -Forest (Conservation) Act, 1980 -Issues involved in enforcement of environmental legislation – Eco-tourism.

#### Text books:

- 1. Environment Studies, Fourth Edition, Anubha Kaushik, C P Kaushik, New Age International Publishers.
- 2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi.
- 3. Fundamentals of Environment Studies, DD Mishra, S Chand & Co Ltd.
- 4. Textbook of Environmental Science, M. Anji Reddy, B S Publications, Hyderabad.

### **ENGLISH COMMUNICATION SKILLS LAB - I**

(Common to All Branches)

I Semester		L	Т	Р
Course Code	: V18ENL01	0	0	2
Credits	:MNC			

#### **Course Outcomes**

**CO-1:** Listen to and make inquiries on phone, thank and respond to thanks in appropriate spoken idiom.

**CO-2:** Make requests, give permissions and directions in fluent English

**CO-3:** Articulate well in the contexts of clarifying, inviting, complaining, congratulating, apolozing, advising, agreeing and disagreeing in conversational mode

**CO-4:** Distinguish and pronounce letters and sounds of English phonetically

**CO-5:** Practice and pronounce consonants, vowels and diphthongs and consonant clusters

**CO-6:** Listen to and understand different accents in English, and pronounce English words and speak sentences with right stress and intonation.

**Unit-1:** Why Study Spoken English, Making Inquiries on the Phone, Thanking and Responding to Thanks, Practice Work

Unit-2: Requests, Permissions, and Directions, Practice Work

**Unit-3:** Clarifying, Inviting, Complaining, Congratulating and Expressing Sympathy, Apologising, Advising, Suggesting, Agreeing and Disagreeing, Practice Work

Unit-4: Letters and Sounds, Practice Work

Unit-5: The Sounds of English, Practice Work

**Unit-6:** Pronunciation, Stress and Intonation, Practice Work Book Prescribed:

### Interact: English Lab Manual for Undergraduate Students:

Orient BlackSwan (Prescribed for I B.Tech students of the JNTUK, Kakinada under R16 Regulation) **Books for further reference:** 

- 1. The Official Cambridge Guide to IELTS, For Academic & General Training, (With DVD-ROM), Student Book with Answers, 2015.
- 2. English Language Communication Skills, Lab Manuel cum Workbook (with CD), Cengage Learning.

### **ENGINEERING WORKSHOP & IT WORKSHOP**

(Common to All Branches)

I Semester		-	L	Т	Р
Course Code	: V18MEL01		0	0	3
Credits	: 1.5				

#### Engineering Workshop Course Outcomes:

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

**CO1:** prepare different models in the carpentry trade such as Cross lap joint, Dove tail joint. **(K3) CO2:** make various basic prototypes in the trade of Tin smithy such as rectangular tray, and open Cylinder **(K3)** 

**CO3**:model various basic prototypes in the trade of fitting such as Straight fit, V- fit. **(K3)** 

**CO4:** prepare different models in the Black smithy such as Round rod to Square, S-Hook.. **(K3) CO5:** perform various basic House Wiring techniques such as connecting one lamp with one switch,

connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring. **(K3)** 

**CO6:** prepare various basic prototypes in the trade of Welding such as Lap joint, Butt joint. **(K3)** 

#### **Engineering Workshop**

Note: At least two exercises to be done from each trade. Carpentry

- 1. T-Lap Joint
- 2. Cross Lap Joint
- 3. Dovetail Joint
- 4. Mortise and Tenon Joint

### **Tin Smithy**

- 1. Taper Tray
- 2. Square Box without lid
- 3. Open Scoop
- 4. Funnel

### Fitting shop

- 1. V- Fit
- 2. Square Fit
- 3. Half Round Fit
- 4. Dovetail Fit

### **Black smithy**

- 1. Round rod to Square
- 2. S-Hook
- 3. Round Rod to Flat Ring
- 4. Round Rod to Square headed bolt

### House wiring

- 1. Parallel / Series Connection of three bulbs
- 2. Stair Case wiring
- 3. Florescent Lamp Fitting
- 4. Measurement of Earth Resistance

### Welding shop (Arc welding)

- 1. Butt Joint
- 2. Lap Joint

### **IT WORKSHOP LAB**

### **Course Outcomes:**

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

- Demonstrate Disassemble and Assemble a Personal Computer and its peripherals(K3)
- Practice installation of operating system.(K3)
- Connect peripherals and install required drivers(K4)
- Demonstrate internet connectivity and usage of internet as per his/her requirement.(K3)
- Prepare the Documents for their projects(K3)
- Prepare Slide shows for their presentations (K3)

### PC Hardware:

**Task 1: Identification of the peripherals of a computer**: To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices.

**Task 2(Optional)** : A practice on disassembling the components of a PC and assembling them to back to working condition.

Task 3: Examples of Operating systems- DOS, Installation of MS windows on a PC

**Task 4:** Introduction to Memory, types of Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters

**Software Troubleshooting (Demonstration):** Identification of a problem and fixing the PC for any software issues.

**Task 5: Hardware Troubleshooting (Demonstration):** Identification of a problem and fixing a defective PC (improper assembly or defective peripherals).

#### Internet & Networking Infrastructure

**Task 6:** Demonstrating Importance of Networking, Transmission Media, Networking Devices-Gateway, Routers, Hub, Bridge, NIC, Bluetooth Technology, Wireless Technology, Modem, DSL, ISP.

**Task 7: Search Engines & Netiquette:** Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc). Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums.

### <u>Word</u>

**Task 8: MS Word Orientation:** Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting ,Drop Cap , Applying Text effects, Using Character Spacing, OLE in

Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving, , mail merge.

**Task 9: Creating project :** Abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

### **Excel**

**Task 10:** Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations. **Creating a Scheduler -** Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text, ,Charts,

**Task 11:** Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

#### <u>Power Point</u>

**Task 12:** Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables, animation and Charts in PowerPoint.

#### **TEXT BOOK:**

Faculty to consolidate the workshop manuals using the following references

1. Computer Fundamentals, Anita Goel, Pearson.

2. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson, 2008.

3. Information Technology Workshop, 3e, G Praveen Babu, M V Narayana BS Publications.

4. Comdex Information Technology , Vikas Gupta, dreamtech.

#### **REFERENCE BOOK:**

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N.B. Venkateswarlu.

2. PC Hardware trouble shooting made easy, TMH.

#### **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB** (Common to All Branches)

I Semester	-	-	L	Т	Р
Course Code	: V18EEL01		0	0	3
Credits	: 1.5				

#### Any 10 of the following experiments are to be conducted

- 1. Verification of Superposition Theorem.
- 2. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.
- 3. Verification of maximum power transfer theorem.
- 4. Series and Parallel Resonance Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
- 5. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance and speed.
- 6. Speed control of D.C. Shunt motor by Armature & flux control methods
- 7. Brake test on DC shunt motor. Determination of performance characteristics.
- 8. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
- 9. Brake test on 3-phase Induction motor (performance characteristics).
- 10. PN junction diode characteristics a) Forward bias b) Reverse bias (Cut in voltage and resistance calculations)
- 11. Transistor CE characteristics (Input and output)
- 12. Half wave rectifier with and without filters.
- 13. Full wave rectifier with and without filters.
- 14. CE amplifiers.

#### OPTICS & WAVES LAB (For CE & ME)

L

0

### List of Experiments:

#### (Any eight of the following to be done)

- 1. Determination of Rigidity modulus of a material Torsional Pendulum
- 2. Determination of acceleration due to gravity Compound Pendulum
- 3. Verification of laws of vibrations in stretched strings Sonometer
- 4. Determination of velocity of sound Volume Resonator
- 5. Magnetic field Induction along the axis of current carrying coil Stewart and Gee's apparatus.
- 6. Determination of Planck's constant using photocell.
- 7. Determination of wave length of laser source using diffraction grating.
- 8. Melde's experiment Transverse and longitudinal modes.
- 9. Coupled oscillator Study two normal modes of coupled oscillator.

Determination of radius of curvature of Plano convex lens by forming Newton's rings.

#### ENGLISH-II (Common to All Branches)

II Semester		L	Т	Р
Course Code	: V18ENT02	2	0	0
Credits	2			

#### **Course Outcomes**

**CO-1:** Understand the real import of education and work of noble men, use nouns, verbs and

adjectives appropriately, identify and correct common errors in usage and write official letters.

**CO-2:** Derive inspiration from real life samples, interpret and speak on them, use synonyms and antonyms of words properly and do E-correspondence with required netiquette.

**CO-3:** Assimilate and adjust to new cultural environments, write on life-sketches, make the right use of tense and aspect and concord in sentences and plan and develop speech-writing.

**CO-4:** Imbibe ideas from the lives and works of successful men, use adverbs, develop view-points and topics and write different types of essays.

**CO-5:** Emulate personality-development inputs, elaborate on inspiring scientists use one-word substitutes, develop précis writing and write for the media.

**CO-6:** Learn from the paradigm of great contributors, use collocations and write professional and technical reports in standard formats.

#### Unit-1 The Greatest Resource - Education (From 'English Encounters')

Understanding the author's perspective

Making use of nouns

Vocabulary – deriving nouns from verbs and adjectives

Misplaced modifiers

Synonyms and Antonyms

Identifying common errors

Letter writing : Standard formats for official letters

**A.P.J. Abdul Kalam** (From 'The Great Indian Scientists')

Synonyms and Anonyms

#### Unit-2 Jadav Payeng : 'The Forest Man of India'

Vocabulary : deriving adjectives

Synonyms and Antonyms

Identifying common errors in the use of adjectives

E-correspondence with required Netiquette

Cliches

C.V. Raman (From 'The Great Indian Scientists')

Use of Synonyms and Antonyms of words in different contexts

#### Unit-3 Cultural Shock : Adjustment to New Cultural Environments

(From 'English Encounters')

Building Vocabulary – Verbs and nouns

Synonyms and Antonyms and appropriate usage

Making use of Tense and aspect and subject-verb agreement in sentences

Planning and developing speech-writing

**Reading comprehensions** 

Homi Jahangir Bhabha (From 'The Great Indian Scientists')

Synonyms and Antonyms

Unit-4 Satya Nadella's First Letter to the Employees as CEO of Microsoft

Building Vocabulary – deriving adverbs

Identifying common errors in the use of adverbs

Essay writing : Developing ideas and topics into different types of essays Redundancies

Jagadish Chandra Bose (From 'The Great Indian Scientists')

Using synonyms and antonyms of words in different contexts

### Unit-5 Excerpts from Robin Sharma's 'Who Will Cry When You Die?'

One-word substitutes and usage

Prepositions

Required skills to write for the media

Précis writing

Prafulla Chandra Ray (From 'The Great Indian Scientists')

Using synonyms and antonyms of words in different contexts

### Unit-6 The Chief Software Architect (From 'English Encounters')

Building Vocabulary : Collocations and Usage

Identifying common errors

Report writing – Standard formats and required skills

**Srinivasa Ramanujan** (From 'The Great Indian Scientists')

Using synonyms and antonyms of words in different contexts

### **Books Prescribed:**

### **1. English Encounters**

A Text Book to Face Challenges in Communication Maruthi Publications (Prescribed for I B.Tech students of the JNTUK, Kakinada under R16 Regulation)

Lessons 2,4 and 5 in the above text book have been replaced by the following

- 1. Jadav Payeng : The Forest Man of India by Shreya Pareek, 2014, Net Source: https://www.thebetterindia.com
- 2.Satya Nadella's First Letter to the Employees as CEO of Microsoft, Net Source: <u>https://news.microsoft.com</u>
- 3. Excerpts from Robin Sharma's 'Who Will Cry When You Die?' JAICO Publishing House, Mumbai, 2009

### 4. The Great Indian Scientists, Cengage

### Suggested Readings from AICTE

- 1. Practical English Usage. Michael Swan, OUP. 1995
- 2. Remedial English Grammar, F.T. Wood. Macmillian, 2007
- 3. On Writing Well. William Zinsser. Harper Resource Book. 2001
- 4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press 2006
- 5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press.2011
- 6. Exercises in Spoken English. Parts, I-III. CIEFL, Hyderabad Oxford University Press

### Books for further reference

- 1. The Oxford guide to Writing & Speaking John Seely
- 2. Technical Communication : Principles and practice Meenakshi Raman & Sangeetha Sharma, Oxford

University Press, New Delhi, 2014. (For Gujarat Technological University)

3. Business communication Concepts, Cases and Application – P.D. Chaturvedi and Mukhesh Chaturvedi,

Pearson Education, Delhi, 2006.

4. The Students' Companion – Wilfred D. Best (New Edition) – Harper, Collins Publishers, 2012.

### MATHEMATICS-II (Common to All Branches)

		(common to An Dranches)			
II Semester			L	Т	Р
Course Code	: VI8MAT02		3	1	0
Credits	4				

**Course Outcomes:** At the end of the Course student will be able to:

**CO1:** Estimate approximate root of algebraic and transcendental equations

**CO2:** Compute interpolating polynomial for the given data

**CO3:** Solve ordinary differential equations using numerical methods

**CO4:** Evaluate multiple integrals and improper integrals

**CO5:** Calculate gradient of a scalar function, divergence and curl of a vector function.

**CO6:** Apply the knowledge of vector integral concepts to find characteristics of vector fields

### UNIT I: Solution of Algebraic and Transcendental Equations:

Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable).

### UNIT II: Interpolation:

Introduction- finite differences- forward differences backward differences – central differences – symbolic relations and separation of symbols - differences of a polynomial-Newton's formulae for interpolation - Lagrange's interpolation formula.

### UNIT III: Numerical Integration and solution of Ordinary Differential equations:

Trapezoidal rule- Simpson's 1/3rd and 3/8th rule-Solution of ordinary differential equations by Taylor's series- Euler's method - Runge-Kutta method (second and fourth order).

### **UNIT IV: Multiple Integrals:**

Definition of Improper integrals - Double and triple integrals - Change of variables - Change of order of integration.

Applications: Finding areas and volumes.

### **UNIT V: Vector Differentiation:**

Vector differential operator - Gradient- Divergence- Curl - Laplacian and second order operators - Vector identities.

### **UNIT VI: Vector Integration:**

Line integral: Work done – Potential function – Surface and volume integrals - Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

### **Text Books:**

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.

2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

### **Reference Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-

2. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press

- 3. V.Ravindranath and P.Vijayalakshmi, Mathematical Methods, Himalaya Publishing House. India
- 4. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.
- 5. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi

### **ENGINEERING CHEMISTRY**

#### (Common to All Branches)

II Semester		-	L	Т	Р
Course Code	: V18CHT01		3	1	0
Credits	4				

#### **Course Outcomes:**

At the end of the course, the student should be able to:

- **CO1:** Apply different plastics and rubbers for various engineering applications.
- **CO2:** Assess the quality of fuels and apply the knowledge of fuels for the preservation of natural fuels.
- **CO3:** Understand relevant concepts of Electro Chemistry to apply them in designing electrochemical energy systems.
- **CO4:** Analyze boiler troubles arising due to poor water quality and suggest suitable water treatment methods for different industrial applications.
- **CO5:** Analyze the causes for practical corrosion problems and apply corrosion principles for protection of metallic structures from corrosion.
- **CO6:** Identify the important applications of advanced engineering materials.

### **UNIT I: HIGH POLYMERS**

Polymerisation: Introduction- Mechanism of Free radical addition polymerization – Plastics as engineering materials: advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication techniques (Compression, Injection, Transfer and Extrusion) -Preparation, properties and applications of Polythene (HDPE and LDPE), PVC, Bakelite, and Teflon. Elastomers: Natural rubber – Vulcanization of rubber – Synthetic Rubbers: Preparation, properties and applications of Buna S, Buna N, and Thiokol.

#### **UNIT II: FUEL TECHNOLOGY**

Fuels – Characterstics of good fuel – Classification – Calorific value - HCV and LCV – Dulong's formula, Numerical problems – Bomb calorimeter – Numerical problems.

Solid fuels - Coal – Proximate and ultimate analysis – Significance of the analyses, Numerical problems.

Liquid fuels –Petroleum- Refining – Cracking – Synthetic petrol (Fischer Tropsch and Bergius process) – Knocking - Octane and Cetane ratings – Anti-knocking agents.

Gaseous fuels – Natural gas, LPG and CNG – Biofuels.

### **UNIT III: ELECTROCHEMICAL CELLS**

Single electrode potential – Electrochemical series and its significance - Standard electrodes (Hydrogen, Calomel and, Glass electrodes)– Conductometric titrations (Acid – Base).

Batteries: Primary battery (Dry Cell) – Secondary batteries (Lead acid cell, Ni-Cd cells).

Fuel cells: H<sub>2</sub>-O<sub>2</sub> fuel cell, H<sub>2</sub>-methanol fuel cell.

### **UNIT IV: WATER TECHNOLOGY**

Hard water - Types of Hardness – Units of hardness - Determination of hardness and alkalinity -Boiler troubles: Priming and foaming, sludge and scale formation, Boiler corrosion, Caustic embrittlement - Softening of hard water: Zeolite process, Lime – Soda process, and Ion exchange process - Water for drinking purposes - Purification – Sterilization and disinfection: Chlorination, Break point chlorination – Desalination - Reverse Osmosis and Electrodialysis.

### **UNIT V: CORROSION**

Definition – Theories of Corrosion (Chemical & Electrochemical) – Types of electrochemical corrosion (Galvanic corrosion, Concentration cell corrosion,Stress corrosion Pitting corrosionand Intergranular corrosion) - Galvanic series - Factors which influence the rate of corrosion - Protection from corrosion:Metallic coatings (Cathodic and Anodic), Cathodic protection, Protective coatings –Methods of application of coatings on metals (Galvanizing, Tinning, &Electroplating) – Paints.

### **UNIT VI: CHEMISTRY OF ADVANCED MATERIALS**

Nano materials: Introduction – Carbon nano tubes - Types, preparation (Arc discharge, Laser ablation and CVD Method) - Properties and applications of Nano materials.

Liquid crystals: Introduction – Types – Applications.

Biodegradable polymers – Conducting polymers.

Green Chemistry: Principles, Need for green Chemistry.

#### **Text Books:**

- 1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publications & Co.
- 2. A Text book of Engineering Chemistry by S. S. Dara; S. Chand & Co Ltd.

#### **Reference Books:**

- 1. Engineering Chemistry of Willey India Pvt. Ltd., Vajiram and others.
- 2. Engineering Chemistry by PrasanthRath, Cengage Learning.
- 3. Engineering Chemistry by Shikha Agarwal; Cambridge University Press.
- 4. B. Sivasankar, Engineering Chemistry, McGraw-Hill.

#### **PROGRAMMING IN C FOR PROBLEM SOLVING**

(Common to All Branches)

		(			
II Semester			L	Т	Р
Course Code	: V18CST01		3	0	0
Credits	: 3				

#### **Course Outcomes:**

<b>CO1:</b> Describe various problem solving strategies such as Algorithms and Flowcharts	(K2)
CO2: Develop various programming constructs using Control Structures.	(K3)
CO3: Summarize the process of modular programming approach	(K5)
CO4: Illustrate the usage of String handling functions and pointers	(K3)
<b>C05:</b> Construct Programs using Structures and Unions.	(K3)
<b>CO6:</b> Distinguish between Sequential files and Random access files.	(K4)

**UNIT-I: Problem solving concepts**: Problem solving strategies – Top down design, Bottom up design, Algorithms, Flow-charts, Types of Programming Languages, Compiler, Assembler and Linker, Testing and Debugging a program. **Introduction to C Programming:** Overview and importance of C, C Program Structure, Creation and Compilation of C Programs, Identifiers, Variables, Data types, Constants, Declarations.

**UNIT-II: Operators:** Arithmetic, relational and logical operators, increment and decrement operators, conditional operator, assignment operator, bitwise operators, special operators, expressions, Precedence, Associativity, Order of evaluation, Type conversion, Programming Examples.**Input and output statements:** Input and output functions.

**Flow of Control**: Conditional statements - If-else, Switch-case constructs, Loops - while, do-while, for.

**UNIT-III: Arrays**: Single-Dimensional Arrays, multi-Dimensional Arrays, initialization and accessing individual elements. **Functions:** Top down approach of problem solving, standard library functions, user defined functions, parameter passing - call by value, call by reference, return statement, passing arrays as parameters to functions, recursion, command line arguments.

**UNIT-IV: Storage Classes:** Scope and extent, Storage Classes in a single source file: auto, extern and static, register. **Strings in C-** Concepts, string handling functions. **Understanding pointers:** Accessing the address of a variable, declaring pointer variables, initialization of pointer variables, accessing a variable through its pointer, pointer arithmetic, pointer and arrays, pointers and character strings, array of pointers.

**UNIT-V:Structures and Unions:** Defining, declaring, initialization, accessing, comparing, operations on individual members, array of structures, structures within structures, self referential structure, structures and functions, pointers and structures, bit fields, Programming Examples.

**Dynamic Memory Allocation:** Definition, malloc, calloc, realloc, free, dynamic arrays.

**UNIT-VI: File Processing:** Defining and Opening a file, closing a file, input/output operations on files, error handling during I/O operations, random access to files, Programming Examples.

**Preprocessor:** Definition, Macro substitution, file inclusion, compiler control directives, Programming Examples.

#### **Text Books:**

- 1. Computer Programming: Ashok N Kamthane, Pearson Education
- 2. C: The Complete Reference: Herbert Schildt, Osborne/Mcgraw Hill, Inc.
- 3. Let Us C, <u>Yashavant Kanetkar</u>, BPB Publications, 15<sup>th</sup> Edition

#### **Reference Books:**

- 1. Programming with C, Second edition, Byron S Gottfried, Tata McGrawhill
- 2. Programming in C, Reema Thareja, Oxford.
- 3. Problem Solving and Programm design in C, Hanly J R & Koffman E.B, Pearson Education, 2009.
- 4. Foundations of Computer Science (C Edition), Alfred V. Aho.
- 5. Programming and Problem Solving Using C, ISRD Group, Tata McGraw Hill, 2008.
- 6. Programming in C, Pradip Dey, Manas Ghosh, Oxford University Press, 2007.
- 7. Problem Solving Using C: Structured Programming Techniques, <u>Yuksel Uckan</u>.
- 8. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.
- 9. Computer Programming in C Kerninghan & Ritchie, PHI

## **ENGINEERING GRAPHICS**

(Common to All Branches)

II Semester		L	Т	Р
Course Code	: V18MET01	1	0	3
Credits	: 2.5			

#### **Course Outcomes:**

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

**CO1:** Demonstrate the usage of drawing instruments and sketch conic sections

(K3)

**CO2:** Construct different types of scales and special curves

(K5)

**CO3:** Draw the projections of the points, lines and planes with reference to the principal planes. (K2)

**CO4:** Develop the projections of solids and its surfaces.

(K3)

**CO5:** Draw the Isometric projections of solids.

(K2)

**CO6:** Convert the isometric view to orthographic view and vice versa.

(K2)

### **UNIT1: INTRODUCTION TO ENGINEERING GRAPHICS:**

Introduction to Engineering Graphics and its significance, usage of Drawing instruments- Mini Drafter, Calipers, Set square etc..Lettering, Conic sections - Ellipse, Parabola, Hyperbola,

#### **UNIT 2: SPECIAL CURVES & SCALES:**

Special Curves - cycloid, epicycloids, hypocycloid, involutes; Scales - Plain, Diagonal and Vernier Scales.

#### **UNIT 3: ORTHOGRAPHIC PROJECTIONS:**

Introduction to Orthographic Projections- Projections of Points, Projection of lines inclined to both the planes; Projections of planes- inclined to both the Planes.

#### **UNIT 4: PROJECTIONS OF REGULAR SOLIDS:**

Projections of Solids - Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes. Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone.

### **UNIT 5: ISOMETRIC PROJECTIONS :**

Principles of Isometric projection - Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids and compound Solids;

#### **UNIT 6:**

Conversion of Isometric Views to Orthographic Views and Vice-versa.

#### **Text Books:**

1. Engineering Drawing by N.D. Butt, Chariot Publications, 53rd Edition-2014

2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers, 2nd Edition-2016

### **Reference Books:**

- 1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers, 2nd Edition-2014
- 2. Engineering Graphics for Degree by K.C. John, PHI Publishers-2014
- 3. Engineering Graphics by PI Varghese, McGrawHill Publishers-2013

4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age, 5<sup>th</sup> Edition-2015

### **ENGLISH COMMUNICATION SKILLS LABORATORY-II**

(Common to All Branches)

		,			
II Semester			L	Т	Р
Course Code	: V18ENL02		0	0	2
Credits	:1				

#### **Course Outcomes:**

**CO-1:** Listen to people critically and argue rationally to present a view-point confidently in formal debates.

**CO-2:** Exhibit team spirit and communicative skill and participate effectively in group discussions.

**CO-3:** Plan, structure and give presentations in professional manner.

**CO-4:** Face and perform well in interviews with required etiquette.

**CO-5:** Compose E-mails in standard formats to communicate clearly and write different types of CV in vogue that befit today's career needs.

**CO-6:** Make apt use of idiomatic expressions and recognize and correct typical errors that Indian speakers of English make in pronunciation, spelling, vocabulary and grammar.

### Unit-1

Presentation Skills

Practice Work

#### Unit-2

Group Discussions Practice Work

#### Unit-3

Debating

Practice Work

#### Unit-4

Interview Skills

Practice Work

#### Unit-5

E-mails

Practice Work

### Unit-6

Idiomatic Expressions

**Common Errors in English** 

**Book Prescribed:** 

### Interact : English Lab Manual for Undergraduate Students

Orient BlackSwan

(Prescribed for I B.Tech students of the JNTUK, Kakinada under R16 Regulation)

### **Books for further reference**

- 1. The Official Cambridge Guide to IELTS, For Academic & General Training, (With DVD-ROM), Student Book with Answers, 2015.
- 2. English Language Communication Skills, Lab Manuel cum Workbook (with CD), Cengage Learning.

## **PROGRAMMING LAB IN 'C' FOR PROBLEM SOLVING**

(Common to All Branches)

II Semester		L	Т	Р
Course Code	: V18CSL01	0	0	3
Credits	: 1.5			

#### **Course Outcomes:**

<ul> <li>CO 1: Demonstrate problem solving techniques using Control Structures. (K3)</li> <li>CO 2: Construct Programmes using the concepts of Arrays, Strings and Pointers. (CO3: Apply the concepts of Functions, Structures and Unions. (K3)</li> <li>CO 4: Use various file processing expertisions to develop real time explications.</li> </ul>	(K3) (K4)
<b>CO 2:</b> Construct Programmes using the concepts of Arrays, Strings and Pointers.( <b>CO3:</b> Apply the concepts of Functions, Structures and Unions.(K3) <b>CO4:</b> Use various file processing operations to develop real time applications	(K3) (K4)
<b>CO3:</b> Apply the concepts of Functions, Structures and Unions. <b>(K3)</b>	(K4)
<b>COA</b> . Use vericus file processing experticus to develop real time explications	(K4)
<b>CO4:</b> Use various me processing operations to develop real time applications.	
LIST OF EXPERIMENTS:	
<b>Tutorial 1:</b> Problem solving using computers.	
Lab1: Familiarization with programming environment.	
<b>Tutorial 2:</b> Variable types and type conversions.	
Lab 2: Simple computational problems using arithmetic expressions.	
Tutorial 3: Branching and logical expressions.	
Lab 3: Problems involving if-then-else structures, switch – case.	
Tutorial 4: Loops, while and for loops.	
Lab 4: Iterative problems e.g. sum of series.	
<b>Tutorial 5:</b> 1D Arrays: searching, sorting.	
Lab 5: 1D Array manipulation.	
Tutorial 6: 2D arrays.	
Lab 6: Matrix problems.	
<b>Tutorial 7:</b> Functions, call by value, call by reference, command line arguments.	
Lab 7: Simple functions.	
Tutorial 8: String handling.	
Lab 8: String handling functions.	
<b>Lutorial 9:</b> Pointers.	
Lad 9: Programming with pointers.	
Leb 10: Recursion, structure of recursive calls.	
Lab 10: Recursive functions.	
Leb 11: Structures, unions and dynamic memory allocation.	
Lau 11: 50 uctures & unions. Tutorial 12: File handling	
Lab 12: File operations	
Rafaranca Books	
1 Mastering C K R Venugonal and S R Prasad TMH Publishers	
2 Computer Programming in C. V. Rajaraman PHI	
3 Programming in C. Stephen G. Kochan Fourth Edition Pearson Education	
4 C- The Complete Reference, Herbert Schildt Osborne/Mcgraw Hill Inc	
5. Programming with C. Byron S Gottfried, Second edition, Tata McGrawhill	

- 6. Programming in C, Reema Thareja, Oxford.
- 7. Problem Solving and Program design in C, Hanly J R & Koffman E.B, Pearson Education, 2009.
- 8. Programming and Problem Solving Using C, ISRD Group, Tata McGraw Hill,2008.

### ENGINEERING CHEMISTRY LABORATORY

(Common to All Branches)

II Semester		L	Т	Р
Course Code Credits	: V18CHL01 : 1.5	0	0	3

#### **Course Outcomes:**

At the end of the course, the student will be able to:

**CO1:** Analyse quantitatively a variety of samples using volumetric methods and instrumental methods.

**CO2:** Applying volumetric and instrumental methods for the determination of water quality parameters namely Alkalinity, Hardness and pH.

**CO3:** Prepare polymeric materials and analyse the given coal samples.

### List of Experiments:

- 1. Introduction to chemistry laboratory Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.,
- 2. Trial experiment Estimation of HCl using standard Na<sub>2</sub>CO<sub>3</sub> solution.
- 3. Estimation of KMnO<sub>4</sub>using standard oxalic acid solution.
- 4. Determination of alkalinity of a sample of water.
- 5. Determination of total hardness of water using standard EDTA solution.
- 6. Determination of rate of corrosion of mild steel in acidic environment in the absence and presence of an inhibitor.
- 7. Estimation of ferrous iron using standard K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>solution.
- 8. Estimation of copper using standard EDTA solution.
- 9. Estimation of vitamin C using standard lodine solution.
- 10. Estimation of pH of the given sample solution using pH meter.
- 11. Conductometric titration between strong acid and strong base.
- 12. Potentiometric titration between strong acid and strong base.
- 13. Proximate analysis of coal.
- 14. Preparation of phenol formaldehyde resin.

### **Reference Books:**

- 1. Practical Engineering Chemistry by K. Mukkanti, B.S. Publications.
- 2. Vogel's Quantitative Chemical Analysis V Edition Longman.
- 3. A Text Book on experiments and Calculations Engineering by S.S.Dara, S.Chand& Co Ltd.
- 4. Chemistry Practical Manual, Lorven Publications.

### **III Semester**

<b>X/10N/A</b> TO/	PROBABILITY AND STATISTICS	L	Т	Р	С
V 10IVIA 104	(Common for CIVIL, EEE, ME & CSE)	3	1	0	4

#### Pre requisites: Probability, Conditional Probability, Baye's theorem on probability Course Outcomes: At the end of the Course student will be able to:

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Find measures of central tendency and dispersion for real data sets	K3
CO2	Find parameters of given function	K3
CO3	Apply probability distribution to real time problems	K3
CO4	Plot a best fit curve to an experimental data and find the correlation and regression	K3
CO5	Create good estimators to various parameters	K6
CO6	Apply the principles of Statistical Inference to practical problems	K3

#### **Unit-I: Basic Statistics**

Measures of Central Tendency: Mean, Median, Mode

Measures of Dispersion: Variance, Standard deviation, Skewness and Kurtosis

#### **Unit-II: Basic Probability**

Random Variables: Discrete and continuous - Probability function – density and distribution function, Expectation of a Random Variable, Moments, Chebychev's Inequality (Without proof).

#### **Unit-III: Probability Distributions**

Probability distributions: Binomial, Poisson and Normal - Evaluation of statistical parameters: Mean, Variance and their properties, Introduction to Exponential, Gamma and Weibull distributions.

#### **Unit-IV: Bivariate Distributions**

Curve fitting by the method of Least squares- Fitting of straight line, parabola and exponential curves, Simple Correlation and Regression – Rank correlation.

#### **Unit-V: Sampling Distribution and Estimation**

Introduction –Sampling distribution of means with known and unknown standard deviation Estimation: Criteria of a good estimator, point and interval estimators for means and proportions

#### **Unit-VI: Tests of Hypothesis**

Introduction-Type-I, Type-II Errors, Maximum Error, one-tail, two-tail tests,Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means. Test of significance: Small sample test for single mean, difference of means and test of ratio of variances (F-Test) - Chi-square test for goodness of fit and independence of attributes.

#### **Text Books:**

- 1. B. V. Ramana, A text Book of Engineering Mathematics, Tata Mc Graw Hill.
- 2. Miller & Freund's, Probability & Statistics for Engineers Eighth Edition, Richard. A. Johnson References Books:
- 1. S. Ross, "A First Course in Probability", Pearson Education India, 2002.
- 2. Dr.T.S.R.Murthy, Probability and Statistics for Engineers, BS Publications.
- 3. T. Veerarajan, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.

V18MET03	ENGINEERING MECHANICS	L	Т	Р	С
	(Common for ME & CE)	3	1	0	4

#### **Course Outcomes:**

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Compute the resultant force of a given system of forces	K3
CO2	Calculate the forces in the different types of plane trusses	К3
CO3	Find the Centroid, Center of Gravity and Moment of Inertia for plane figures and bodies	К3
CO4	Illustrate the different types of plane motions of a particle to compute its velocity, acceleration and force.	К3
CO5	Illustrate the concept of Work and Energy	K3
CO6	Apply the principle of Virtual Work to stability of equilibrium of beams and trusses	K3

#### Unit I:

Introduction to Engg. Mechanics – Basic Concepts.

**Systems of Forces:** Coplanar Concurrent Forces – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

**Equilibrium of Systems of Forces:** Free Body Diagrams, Equations of Equilibrium of Coplanar Systems for concurrent forces. Lami'sTheorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

#### Unit II:

**Analysis of Trusses by Method of Joints:** Types of Trusses - Assumptions for forces in members of a perfect truss, Force table, Cantilever Trusses, Structures with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

#### Unit III:

Centroid: Centroid of simple figures (from basic principles) – Centroid of composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), Pappus theorems.

**Area moments of Inertia:** Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia.

#### Unit IV:

**Kinematics:** Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

**Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

#### Unit V:

**Work – Energy Method:** Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

#### Unit VI:

**Principle of Virtual Work:** Principle of virtual work, advantages of principle of virtual work, principle of virtual applied to stability of equilibrium. Application of principle of virtual work limited to beams, ladder problems and trusses only.

#### **Text Books:**

- 1. Engg.Mechanics S.Timoshenko&D.H.Young., 5th Edn , McGraw Hill publications. reprint 2015
- 2. Engineering Mechanics by A.K.Tayal, 14th Edn Umesh Publications. reprint 2015

3. Engineering Mechanics, Fedinand . L. Singer, 3<sup>rd</sup> Edn - BS Publications Harper – Collins. • reprint 2016

#### **Reference Books:**

1. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best& W.G. McLean,

5th Edn – Schaum's outline series - McGraw Hill Publ. • reprint 2015

- 2. Meriam J. L., Kraige L. G., "Engineering Mechanics Dynamics", Wiley Student Edition, (Seventh Edition) reprint 2015.
- 3. Beer F. P., Johnston E. R., "Vector Mechanics for Engineers Statics and Dynamics", Tata• McGraw Hill Publishing company Ltd., New Delhi (Eighth Edition) reprint 2009
- 4. Shames Irving H., "Engineering Mechanics", Prentice Hall, New Delhi (Fourth edition)• reprint 2009.

V18MET04	THERMODYNAMICS	L	Т	Р	С
		3	1	0	4

#### **Course Outcomes:**

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Describe the basic terms related to work and heat	K2
CO2	Explain first law of thermodynamics and internal energy.	K2
CO3	Apply the second law of thermodynamics to basic thermal systems.	K3
CO4	Explain the concept of entropy.	K2
CO5	Illustrate various thermodynamic cycles.	K2
CO6	Discuss about pure substance.	K2

#### UNIT – I

Thermodynamic System, boundary, Surrounding, control volume, Universe, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi-static Process, Irreversible Process, Causes of Irreversibility – Energy in State, Work and Heat, Point and Path function. Zeroth law of thermodynamics.

#### UNIT – II

**First law of thermodynamics:** Joule's experiments, First law of thermodynamics- systems and steady flow systems, Specific heats at constant volume and pressure, Enthalpy, First law applied to flow systems, Systems undergoing a cycle and change of state, First law applied to steady flow processes, various non-flow processes, Properties of end states, Heat transfer and work transfer, Change in internal energy, throttling and free expansion.

#### UNIT – III

**Second law of thermodynamics:** Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics - Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Clausius theorem, Clausius Inequality.

#### $\mathbf{UNIT} - \mathbf{IV}$

Entropy, Principle of Entropy Increase, availability and irreversibility, Third Law of Thermodynamics, T-ds relations, Helmholtz and Gibbs functions, Gibbs relations, Maxwell relations.

#### UNIT – V

**Thermodynamic Cycles:** Carnot vapor cycle, Ideal Rankine cycle, Rankine reheat cycle, air-standard Otto cycle, air-standard Diesel cycle, air-standard Brayton cycle, vapor-compression refrigeration cycle.

#### UNIT – VI

**Pure Substances**: P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations, Triple point at critical state properties during change of phase, Dryness Fraction.

#### **Text Books:**

- Engineering Thermodynamics, PK Nag 5<sup>th</sup> Edn, TMH,2014
   Thermodynamics. An engineering Approach with student resources DVD Y.A. Cengel & M.A. Boles, 7<sup>th</sup> Edn-McGrawHill,2014
- 3. Internal Combustion Engine –V Ganeshan.4<sup>th</sup> edition, TMH, 2016

#### **References:**

- 1. Engineering Thermodynamics by Y.V.C. Rao, 1<sup>st</sup> edition, Universities, 2005.
- 2. A text book of Engineering thermodynamics, R.K Rajput, 4<sup>th</sup> edition, Lakshmi Publishers,2010

V18MET05	FLUID MECHANICS AND FLUID MACHINES	L	Т	Р	С
		3	0	0	3

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Understand the basic concepts of fluid properties and to determine hydrodynamic forces on submerged bodies.	K3
CO2	Apply the flow field phenomena and the basic governing equations in solving fluid flow problems.	K3
CO3	Calculate the various losses occurring when the fluid flowing in closed conduit and measure the discharge by different apparatus.	К3
CO4	Understand the concept of boundary layer theory and to find out major and minor losses.	K3
CO5	Determine the forces in the operation of jets and turbines and to determine efficiencies of turbines.	K3
CO6	Interpret the operation of pumps and hydraulic systems and to find efficiencies of pumps.	K3

#### UNIT 1

**Fluid Statics** :Dimensions and units, Physical properties of fluids-Density, Specific gravity, Viscosity, Surface tension, Vapour pressure, Capillarity, Bulk modulus, Pressure types-Atmospheric, absolute, gauge and vacuum pressure, Measurement of pressure - Piezometer, different types of manometers.

#### UNIT 2

**Fluid Kinematics**: Stream line, path line and steak line, Classification of flows- steady &un steady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows, equation of continuity for one dimensional flow and three dimensional flow, Equation of continuity in differential form.

#### UNIT 3

**Fluid Dynamics**: Bernoulli's equation along a stream line, Momentum equation, application of momentum equation on pipe bend, Measurement of flow- Pitot tube, Venturimeter, Orifice meter, Turbine flow meter.

#### UNIT 4

**Closed Conduit Flow:** Reynolds experiments, Darcy-Weisbatch equation, Major and minor losses, Hydraulic gradient line, Total energy line, Pipes in series and parallel.

**Boundary layer concepts**: Definition, Development along a thin flat plate, Thicknesses (Momentum, Energy, Displacement-No derivations), separation, methods of controlling separation, stream lined and bluff bodies.

#### UNIT 5

**Basics of turbomachinery:** Determination of hydrodynamic force of jet on stationary and moving flat, inclined, curved vanes (jet striking at tip and centre), velocity diagrams, work done and efficiency, flow over radial vanes, series of vanes.

#### **Turbines:**

Classification of turbines, Pelton wheel, Francis turbine, Kaplan turbine- Working principles, working proportions, work done, efficiencies. Draft tube-types, functions and efficiency.

Unit and specific quantities, governing, Cavitation, Water hammer, Surge tank.

#### **UNIT 6:**

#### **Pumps**:

Centrifugal pumps: Classification, working, work done, heads, efficiencies, losses, Specific speed, pumps in series and parallel.

Reciprocating pumps: Classification, working, work done, slip, indicator diagrams, Effect of acceleration and friction on work done.

#### **TEXT BOOKS:**

- 1. Hydraulics and Fluid Mechanics including Hydraulics Machines (In SI Units)– Modi & Seth.20<sup>th</sup> edition. Standard publishers, 2015.
- 2. Fluid mechanics and Hydraulic machines R.K. Bansal,1<sup>st</sup> edition, Lakshmi Publications,2011.

#### **REFERENCES:**

- Fluid Mechanics And Fluid Power Engineering, D.S Kumar, 9<sup>th</sup> edition, , S.K Kataria publishers, 2016.
   Fluid Mechanics and Hydraulics by Jack.B. Evett -,3<sup>rd</sup> edition, TMH, 2004.
- 3. Fluid Mechanics Yunus A.Cengel & John.M.Cimbala,2<sup>nd</sup> edition, TMH publications, 2013.

V18MET09	MATERIALS ENGINEERING	L	Т	Р	С
		3	0	0	3

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Explain the types of bonds in solids and crystallization of metals.	K2
CO2	Construct phase diagrams for the study of alloys and phase transformation reactions.	K2
CO3	Distinguish Cast Irons and Steels.	K2
CO4	Identify suitable heat treatment process to achieve desired properties of metals and alloys.	K2
CO5	Discriminate different non ferrous metals and their alloys	K2
CO6	Illustrate the properties and applications of composites and ceramic materials and understand the concepts of powder metallurgy.	K2

#### Unit 1

**Structure of Metals:** Properties of metals, Types of Bonds in Solids, Crystal geometry - Space Lattices, Unit cells, Crystal Structure, Miller indices. Imperfections in crystals- Line defects, Point defects, Surface defects. Crystallization of metals, grain, grain boundaries and their properties.

Constitution of alloys: Necessity of alloying, types of solid solutions, Hume Rotherys rules.

#### Unit 2

**Equilibrium Diagrams:** Experimental methods of construction of equilibrium diagrams, phase rule, Isomorphous alloy systems, Lever rule, eutectic systems, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni, Al-si, and Fe-Fe3C.

#### Unit 3

**Production of Iron & Steels:** Working principle of Blast Furnace, Cupola furnace, Open hearth furnace, Electric arc furnace and Induction furnace.

**Cast irons and alloy steels:** Types of Cast irons- White, Grey, Malleable and Nodular Cast Irons, Properties and application of cast irons, Effect of alloying elements on structure and properties of steels, Properties and uses of Silicon and Hadfield Manganese steels, High speed steels and Stainless steel.

#### Unit 4

**Heat treatment of Ferrous and Non Ferrous alloys:** Types of heat treatment processes, Annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface - hardening methods, Age hardening treatment.

#### Unit 5

**Non-ferrous metals and alloys:** Properties and uses of important non-ferrous metals like Cu, Al, Pb, Sn, Zn. Study of important non-ferrous alloys: Brass & Bronzes, Bearing alloys, Al alloys & Ti alloys.

#### Unit 6

**Composite materials and Ceramics:** Classification of composites, methods of manufacturing of composites - stir casting method, hand layup process, filament winding process.

Properties and applications of crystalline ceramics, glasses, cermets, abrasive materials and nano-materials **Powder metallurgy:** Introduction ,steps in powder metallurgy.
### **TEXT BOOKS:**

1. Introduction to Physical Metallurgy/ Sidney H. Avner/ 2<sup>nd</sup> edition ,McGraw Hill Education (India) Private

Limited/2016

2. Materials Science and Engineering/ William D Callister (Adapted by R. Balasubramaniam) /Wiley Inida (P)

Ltd/ 2007

3. Material Science and Metallurgy/ Dr. V.D.Kodgire/40<sup>th</sup> edition, Everest Publishing House/2017

### **REFERENCE BOOKS:**

- 1. Materials Science and Engineering/ V. Raghavan /(5th Edition) Prentice-Hall of India Pvt. Ltd/2004.
- 2. Essential of Materials science and engineering /Donald R.Askeland/ 2<sup>nd</sup> edition Thomson/2014
- 3. Engineering mechanics of Composite Materials/Isaac M.Daniel, Ori Ishai/ 5<sup>th</sup> edition/Oxford Publications/2015.

V18MEL02	02 MACHINE DRAWING	L	Т	Р	С
		0 0 3	1.5		

Cou	rse Outcomes:	
	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Describe the drawing and develop ability to represent any matter/symbol with the help of picture in CAD.	K2
CO2	Develop primary knowledge on machine drawings and the representation of tolerance on dimensions.	К3
CO3	Show the hidden objects by sectional views of different machine parts and their geometry representation.	К3
CO4	Identify the different joining methods to assemble the machine parts .	K3
CO5	Develop skill to produce assembly drawings from detailed drawings of machines parts.	К3
CO6	Construct press tools and their assemblies in 3D.	K3

### PART-A

**Sectional views :** Orthographic projection of different types of composite bodies. Sectional views, Full sectional, half sectional views of simple machine parts, Screwed fastenings – nomenclature of threads, conventional representation of threads, Hexagonal and square headed bolts and nuts, Various types of machine screws and set screws, Foundation bolts.

### Keys, Shaft couplings, Riveted joints, Bearings

Sunk key, saddle key, feather key, sleeve coupling, flanged coupling, lap and but riveted joints and plummer block,Lock nuts, Cotter joints

### PART-B

AutoCAD Mechanical Desktop, draw, modify, dimension tool bars, annotations, Layers, ISI conventions in drawing, representation of Materials, machine parts, welded joints, riveted joints, methods of indicating notes on drawings. Sketcher, part modeling, assembly, drafting commands in CATIA.

Assembly drawings in 2D using AUTOCAD: Stuffing box, steam engine connecting rod, Eccentric, single tool post, Lathe tail stock, machine vice, knuckle joint and Screw jack.

**Assembly drawings in 3D Using CATIA:** Foot step bearing, square tool post, piercing and blanking tool, V-bending tool and box jig.

### **TEXT BOOKS:**

- 1. Machine drawing \_ K.L. Narayana, P. Kannaiah& K.Venkata reddy, 1<sup>st</sup> edition, Radiant, 2016.
- 2. Tool Engineering & Design \_ G.R. Nagpal/Khanna publishers, 1<sup>st</sup> edition, Khanna Publishers, 2009.
- 3. Machine Drawing with Auto CAD- Pohit and Ghosh, 1<sup>st</sup> edition, Pearson, 2017.

### **REFERENCES:**

- 1. Machine Drawing by Nagpal, 1<sup>st</sup> edition, khanna publishers, 2009.
- 2. Machine drawing, Ajeet Singh, 2<sup>nd</sup> edition, TMH, 2016.
- 3. Machine drawing with autocad, Pohit; Goutam, 1<sup>st</sup> edition, Pearson, 2017.

V18MEL03	V18MEL03 FLUID MECHANICS AND FLUID MACHINES LAB	L	Т	Р	С
		0	0	3	1.5

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Employ the basic principles of Fluid mechanics to assess discharge with different devices and different losses in a pipe line.	К3
CO2	Calculate the performance parameters of Reciprocating and Centrifugal pumps.	K3
CO3	Calculate the performance parameters of different types of turbines.	K3

- 1. Determination of friction factor for the given pipe line.
- 2. Determination of loss of head due to sudden contraction.
- 3. Determination of force exerted by a jet on a vane.
- 4. Calibration of Venturimeter.
- 5. Calibration of Orificemeter.
- 6. Calibration of Turbine flow meter.
- 7. Determination of performance parameters of Reciprocating pump.
- 8. Determination of performance parameters of Single stage Centrifugal pump.
- 9. Determination of performance parameters of Multi stage Centrifugal pump.
- 10. Determination of performance parameters of Pelton wheel.
- 11. Determination of performance parameters of Francis Turbine.
- 12. Determination of performance parameters of Kaplan Turbine.

# ADD ON EXPERIMENTS:

- 1. Determination of loss of head due to sudden expansion.
- 2. Verification of Bernoulli's theorem.

### **REFERENCES:**

- 1. Fluid Mechanics and Fluid Machines lab College lab manual.
- 2. Hydraulics and Fluid Mechanics including Hydraulics Machines (In SI Units)– Modi & Seth,20<sup>th</sup> edition, Standard publishers, 2015.

	Professional Communication	L	Т	Р	С
V18ENT03	Skills - I	3	0	0	MNC

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Summarize one's introduction in an appropriate manner, exhibit grammatical competence through correction of sentences, analyze noun and pronoun dispositions and develop pre-reading strategies to improve comprehension skills.	K5
CO2	Distinguish singular and plural in different contexts and display knowledge through accurate usage of sentences, build conversations which befit the situations, comprehendthe passages well and, use different kinds of idioms.	K4
CO3	Classify various kinds of adjectives and adverbs, learn natural occurrence of paired words of native speakers, infer the referential and inferential aspects of the passages and make use of idioms while narrating personal experiences.	K4
CO4	Judge and assess the behaviour of people in day to day life using kinesics and proxemics that disclose their disposition and be aware of their personal traits that promote good relations.	K2
CO5	Articulate their goals and have a constructive plan of executing them properly and become adept in oral presentations as well as poster presentations that enhance their professional skills.	K3
CO6	Evaluate various happenings by thinking out of the box and display their latent talent. They can also reduce the stress levels by applying various stress management techniques.	K4

# UNIT – I

**Self-Introduction:** Basic information - Academic and personal - interests- strengths and weaknesses - goal.

ERROR ANALYSIS: Nouns & Pronouns – Singular & Plural – Kinds of Nouns & Pronouns- Collective Nouns - Personal and Reflexive Pronouns.

READING COMPREHENSION: Reading as a skill – quick reading - analyzing – answering IDIOMS& PHRASES: Colloquial expressions– formal and informal expressions.

### UNIT – II

**Error Analysis**: Concord – Subject – Verb agreement.

Role Play: Day to day situations - practical approach - real life experiences.

**Reading Comprehension**: Skimming – scanning - summarizing – problem solving.

Idioms & Phrases: Enriching written and spoken English – use and usage.

### UNIT – III

Error Analysis: Adjectives – Adverbs – role of modifiers – place of Adjectives– Adverbs of frequency. Collocations: Natural combination of words – closely affiliated with each other. Reading Comprehension: At a glance – close reading – understanding – answering Idioms & Phrases: Communicative - expressive – competent.

### UNIT -IV

**Inter aqnd Intra Personal Skills**: Leading, Coaching, Interviewing, Managing, Persuading - Self awareness, Self confidence, Good Attitude.

Body Language: Basics of proxemics and kinesics.

#### UNIT -V

**Presentation Skills**: Importance of Presentation skills, Structuring our presentations, Ways to improve our presentation skills, Tips for effective presentations.– oral – Power point – poster. GOAL SETTING: Short-term – long-term – aim – target – vision – How to set SMART goals.

### UNIT - VI

**Lateral Thinking**: What is creativity, Fundamental approaches to smart thinking, Characteristics of a creative person, Convergent and Divergent thinking.

**Stress Management**: Meaning of Stress, Types of Stress, Symptoms of stress, Short term and long term stress, how can people manage stress.

#### **References:**

1. Essential English Grammar -		Raymond Murphy
2. Advanced English Grammar	_	D.S. Paul
3. Word Power Made Easy		<ul> <li>Norman Lewis</li> </ul>
4. English collocations in use -		Michael McCarthy
5. Word Power Made Handy		- ShaliniVarma
6. Barron's GRE		- Barron's
7. Current English Grammar & U	sage –	R.P Sinha
8. Think & Grow Rich	-	NapoleaonHill
9. Soft Skills for Everyone		- Butterfield, Jeff,
10. Soft Skills		- Chauhan, G.S. and Sangeeta Sharma
11. Theories of Personality		- Hall, Calvin S
12. Corporate Conversations		- Holtz, Shel
13. Communication Skills		- Kumar, Sanajy and PushpLata
14. Winning at Interviews		- Thorpe, Edgar and Showick Thorpe
15. Swami Vivekananda and "Per	sonalit	y Development" published by RK Math.

# **IV SEMESTER**

V18MET07	APPLIED THERMODYNAMICS	L	Т	Р	С
		3	0	0	3

#### **Course Outcomes:**

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Illustrate the working of various IC engines.	K2
CO2	Classify the working of various steam boilers, mountings, accessories and draught systems.	K2
CO3	Demonstrate about steam nozzles	K2
CO4	Calculate the performance of steam turbines	К3
CO5	compute the performance of steam condensers	K3
CO6	Illustrate the performance parameters of gas turbines	K3

### UNIT – I

**I. C. Engines :** Classification, Working principles, Valve and Port Timing Diagrams, Engine systems, Fuel, Carburettor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of wankle engine.

### UNIT – II

**Steam boilers:** Classification, working principles of L.P & H.P boilers with sketches & applications, mountings and accessories, working principles, boiler horse power, Process Steam, equivalent evaporation, efficiency and heat balance, draught, classification- natural and artificial draught.

### UNIT – III

**Steam Nozzles:** Type of nozzles, Applications, Flow through nozzles, Condition for maximum discharge, Nozzle Efficiency, Super saturated flow in nozzles, Wilson's line.

### UNIT – IV

**Steam Turbines**: Classification, Applications, impulse turbine, mechanical details, velocity diagram, effect of friction, power developed, axial thrust, blade or diagram efficiency, condition for maximum efficiency, velocity compounding, pressure compounding and velocity & pressure Compounding, combined velocity diagram for a velocity compounded impulse turbine.

**Reaction Turbine**: Applications, Mechanical details, principle of operation, thermodynamic analysis of a stage, degree of reaction, velocity diagram, Parson's reaction turbine, condition for maximum efficiency.

### UNIT – V

**Steam Condensers**: Classification of condensers- Jet, Evaporative and surface condensers, Applications, Vacuum and its Measurement, Vacuum efficiency, Sources of air leakage in condensers, Condenser Efficiency, Daltons law of partial pressures, Determination of mass of cooling water.

### UNIT – VI

Gas Turbines: Applications, Simple gas turbine plant, ideal cycle, essential components, parameters of performance, actual cycle, regeneration, inter cooling and reheating, closed and open cycles, merits and demerits.

# **Text Books:**

- 1. Engineering Thermodynamics, PK Nag 4<sup>th</sup> Edn, TMH.
- 2. Thermodynamics. An engineering Approach with student resources/ DVD. Y.A. Cengel & M.A. Boles/
- 8<sup>th</sup> Edn-McGrawHill/2016.
- 3. Gas Turbines / V Ganesan/3<sup>rd</sup> edition, TMH/2016.

### **References:**

- 1. Thermal Engineering/ R.K.Rajput/4<sup>th</sup> edition/ Laxmi Publications/2010
- 2. Applied Thermodynamics-II / R. Yadav./6<sup>th</sup> edition, Central Publishing House/2016
- 3. Gas turbines and Propulsive Systems/1<sup>st</sup> edition, Dhanpat Rai/2014
- 4. Tables of the properties of steam and other vapours and temperature-Entropy table by Cecil H Peabody
- by Forgotten books
- 5. Steam tables by C.P Kodandaraman New age International

VIQMETAQ		L	Т	Р	С
V TOIVILL TUO	MECHANICS OF SOLIDS	3	1	0	4

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Explain concept of stress and strain of composite bars.	K2
CO2	Find the shear force and bending moment in a beams.	К3
CO3	Calculate flexural and shear stresses in a beam and understand applications of various springs.	K3
CO4	Estimate the principal stresses in structural members.	K3
CO5	Determine the torsional rigidity of shaft and buckling load capacity of columns.	K3
CO6	Estimate the hoop and longitudinal stress and strains in thin and thick cylinders.	K3

#### UNIT-I

**Simple stresses & Strains:** Definitions of stress and strain, types of stresses and strains, Elasticity, Hooke's law, Stress-Strain diagram for Mild steel, working stress, factor of safety, Lateral strain, Poisson's ratio and volumetric strain, Elastic Modulii and the relationship between elastic constants ,Bars of varying section, composite bars ,temperature stresses.

**Strain Energy :** Definition, Resilience, Strain Energy due to gradually applied, suddenly applied and impact loads, simple applications.

### UNIT-II

**Shear Force & Bending Moment Diagrams:** Definition of beam, Types of beams, concept of SF and BM, SF & BM diagrams for cantilever, Simple support and overhanging beams subjected point loads, Uniform distributed load(UDL), Uniformly varying loads, point of contra flexure, Relationship between S.F, BM and rate of loading.

#### UNIT-III

**Flexural Stresses:** Theory of simple Bending, Assumptions, Derivation of Bending equation, Neutral axis, Determination of bending stresses, section modulus of rectangular, Circular sections (Solid and Hollow), I and T channel sections.

**Mechanical Springs:** Introduction, classification, Applications, Stresses and deflections of helical springsextension, compression springs.

#### **UNIT-IV**

**Principal Stresses and Strains:** Introduction-stresses on an inclined section of a bar under axial loading, compound stresses, Normal and tangential stresses on an inclined plane for biaxial stresses, Two perpendicular normal stresses, representation of stress on Mohr's circle diagram, Introduction to theories of Failure.

#### UNIT-V

**Torsion:** Introduction- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity. Combined torsion and bending of circular shafts. **Columns:** Buckling and Stability, Columns with Pinned ends, Columns with other support Conditions, Limitations of Euler's Formula, Rankine's Formula.

### UNIT-VI

**Thin Cylinders:** Thin seamless cylindrical shells, Derivation of formula for longitudinal and circumferential stresses , hoop, longitudinal and Volumetric strains, changes in diameter, and volume of thin cylinders, Riveted boiler shells , Thin spherical shells.

Thick Cylinders: Lame's equation, cylinders subjected to inside & outside pressures, compound cylinders.

### **Text Books**:

- 1. Solid Mechanics, by Popov/PHI publications 2<sup>nd</sup> edition /2017.
- Mechanics of Materials/Gere and Timoshenko,/ TMH 4<sup>th</sup> edition /2010.
- 3. Strength of materials/ S.Ramamrutham/Dhanpat rai publishers 1<sup>st</sup> edition /2016.

#### **Reference Books:**

- 1. Strength of materials/ R.K.Bansal/ Laxmi Publications 5<sup>th</sup> edition /2017.
- 2. Introduction to Solid Mechanics / Irving H Shames/ 4<sup>th</sup> edition PEARSON /2014.
- 3. Strength of materials /Young, D.H. Timoshenko, Stephen/CBS publishers /2002.

<b>V18MET06</b>	THEORY OF MACHINES-I	L	Т	Р	С
		3	0	0	3

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Explain the inversion of the four bar, slider crank and double slider chains.	K2
CO2	Determine the velocities and accelerations in mechanisms by graphical method.	К3
CO3	Explain the working of copying mechanism, straight line motion mechanisms, steering gears and Hooke's joint.	K2
CO4	Draw the cam profiles for given follower motions.	K3
CO5	Compare tooth profiles for gears and compute performance characteristics.	K2
CO6	Describe gear trains and compute the velocity ratio and torque in gear trains and calculate various parameters related to belts.	К3

### UNIT-I

### Mechanisms :

Introduction, terminology, definitions and assumptions, planar, spherical and spatial mechanisms, mobility, classification of mechanisms, kinematic inversion, inversions of four bar chain, slider crank chain and double slider chain, Grashoff's law, mechanical advantage.

### UNIT-II

### Velocity Analysis :

Introduction, Absolute and relative motions, Vectors, Addition and subtraction of vectors, Motion of a link, Four-link mechanism, Velocity diagrams, Angular velocity of links, Velocity of rubbing, Slider-crank mechanism, crank and slotted lever mechanism, Instantaneous center, Kennedy's theorem, Locating I-centers, Angular velocity ratio theorem.

### **Acceleration Analysis:**

Introduction -Acceleration, four-link mechanism, Acceleration of intermediate and offset points, Slider-crank mechanism, Coriolis component, Crank and slotted lever mechanism using graphical method, Klein's Construction.

### UNIT-III

**Lower Pairs:** Pantograph, Exact straight line mechanism condition, Peaucellier, Hart Scott-Russel mechanisms. Approximate straight line mechanisms, Grasshopper, Watt, Chebyshev, Robert mechanisms. Steering gears-condition for correct steering, Davis, Ackerman steering gears, Hooke's joint-velocity ratio, angular acceleration of driven shaft, double Hooke's joint.

### UNIT-IV

**Cams:** Types of cams and followers, types of follower motion, velocity and acceleration diagrams, profile of cams.

### UNIT-V

**Gears:** Classification of gears, spur gears- terminology, fundamental law of toothed gearing, involute and cycloidal profile, Path of contact, arc of contact, contact ratio, minimum number of teeth, interference and methods of avoiding interference, rubbing velocity.

### UNIT-VI

Gear Trains: Introduction, Types - Simple, compound and reverted gear trains, Epicyclic gear train.

**Belt drives:** Belt and rope drives, open and crossed belt drives, velocity ratio, slip, material for belts and ropes, crowning of pulleys, ratio of friction tensions, power transmitted, centrifugal effect on belts, maximum power transmitted by a belt, initial tension.

### **Text Books**:

- 1. Theory of Machines/ Rattan SS, Tata McGraw Hill Education Publishers, 4<sup>th</sup> Edition 2015.
- 2. Theory of Machines / Beven Thomos / CBS publication, 3<sup>rd</sup> edition /2005

### **References:**

- 1. Theory of Machines / R.K.Bansal/ Laxmi Publications 5<sup>th</sup> edition /2016
- 2. Mechanisms of Machines, V Ramamurthy, Narosa publishing House, Reprint ,2019
- 3. Theory of Machines by R S Khurmi, S Chand Publications, 1st Edition, 2011.
- 4. Theory of Machines and Mechanisms, Ballaney P, Khanna publications,1st Edition,2011.

V18MET14	MANUFACTURING PROCESSES	L	Т	Р	С
		3	0	0	3

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Understand fundamentals of casting-patterns and its materials, Gating System	K3
CO2	Choose the elements of casting and introduce other casting processes	K3
CO3	Distinguish various arc and solid state welding processes and select a suitable process based on the application and requirements	K3
CO4	Understand the principles of advanced welding processes and their applications, welding defects and its testing methods	K3
CO5	Establish the knowledge on Hot working and Cold Working Process	K3
CO6	Understanding of various bulk forming processes, sheet metal forming and processing of plastics.	K3

# UNIT I

Casting - Steps involved in making a casting, Advantage of casting and its applications.

**Patterns and Pattern making** - Types of patterns, Materials used for patterns, pattern allowances and their construction.

Principles of Gating- Gating ratio and design of Gating systems.

# UNIT II Melting and solidification:

Methods of melting - Crucible melting and cupola operation, steel making processes.

**Solidification of casting** - Concept, Solidification of pure metal and alloys, short & long freezing range alloys.

Risers – Types, function and design, casting design considerations,

**Special casting processes** - 1) Centrifugal 2) Die 3) Investment.

# UNIT III

**Welding:** Classification of welding process, types of welds and welded joints and their characteristics, design of welded joints - Gas welding, ARC welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water) welding.

# UNIT IV

### Special welding processes:

Inert Gas welding - TIG & MIG, welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering & Brazing. Heat affected zones in welding, welding defects-causes and remedies, destructive non-destructive testing of welds.

Cutting of metals: Oxy- Acetylene Gas cutting, water plasma. Cutting of ferrous, non-ferrous metals.

### UNIT V

Hot & cold working- strain hardening, recovery, recrystallization and grain growth, Comparison of properties of Cold and Hot worked parts

**Rolling fundamentals** - Theory of rolling, types of rolling mills and products.

**Extrusion of metals:** Basic extrusion process and its characteristics, Hot extrusion and cold extrusion, Forward extrusion and backward extrusion, Impact extrusion Hydrostatic extrusion.

Drawing - Wire drawing and Tube drawing.

### UNIT VI

**Bulk forming processes**: Principles of forging, Tools and dies-Types, Forging -Smith forging, Drop Forging, Roll forging ,Forging hammers: Rotary forging - forging defects.

**Sheet metal forming**: Stretch Forming, Deep Drawing, Coining, Spinning, Blanking and Piercing, Bending and Forming, Stamping Spring Back and Remedies, Types of Presses and Press Tools.

**Processing of plastics**: Types of Plastics, Properties, applications and their Processing methods and Equipment (blow and injection moulding).

#### **Text Books:**

1. Manufacturing Engineering and Technology/ Kalpak jian, Serope, Steven, Schmid R./Pearson, 1<sup>st</sup> Edition 2013.

2. Manufacturing Technology / P.N. Rao/ Tata McGraw Hill, 4<sup>th</sup> Edition 2016.

#### **References:**

1. Production Technology / R.K. Jain /Khanna publishers,17<sup>th</sup> edition 2004.

2. Principles of Metal Castings / Richard W Heine and Roenthal. McGraw Hill Education, 2nd Edition 2017.

3. Welding Process and technology /Dr. Paramar / Khanna Publishers, 3rd Edition.

4. Production Technology /Sarma P C / S.Chand Publications,4<sup>th</sup> Edition 2014.

V18MET11	INSTRUMENTATION AND CONTROL SYSTEMS	L	Т	Р	С
		3 0 0	0	3	

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Discuss about the basic concepts of Linear measuring Instruments	K2
CO2	Explain various types of Temperature and Pressure measuring Instruments	K2
CO3	Understand the working of flow, Speed, Acceleration and Vibration measuring devices	К2
CO4	Illustrate various types of Strain measuring Instruments	K2
CO5	Explain the Humidity, Force, Torque, and Power measuring Instruments	K2
CO6	Describe various types of control system and its Elements	K2

### UNIT – I

**Basic principles of measurement**: Generalized configuration, Dynamic performance characteristics- sources of error and elimination methods.

**Displacement Measurement:** Principle and construction of various transducers - piezo electric, inductive, capacitance, resistance, ionization and photo electric transducers, calibration procedures.

### UNIT – II

**Temperature Measurement:** Thermometry, scales of temperature, electrical resistance -thermister, thermocouple, pyrometers.

**Pressure Measurement:** Working of various instruments - dead weight pressure gauge , bourdon pressure gauges, bellows, diaphragm gauges.

Low pressure measurement: Thermal conductivity gauges - Ionization pressure gauges, Mcleod pressure gauge.

### UNIT – III

**Level Measurement :** Working of Various instruments- Capacitative, Ultrasonic, Magnetic, Cryogenic fuel level indicators, bubler level indicators.

Flow Measurement: Rotameter, Magnetic, Ultrasonic, hot-wire anemometer, Laser Doppler Anemometer (LDA).

**Speed Measurement:** Types of Mechanical tachometers, electrical tachometers, stroboscope and noncontact type of tachometer

### UNIT – IV

Acceleration And Vibration Measurement: Principles of seismic instruments - Vibrometer and Accelerometer

**Strain Measurements:** Various types of strain measuring instruments -electrical strain gauge ,gauge factor, use of resistance strain gauge for measuring bending compressive and tensile strains , strain gauge rosettes.

### UNIT – V

**Introduction to Elements of Control Systems:** classification, Elements of control systems, concept of open loop and closed loop systems, Examples and application of open loop and closed loop systems, Feed-Back Characteristics.

# UNIT – VI

**Control Systems Components:** Servomechanisms, Transfer Function of DC Servo motor and AC Servo motor, working principle of stepper motor, applications (position, temperature and speed control systems with block diagrams).

Microprocessor and Microcontrollers : Introcution, basic concepts and various types of controllers.

### **Text Books:**

- 1. Measurement Systems: Applications & design / D.S Kumar/ Metropolitan/1st/2015
- 2. Mechanical Measurements / BeckWith, Marangoni, Linehard/ Pearson/6th/2018

#### **References:**

- 1. Measurement systems: Application and design/Doeblin Earnest. O. Adaptation/ TMH/ 6th edition, 2018
- 2. A course in mechanical measurements and Instrumentation and control / Sawhney, A.K.;Sawhney, Puneet/ Dhanpat Rai/1st edition/2016
- 3. Experimental Methods for Engineers / J.P.Holman/McGraw Hill /8th edition.
- 4. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers/2008

V18MEL05	MECHANICS OF SOLIDS & MATERIALS ENCINEERING LAB	L	L T	Р	С
		0 0 3	3	1.5	

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Assess the Mechanical properties of different metals.	K3
CO2	Examine the microstructures of different ferrous and non ferrous metals.	K3
CO3	Identify the effect of heat treatment and cooling rates on the properties of steels.	K4

#### NOTE: Any 6 experiments from each section A and B.

#### (A) MECHNICS OF SOLIDS LAB:

- 1. Direct tension test
- 2. Bending test on
- a) Simply supported beam
- b) Cantilever beam
- 3. Torsion test
- 4. Hardness test
- a) Brinells hardness test
- b) Rockwell hardness test
- 5. Test on springs
- 6. Compression test on cube
- 7. Impact test
- 8. Punch shear test

#### **(B) METALLURGY LAB:**

- 1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
- 2. Preparation and study of the Microstructure of Mild steels, Medium carbon steels, high C steels.
- 3. Study of the Micro Structures of Cast Irons.
- 4. Study of the Micro Structures of Non-Ferrous alloys Brass and Bronze.
- 5. Study of the Micro structures of Heat treated steels.
- 6. Hardenability of steels by Jominy End Quench Test.
- 7. To find out the hardness of various treated and untreated steels.

#### **References:**

- 1. Strength of materials, S.S.Bhavikatti Vikas Publications, 4<sup>th</sup> edition, 2013.
- 2. Material Science and Metallurgy, Dr. V.D.Kodagire, Everest Publishing House, 40 th Edition, 2017.

V18MEL11	MANUFACTURING PROCESSES LAB	L	Т	Р	С
		0	L T P 0 0 3	1.5	

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Design and Make a pattern.	K3
CO2	Test the properties of sand and prepare a casting.	К3
CO3	Perform Arc welding, Spot welding, TIG, MIG welding and Plasma Arc Cutting operations	К3
CO4	Perform blanking, piercing, Drawing and bending operations.	К3
CO5	Operate injection and blow moulding machines to manufacture plastic components	K3

### **METAL CASTING:**

Pattern Design and pattern making using wood turning lathe Sand properties testing for Compression strength and permeability. Mould preparation, melting and casting.

### WELDING:

ARC Welding - Lap, Butt & T- Joint Spot Welding - Lap &Butt Joint TIG Welding - Butt Joint MIG Welding- Butt Joint Plasma Arc Cutting

### **METAL FORMING:**

Blanking & Piercing operation by using Progressive Die Bending and Drawing operation

### **PROCESSING OF PLASTICS**

Injection Moulding Blow Moulding

### **REFERENCES:**

1. Production technology lab – College manual.

2. Manufacturing Engineering and Technology/ Kalpakjian, Serope; Steven, Schmid R./Pearson, 1<sup>st</sup> Edition, 2013

3. Manufacturing Technology / P.N. Rao/TMH, 4<sup>th</sup> Edition, 2016.

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V 1	OLINII	

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Summarize the evolution and historical importance of Indian constitution from 1858 to 1947.	K2
CO2	Explain various stages in the composition of Indian Constitution.	К2
CO3	Develop awareness about their primary rights and duties & build up their civic sense.	К3
CO4	Comprehend the distribution of powers between the center and states.	K4
CO5	Summarize and sketch the specific roles of heads of Nation and the functioning of legislative bodies.	K2
CO6	Explain the role of local self-government in strengthening democracy.	K1

# UNIT-I

Historical Perspective of the Indian Constitution – A brief discussion of various Acts i.e from 1858 to 1947 passed by the British Government.

# UNIT-II

### **Constitution of India**

- a) Preparation of Indian constitution by Constituent Assembly of India.
- b) Preamble or Philosophy of the Indian Constitution.
- c) Salient features of the Indian constitution.

### UNIT-III

- a) Fundamental Rights their importance& Limitations
- b) Fundamental Duties and their importance
- c) Directive principles of the state policy and their implementation

### UNIT-IV

### **Indian Federalism**

- a) Distribution of powers between Union and State Governments
- b) Legislative, Executive and Financial relations between Union and State Governments

### UNIT-V

Parliamentary form of Government in India

# 1. Union Executive

- a) President of India- Powers and functions
- b) Vice-President Powers and functions
- c) Prime Minister and Council of Minister Powers and functions

### 1. Union Legislature

- a) Rajya Sabha Powers and Functions
- b) Lok Sabha- Powers and Functions
- c) Amending Procedure- Important Constitutional Amendments 42nd, 44 Constitutional Amendment Acts.
  - 2. Judiciary Supreme court of India Powers and Functions

### UNIT-VI

Local Self-government in India 73rd & 74th Constitutional Amendments Acts

### **Reference Books:**

1. D D Basu-Introduction to the constitution of India – 18th Edition. Prentice – Hall of India Private Ltd-New Delhi-1998

2. Granville Austin (1972) the Indian Constitution, Cornerstone of a Nation Oxford university Press, New Delhi

3. Madhavkhosla (2012) the Indian Constitution, oxford university press, New Delhi

4.Granville Austin (1999) Working a Democratic Constitution; A History of the Indian Experience, Oxford University Press, New Delhi

5. Zoya Hasan, Sridharan E and Sudharshan R (Eds) 2002 India's living Constitution, Permanent black, New Delhi

6. BaxiUpendra (1980) the Indian Supreme Court and Politics Eastern book co, Lucknow

V18ENT04	PROFESSIONAL COMMUNICATION SKILLS - II	L	L T P 3 0 0	Р	С
		3		MNC	

	After successful completion of the course, the student will be able to:	Knowledge Level
CO1	Correlate individual words into one whole sentence using new vocabulary and focus on the error analysis of prepositions and conjunctions.	K4
CO2	Distinguish and acquire knowledge of using words of same category in a sentence and learn new words that promote communicative finesse.	K5
CO3	Find errors in sentences where the modifiers are misplaced and put them at the appropriate place, use hit pair words and send an email that is concise and lucid.	K5
CO4	Interpret the importance of Attire and Etiquette in societal context and manage their time.	K2
CO5	Discover the team working abilities among themselves and display their leadership qualities.	К3
CO6	Identify various elements of emotional balance that have positive impact on work- life-balance. (K2)	K2

# UNIT – I

**Error Analysis**: Prepositions - kinds of prepositions –appropriate use - conjunctions –sub- ordinating– co-ordinating.

**Vocabulary**: Etymology – roots – suffixes – prefixes and one word substitutes.

**Sentence Improvement**: Better choice – error-free sentences – effective – syntax.

### UNIT – II

**Error Analysis**: Parallel grammatical forms – same grammatical structures. **Vocabulary**: Words that describe personalities – faiths – professions – medical specialistsand Word Clusters. **Expansion of Proverbs**: Meaning – interpretation – explanation.

### UNIT – III

Error Analysis: Dangling modifiers – misplacement of modifiers – arrangement. Vocabulary: Antonyms and Synonymsand Foreign expressions. Email Writing: Format – method of exchanging – technicalities.

### UNIT-IV

Attire & Etiquette: Formal – informal- professional – social Attires, Meaning of Etiquette, Need for etiquette, Types of Etiquette.

**Time - Management**: Value of time – Setting priorities – effective use of time – ABCD analysis, Pareto Principle, Eisenhower Method.

### UNIT -V

**Team Work** – Benefits of working with a team – Team Dynamics. **Leadership Qualities**: Leadership Styles, Characteristics of a Good Leader, Big 5 Personality traits, Myths about leadership qualities.

# UNIT -VI

**Emotional Intelligence**: What is EI – Daniel Goleman model of EI, Qualities of an Emotionally Intelligent Person - Emotional balance – feelings – thoughts – motivation.

**Work – Life - Balance**: Personal life – professional life – cause of work-life imbalances, consequences of work-life imbalance, Role of gender and family – improving work life balance

### **References:**

1. Essential English Grammar	-	Raymond Murphy		
2. Advanced English Grammar	_	D.S. Paul		
3. Word Power Made Easy		<ul> <li>Norman Lew</li> </ul>	vis	
4. English collocations in use	-	Michael McCarthy		
5. Word Power Made Handy		- ShaliniVarm	ıa	
6. Barron's GRE		- Barron's		
7. Current English Grammar &	Usage -	R.P Sinha		
8. Think & Grow Rich	-	Napoleaon Hill		
9. Soft Skills for Everyone		- Butterfield, Jeff	· •	
10. Soft Skills		- Chauhan, G.	S. and Sangeeta	Sharma
11. Theories of Personality		- Hall, Calvin S		
12. Corporate Conversations	- H	ltz, Shel		
13 Communication Skills		- Kumar, Sanajy a	and PushpLata	
14. Winning at Interviews		- Thorpe, Edgar a	nd Showick Thorp	be
15. Swami Vivekananda and "P	ersonal	y Development" publ	lished by RK Math	1.

# V Semester

V18MET13	HEAT TDANSEED	L	Т	Р	С
	HEAT TRANSFER	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		
	Alter succession completion of the course, the student will be able to	Level	
COI	Illustrate the basic modes of heat transfer, basic laws of heat transfer and to develop	V2	
COI	solution for one dimensional steady state heat conduction problems.	KJ	
$CO^{2}$	Interpret the heat transfer through extended surfaces, to find solution for one	<b>K</b> 3	
002	dimensional extended surfaces and unsteady state heat conduction problems.	KJ	
CO2	Illustrate convective heat transfer and to apply Dimensional analysis concept to	<b>K</b> 3	
005	convective heat transfer.	KJ	
CO4	Apply empirical correlations for forced and free convection to compute values for the	K3	
04	convection heat transfer coefficient.	KJ	
COS	Apply empirical correlations for phase change process to calculate values for the	<b>K</b> 3	
COS	convection heat transfer coefficient and to Illustrate Heat Exchangers.	KJ	
COG	Employ the principles of radiation heat transfer, to find the shape factor and heat	K3	
00	transfer rate through radiation.	КJ	

### 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 Parallel and 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 Age International Publications.

# **REFERENCE BOOKS:**

- 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	L	Т	ГР	С
	(ELECTIVE-I)	3	0	0	3

	After successful completion of the course, the student will be able to	Knowledge Level
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 of ignition 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.

### $\mathbf{UNIT} - \mathbf{IV}$

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.

### $\mathbf{UNIT} - \mathbf{V}$

Measurement, Testing and Performance of 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.

# $\mathbf{UNIT} - \mathbf{VI}$

Emissions from IC 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., Dhanpat Rai and Sons.
- 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.

<b>V18MFT38</b>	NANO TECHNOLOGY	L	Т	Р	С
	(ELECTIVE-I)	3	0	0	3

	After successful completion of the course, the student will be able to	Knowledge Level
CO1	Understand the essential concepts used in nanotechnology	K2
CO2	Identify the various nanomaterials properties	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, piezo response microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy.

### $\mathbf{UNIT} - \mathbf{V}$

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.

V18MET15	THEORY OF MACHINES – II	L	Т	Р	С
		3	1	0	4

	After successful completion of the course, the student will be able to	Knowledge Level
CO1	Apply gyroscopic effect for stabilization of sea vehicles, aircrafts and automobile vehicles etc.,	K3
CO2	Compute friction for torque transmission of mechanical systems	K3
CO3	Interpret dynamic force analysis of slider crank mechanism in design of 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 Discrete systems starting from the general equation of displacement.	K3

### UNIT – I

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving 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, proell and Hartnell 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 secondary balancing 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.

L	Т	Р	С
3	0	0	3

	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.

### $\mathbf{UNIT} - \mathbf{V}$

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.

	After successful completion of the course, the student will be able to	Knowledge Level	
CO1	Examine the mechanism of chip formation in machining and explain different parameters involved in machining process	К3	
CO2	Describe various types of lathe machines and their operations	К3	
CO3	Explain the construction and working of shaper, slotter, planar, drilling and	K)	
005	boring.	<b>K</b> 2	
CO4	Explain the construction and working of various milling and grinding	K2	
C04	machines		
CO5	Illustrate the basic principle and working of Ultrasonic machining, Abrasive jet	K3	
	machining and Electrochemical machining.	KJ	
000	Illustrate the basic principle and working of Electric discharge machining,	V2	
	electron beam machining, Laser beam machining.	КЭ	

### 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.

### $\mathbf{UNIT} - \mathbf{IV}$

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.

### $\mathbf{UNIT} - \mathbf{V}$

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 Hajra choudhury/Asia Publishing House

4. Advanced machining processes/ VK Jain/ Allied publishers.

### **REFERENCE BOOKS:**

- 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.

V18MEL10	THERMAL ENGINEERING LAB	L	Т	Р	С
		0	0	3	1.5

	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	16 METAL CUTTING & MACHINE TOOLS LAB	L	Т	Р	С
		0	0	3	1.5

	After successful completion of the course, the student will be able to	Knowledge Level
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	К3

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

V18CSL05	PYTHON PROGRAMMING LAB	L	Т	Р	С
		0	0	3	1.5

	After successful completion of the course, the student will be able to	Knowledge Level
CO1	Demonstrate Basic Python Programs	K3
CO2	Construct control structures in python	K3
CO3	Demonstrate functions and packages.	K3
CO4	Construct python programs using structured data types.	K3
CO5	Demonstrate Text Files	K3

**Basics of python programming:** Features of python – History of Python - The Future of Python installation and execution - Data types – Identifiers - variables – type conversions- Literal Constants – Numbers – Strings. I/O statements. Operators and expressions, operator precedence – expression evaluation.

# **Exercise 1 - Basics**

a) A sample Python Script using command prompt, Python Command Line and IDLE

b) A program to purposefully raise an Indentation Error and correct it

# **Exercise 2 - Operations**

a) A program to compute distance between two points taking input from the user(Pythagorean Theorem)

b) A program on add.py that takes 2 numbers as command line arguments and prints its sum.

**Decision Control statements**: conditional (if), alternative (if-else), chained conditional (if-elif-else); **Iteration:** while loop, for loop, nested for loop, range function, break, continue and pass statements.

# **Exercise - 3 Control Flow**

a) A Program to implement for checking whether the given number is a even number or not.

b) A program to construct reverse the digits of a given number and add it to the original, If the sum is not a palindrome repeat this procedure.

c) A program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

# **Exercise 4 - Control Flow – Continued**

a) A program to construct the following pattern, using a nested for loop.

b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.
**Functions and modules** : Introduction - Function Definition - Function Call – argument types- Scope and Lifetime - The return statement - More on Defining Functions - Lambda Functions or Anonymous Functions.

# **Exercise - 5 – Problem Solving using Functions**

a) Find mean, median, mode for the given set of numbers passed as arguments to a function

b) Develop a function nearly\_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

c) Develop a Recursive Function to find the Factorial of a given number .

d) Develop function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line. **Lists**: list operations, list slices, list methods, mutability, cloning lists, list parameters. **Tuples**: tuple assignment, tuple as return value. **Set:** Set Creation, Set Operations. **Dictionaries**: Creation, operations; comprehension, operations on strings.

# **Exercise - 6 Structured Data types**

a) a program to count the number of strings where the string length is 2 or more and the first and last character are same from a given list of strings.

b) a program to develop unzip a list of tuples into individual lists and convert them into dictionary.

# **Exercise – 7 Structured Data types Continued**

a) A program to count the numbers of characters in the string and store them in a dictionary data structure

b) a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Documentation Strings- Modules – Packages

# **Exercise - 8– Modules**

a) Install packages requests, flask and explore themusing (pip)

b) A program to implement a script that imports requests and fetch content from the page. Eg. (Wiki)

c) Develop a simple script that serves a simple HTTPResponse and a simple HTML Page Introduction - Types of files - Text files - reading and writing files

# **Exercise - 9 Files**

a) a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

b) a program to compute the number of characters, words and lines in a file.

Classes, Methods, Constructor, Inheritance, Overriding Methods, Data hiding

# Exercise - 10 OOP

a) Class variables and instance variable and illustration of self variable

i) Robot

ii) ATM Machine

V18MET46	INTELLECTUAL PROPERTY RIGHTS AND PATENTS	L	Т	Р	С
		2	0	0	MNC

	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, Intellectual Property Law Basics, Types of Intellectual Property, Innovations and Inventions of Trade related Intellectual Property Rights, Agencies Responsible 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 of Distribution, 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 Application Process and Granting of Patent, Patent Infringement and Litigation, International Patent Law Patent Cooperation Treaty.

#### UNIT – IV

Introduction to Trade Mark , Trade Mark Registration Process, Post registration 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 of Contract.

#### UNIT – VI

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

#### **TEXT BOOKS:**

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

- 1. Kompal Bansal & Parishit Bansal, Fundamentals of IPR for Engineers, BS Publications.
- 2. R. Radha Krishnan, S. Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
- 3. M.Ashok Kumar and Mohd.Iqbal Ali: Intellectual Property Right, Serials Pub.

L	Т	Р	С
0	4	0	MNC

	After successful completion of the course, the student will be able to	Knowledge Level
CO1	Distinguish the subtle meanings of various words in different contexts, recognize similar words as well as words with contrast meanings and use them appropriately.	K2
CO2	Interpret the passage using different strategies and answer the questions with ease.	K3
CO3	Compare different pairs of words and draw analogy between the words. Choose an appropriate word to make a sentence meaningful.	K4
CO4	Recognize the easiest and best possible way of solving problems in the area of NNumber and Letter Series, Analogy, Classification, Coding & Decoding Symbols, a Ranking and Analytical Reasoning.	K1
CO5	Investigate the different types of logics involved in Mirror and Water Images, Logical Reasoning & Arithmetical Reasoning.	K4
CO6	Find the common traps in the questions and errors likely to be made from the concepts of Blood Relations, Directions, Average, Clock and Calendar, Data Sufficiency, Permutations-Combinations and Probability.	K3

#### **UNIT – 1**

**Vocabulary** – 500 words – Meaning – contextual Usage - Prefix – Suffix – Root words Synonyms - Antonyms- Para jumbles – Strategies – Directional words – central theme

#### UNIT – 2

# Sentence completion

Strategies – Cause and effect signals – support signals – contrast signals

#### Writing skills -

Email writing– Types -- Dos and Don'ts- Paragraph writing- Essay writing Fabrication of a story based on the context.

#### UNIT - 3

#### Analogies

Strategies - Create a general sentence - Use the correct part of speech - Beware of homonyms -Recognize common relationship types.

#### **Reading Comprehension**

Strategies- skimming - scanning - predicting - identifying the central idea - questioning - making inferences

#### **UNIT - 4**

#### Number And Letter Series, Coding & Decoding, Analogy, Classification & Ranking. (K1)

Problems of how to find the next number in the series, Finding the missing number and related sums, Sums related to Classification, Sums related to letter series, Relation between number series and letter series, Finding odd one out from groups, Identify the rank in different places.

#### UNIT-5

# Problems On Ages& Numbers, Mirror And Water Images, Logical Reasoning & Arithmetical Reasoning.(K4)

Definition and concept of Venn Diagram – its applications. statements – Affirmations, Denials and Contradictions. Sums related to Ages & numbers. Problems on ages with different logics. Identifying the images of water and Mirror.

#### UNIT-6

# Blood Relations, Directions, Average, Clock And Calendar, Data Sufficiency, Permutations-Combinations And Probability.(K3)

Deriving the formula to find the angle between hands for the given time, History of calendar-, Finding the day for the given date, Problems related to directions. Difference between words Permutation and Combinations – Various cases - Real Time Scenarios. Concept of Probability – - Conjunctions – Rules & Cases of Probability.

#### **Reference Books**

- 1. Pic Voc Published by Sri Vasavi Engineering College
- 2. Word Power Made Easy Handy Dr.ShaliniVerma
- 3. Essential Grammar in Use RAYMOND MURPHY
- 4. English for Professional Students S.S.Prabhakar
- 5. General English for Competitive Examination
- 6. A Practical English Grammar A.J.Thomson
- 7. Soft Skills Dr.Alex Tata mcgra Hill
- 8. GRE Barons- published by Galgotia Publications
- 9. CAT Mohammed Muneer published by Tata McGraw Hill Education
- 10. Work book -1 on Aptitude Prepared by Training & Placement cell, Sri Vasavi Engineering College.
- 11. Magical Book on Quicker Maths Tyra
- 12. Practice Book on Quicker Maths –Kundan & Tyra
- 13. R.S. Agarwal Sultan Chand Publications
- 14. R.S. Agarwal Non Verbal Reasoning.

#### Hyperlinks

- 1. https://www.indiabix.com/
- 2. <u>https://www.campusgate.co.in/</u>
- 3. <u>https://www.questionpaper.org/</u>

# **VI Semester**

V18MET10	METROLOGY	L T	Р	С
		3	0	0

#### **Course Outcomes:**

	After successful completion of the course, the student will be able to	Knowledge Level
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.	К3
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 gaugesangle 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 edgessurface 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

- 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	Р	С	
		3	1	0	4

	After successful completion of the course, the student will be able to	Knowledge Level
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 concepts to curved beams	K3
CO4	Examine different Transmissions 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.

- 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

V18MFT19	ROBOTICS	L	Т	Р	С
	Robottes	3	0	0	3

	After successful completion of the course, the student will be able to	Knowledge Level
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	К3

# 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.

#### $\mathbf{UNIT} - \mathbf{V}$

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.

- 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.

V18MRFT51	MANAGERIAL ECONOMICS AND FINANCIAL	L	Т	Р	С
VIONIDE 131	ANALYSIS	3	0	0	3

	After successful completion of the course, the student will be able to	
CO1	Understanding the basic concepts of managerial economics, demand,	КЭ
COI	and elasticity of demand and methods of demand forecasting.	K2
	Estimating the production function with one, two and infinite	
CO2	variables. Understanding various cost concepts and calculating	K2
	breakeven point.	
$CO^{2}$	Understanding and showing a price output determination in different	КJ
COS	types of market structures and knowing various pricing methods.	K2
CO4	Understanding various forms of business organizations.	K2
CO5	Preparation of financial statements and its analysis.	K3
CO6	Appraising the projects by using various capital budgeting methods.	K4

# UNIT – I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects – Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting..

#### UNIT – II

Production and Cost Analyses: Concept of Production function- Cobb-Douglas Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total cost –Cost–Volume-Profit analysis-Determination of Breakeven point(simple problems)Managerial significance and limitations of Breakeven point.

#### UNIT – III

Introduction to Markets, & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing, Flat Rate Pricing, Usage sensitive pricing and Priority Pricing.

#### UNIT – IV

Types of Business Organization and Business Cycles: Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of Business Cycle.

#### UNIT – V

Introduction to Accounting & Financing Analysis: Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis

#### UNIT – VI

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods and modern methods (simple problems)

# **TEXT BOOKS**

- 1. Dr. N. AppaRao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi 2011
- 2. Dr. A. R. Aryasri Managerial Economics and Financial Analysis, TMH 2011
- 3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.

- 1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House, 2014.
- 2. V. Maheswari: Managerial Economics, Sultan Chand.2014
- 3. Suma Damodaran: Managerial Economics, Oxford 2011.
- 4. VanithaAgarwal: Managerial Economics, Pearson Publications 2011.
- 5. Sanjay Dhameja: Financial Accounting for Managers, Pearson
- 6. Maheswari: Financial Accounting, Vikas Publications.
- 7. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012
- 8. Ramesh Singh, Indian Economy, 7th Edn., TMH2015
- 9. Pankaj Tandon A Text Book of Microeconomic Theory, Sage Publishers, 2015
- 10. Shailaja Gajjala and Usha Munipalle, Univerties press, 201

V18MFOF1	BASIC MECHANICAL ENGINEERING (OPEN ELECTIVE-I)	L	Т	Р	С
VIONEOEI		3	0	0	3

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

- 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	L	Т	Р	С
	(OPEN ELECTIVE-I)	3	0	0	3

	After successful completion of the course, the student will be able to	Knowledge Level
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 applicationssolar 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.

# $\mathbf{UNIT} - \mathbf{VI}$

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.

- 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

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

#### $\mathbf{UNIT} - \mathbf{II}$

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.

#### $\mathbf{UNIT} - \mathbf{IV}$

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

- 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.

	After successful completion of the course, the student will be able to	Knowledge Level
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	К3

#### 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	Т	Р	С
		0	0	3	1.5

	After successful completion of the course, the student will be able to	Knowledge Level
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	Т	Р	С
		0	0	3	1.5

	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)

V18ENT06	PROFESSIONAL COMMUNICATION	L	Т	Р	С
	SKILLS – IV	0	4	0	MNC

	After successful completion of the course, the student will be able to	Knowledge Level
CO1	Express writer's tone and relevant ideas using different types of writing skills and prepare resume to show case skills and accomplishments.	K2
CO2	Organize thoughts in the discussions and express views without reticence and face interviews with aplomb.	К3
CO3	Infer the meaning of the picture by thinking out of the box and speak without inhibitions.	K4
CO4	Demonstrate problem solving skills through the concepts of Percentages, Profit and loss, Simple Interest & Compound Interest and Allegation.	K3
CO5	Analyze appropriate methods of logical thinking on Ratio and Proportion, Partnership, LCM and HCF, Number System, Areas & Volumes.	K4
CO6	Calculate the end results of Cubes, Dice and Data Analysis, Time & Work, Time & Distance, Race & Games.	K4

# **UNIT – 1**

**Writing skills** – Importance of writing skills – Types – Expository – Descriptive – Persuasive – Creative – Narrative Skills.

Resume - Basic rules for a good resume - Steps to make an effective resume format.

#### **UNIT – 2**

Group Discussion – Definition – methodology & guidelines – characteristics of a successful<br/>role of GD in selection process- Etiquette- Types of GDs- Sentence starters for GD -<br/>MockGD- vital<br/>GDs.Campus to corporate – Steps to a successful interview – Kinds of interviews – Screening –<br/>Face – Panel & Skype interviews - Mock interviewsFace – to-

#### UNIT -3

**Speaking skills Level -1** – JAM sessions – Brain storming – Picture interpretation **Speaking skills Level -2** – Debate – Press conference – Business Skills

#### **UNIT - 4**

Percentages, Profit and Loss, Simple and Compound Interest, Allegation & Mixtures

Definition of Simple and Compound Interest. Formulas of Applications – Difference between Simple and Compound interest – Rate of Increase or Decrease Population – Expected values of Maturity. Calculate percentages on different situations, using in profit and loss. Identifying difference between Cost price, Selling Price and Marked Price, Finding Discounts, using the method of allegation.

# UNIT - 5

# Ratio & Proportion, Partnership, LCM & HCF and Areas & Volumes

Introducing the concept of ratio in three different methods, a method to compute and compare two ratios – The effect of increase or decrease of a quantity on the ratio – The meaning of proportion and Problems related to Ratio and Proportion. Improve problem solving skills through Lcm & Hcf.

# Unit- 6

### Time, Work and Distance, Cubes, Dice and Data Analysis

Men- Days -work –completion- Capability Ratio among Men, Women and Children – Application of time in Pipes and Cistern. Work Progress in positive and negative effects. Relation among Time, Speed and Distance – Concepts of Relative speed and Average Speed – Ideas about Boats and Streams and Races of Games. Calculate the end results of Cubes and Dice.

#### REFERENCES

- 1. Suneetha Mishara & Murali Krishanan, C. ,2011, Communication Skills for Engineer's, Pearson publications
- 2. Jain, T.S. & Gupta., 2010, Interviews and Group Discussions, Upkar's Publications
- 3. Clif Ford.A.Whit Comb & Leslie E. Whit Comb , 2013 , Effective Interpersonal and Team Communication skills , Wiley Publications .
- 4. Debra Fine,2014, The Fine Art of small Talk ,Piatkus publications
- 5. Alex,K.,2010,Soft skills, S.Chand Publications
- 6. Training & Placement cell, 2020, Work book -1 on Aptitude, Sri Vasavi Engineering College.
- 7. M Tyra, 2013, Magical Book on Quicker maths, BSC Publications.
- 8. K Kundan & M Tyra, 2009, Practice Book on Quicker Maths, BSC Publications.
- 9. Dr. RS. Agarwal, 2017, Quantitative Aptitude, Sultan Chand Publications
- **10.** Dr. RS. Agarwal, 2017, A modern approach to verbal & on verbal reasoning, Sultan Chand Publications.

#### Hyperlinks

- 1. <u>https://www.indiabix.com/</u>
- 2. <u>https://www.campusgate.co.in/</u>
- 3. <u>https://www.questionpaper.org/</u>

	After successful completion of the course, the student will be able to	Knowledge Level
CO1	Describe M2M and IOT Technologies.	K2
CO2	Identify the layers and protocols in IOT.	K2
CO3	Describe various communication technologies used in IOT.	K2
CO4	Demonstrate various hardware components required for IOT applications.	K2
CO5	Identify the cloud technologies.	K2
CO6	Explain the applications of IoT.	K2

### UNIT I INTRODUCTION

Introduction from M2M to IoT - An Architectural Overview, building architecture, Main design principles and needed capabilities, An IoT architecture outline, M2M and IoT Technology Fundamentals - Devices and gateways

# UNIT II

# IOT PROTOCOLS

Functionality of Layers in IoT –Study of protocols - Wireless HART, Z-Wave, 6LoWPAN, RPL, CoAP, MQTT.

#### UNIT III

#### **COMMUNICATION TECHNOLOGIES IN IOT**

IoT Connectivity - IEEE 802.15.4, Wi-Fi, Bluetooth, Zigbee, LPWAN, 5G Era.

#### UNIT IV SYSTEM HARDWARE

Sensors, Actuators, Radio Frequency Identification, Introduction to Embedded Devices for IoT - RASPBERRY PI.

#### UNIT V

#### **Cloud Computing**

Data Collection, Storage and Computing Using a Cloud Platform for IoT Applications/ Services.

#### UNIT VI IOT APPLICATIONS

Real time applications of IoT - Smart and Connected Cities, Public Safety, Irrigation.

# **TEXTBOOKS:**

- "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1<sup>st</sup>Edition, by Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, DavidBoyle, Academic Press, 2014.
- 2. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things by David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, Cisco Press 800 East 96th Street Indianapolis, Indiana 46240 USA.

- 1. From Internet of Things to Smart Cities: Enabling Technologies edited by Hongjian Sun, Chao Wang, Bashar I. Ahmad, CRC Press -2018.
- 2. "Architecting the Internet of Things" by Bernd Scholz-Reiter, Florian Michahelles, ,ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer.
- 3. IOT (Internet of Things) Programming: A Simple and Fast Way of Learning IOT by David Etter.
- 3. "Internet of Things (A Hands-on- Approach)" by Vijay Madisetti and ArshdeepBahga, 1st Edition, VPT, 2014.
- 4. Internet of Things by Raj Kamal, McGraw-Hill Education. Copyright.

# VII Semester

Semester	VII	L	Т	Р	С	Course Code	
Regulation	V18	3	0	0	3	V18MET20	
Name of the Course	Automation in Manufacturing						
Branch	Mechanical Engineering						

#### **Course Outcomes:**

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

CO1	Understand the basic types, levels, strategies of automation.	K2
CO2	Identify the basic components and their functions of automated production line system.	K2
CO3	Differentiate various automated assembly systems.	K4
CO4	Compute various storage system and transportation requirements of automated systems.	K3
CO5	Apply appropriate process control strategy to an automated system.	K3
CO6	Illustrate the concepts of CIM	K3

# UNIT – I

**INTRODUCTION :** Facilities — Manual work systems, worker-machine systems and automated systems. Manufacturing support systems, Automation in Production systems — Automated Manufacturing systems, Computerized manufacturing support systems, Manual labour in Production systems, Automation principles and strategies.

#### UNIT – II

**AUTOMATED PRODUCTION LINES :** Fundamentals- System configurations, work part transfer mechanisms, Storage buffers, and Control of the production line. Applications — Machining systems and System Design Considerations. Analysis of Transfer lines — Transfer lines with No internal parts storage, Transfer lines with internal storage buffers.

#### UNIT – III

**AUTOMATED ASSEMBLY SYSTEMS :** System configurations, Parts delivery at workstations, and applications, quantitative analysis of assembly systems-Parts Delivery System at Workstations, Multi-Station Assembly Machines, Single Station Assembly Machines, Partial Automation.

#### UNIT – IV

**AUTOMATED MATERIAL TRANSPORT & STORAGE SYSTEMS :** Automated Material Transport & Storage systems: Automated Guided Vehicle (AGV) Systems, Types and applications, Vehicle Guidance Technology, Vehicle Management and Vehicle safety. Automated Storage/Retrieval Systems (ASRS) and Carousel Storage Systems.

#### $\mathbf{UNIT} - \mathbf{V}$

**AUTOMATED INSPECTION SYSTEMS :** Quality in Design and manufacturing, inspection principles and strategies, automated inspection, contact Vison-contact, CMM. Manufacturing support systems. Quality function deployment, computer aided process planning, concurrent engineering, shop floor control, just in time and lean production.

#### UNIT – VI

**COMPUTER INTEGRATED MANUFACTURING :** The Scope of CAD/CAM and CIM, Computerized elements of a CIM System, Components of CIM, Database for CIM, Planning , Scheduling and Analysis of CIM Systems.

# **TEXT BOOKS:**

- 1. Nagrath and Mittel, "Robotics and Control", Tata McGraw-Hill, 2003.
- 2. Mikell P Groover, "Automation, production Systems and Computer Integrated Manufacturing," 3rd Edition, Prentice Hall Inc., New Delhi, 2007.
- 3. Nanua Singh, "System Approach to Computer Integrated Manufacturing," Wiley & Sons Inc.,
- 4. CAD CAM: Principles, Practice and Manufacturing Management by Chris Mc Mohan, JimmieBrowne, Pearson edu. (LPE).
- 5. Automation by Buckinghsm W, Haper& Row Publishers, New York, 1961
- 6. Automation for Productivity by Luke H.D, John Wiley & Sons, New York, 1972.

# **REFERENCE BOOKS:**

- 1. P. Radhakrishnan, S, Subrarnanyan and V, Raju, 'CAD/CAM/CIM', New Age International (P) Ltd., New Delhi, 2009.
- 2. S.R.Deb and Sankha Deb, 'Robotics Technology and Flexible Automation', Tata McGraw Hill, Seconcl Edition, New Delhi, 2010.
- 3. Peter Corke, 'Robotics, Vision and Control' Fundamental Algorithms in MATLAB', Springer, 2011.
- 4. Nicholas Odrey, MikellGroover, Roger Nagel, Ashish Dutta, 'Industrial Robotics (SIE): Technology, Programming and Applications', McGraw Hill, 2012.

# **WEB REFERENCES:**

- 1. https://nptel\_acinicourses/108/105/108105063/
- 2. https://www.automationmag.com/
- 3. https://www.springer.com/gp/book/9783319771786.
- 4. https://library.automationdirect.com/industrial-automation-top-10-trends/
- 5. https://nptel.ac.inicourses/112/102/112102011

Semester	VII	L	Т	Р	С	Course Code
Regulation	V18	3	0	0	3	V18MET21
Name of the Course	Operation Research					
Branch	Mechanical Engineering					

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

CO1	Understand the formulating of LPP and solve LPP by Simplex methods, artificial variables techniques.	K2
CO2	Solve Transportation and assignment problems.	K3
CO3	Explain the concept of Sequencing and replacement of item.	K2
CO4	Understand the concept of queues with single server, solution of games with and without saddle points.	K2
CO5	Apply the concept of inventory models in solving EOQ problems.	K3
CO6	Solve the issues of dynamic programming and simulation.	K3

# UNIT – I

HISTORICAL OVERVIEW – Definition and scope – types of operation research models – applications.

**LINEAR PROGRAMMING**: Problem formulation – graphical solution – simplex method – artificial variables techniques - big-M method, two–phase method.

# UNIT – II

**TRANSPORTATION PROBLEM:** Formulation – optimal solution, unbalanced transportation problem – degeneracy

ASSIGNMENT PROBLEM: Introduction, optimal solution, Traveling Salesman problem.

UNIT – III

**SEQUENCING** – Introduction – flow –shop sequencing – n jobs through two machines – n jobs through three machines

**REPLACEMENT:** Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement.

 $\mathbf{UNIT} - \mathbf{IV}$ 

**THEORY OF GAMES:** Introduction – mini. max (max. mini) – criterion and optimal strategy – solution of games with saddle points – rectangular games without saddle points –  $2 \times 2$  games – dominance principle – m x 2 & 2 x n games -graphical method.

**WAITING LINES:** Introduction – single channel – poison arrivals – exponential service times – with infinite population and finite population models

UNIT – V

**INVENTORY :** Introduction – single item – deterministic models – purchase inventory models with one price break– shortages are not allowed – stochastic models – demand may be discrete variable or continuous variable – instantaneous production. Instantaneous demand and continuous demand and no set up cost. **UNIT – VI** 

**DYNAMIC PROGRAMMING:** Introduction – Bellman's principle of optimality – applications of dynamic programming- capital budgeting problem – shortest path problem .

**SIMULATION:** Definition – types of simulation models – phases of simulation – applications of simulation – inventory and queuing problems – advantages and disadvantages – simulation languages.

# **TEXT BOOKS:**

- 1. Operations Research / S.D.Sharma-Kedarnath
- 2. Operations Research by R. Pannerselvam; Publisher: Prentice Hall International.

# **REFERENCES:**

- 1. Introduction to O.R/Hiller & Libermann (TMH).
- 2. Operations Research / A.M.Natarajan, P. Balasubramani, A. Tamilarasi / Pearson Education.
- 3. Operations Research: Methods & Problems / Maurice Saseini, Arhur Yaspan & Lawrence Friedman.

Semester	VII	L	Т	Р	С	Course Code	
Regulation	V18	3	0	0	3	V18MET22	
Name of the Course	Industrial Engineering and Management Professional Elective –II						
Branch	Mechanical Engineering						

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

CO1	Design and conduct experiments, analyze, interpret data and synthesize valid conclusions	K4
CO2	Design a system, component, or process, and synthesize solutions to achieve desired needs	K4
CO3	Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints	K3
CO4	Examine effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management	K3
CO5	Understand quality and quality management	K2
CO6	Understand concepts on recourse management	K2

# UNIT – I

**INTRODUCTION:** Definition of industrial engineering (I.E), development, applications, role of an industrial engineer, differences between production management and industrial engineering, quantitative tools of IE and productivity measurement. concepts of management, importance, functions of management, scientific management, Taylor's principles, theory X and theory Y, Fayol's principles of management.

#### UNIT – II

**PLANT LAYOUT:** Factors governing plant location, types of production layouts, advantages and disadvantages of process layout and product layout, applications, quantitative techniques for optimal design of layouts, plant maintenance, preventive and breakdown maintenance.

#### UNIT – III

**WORK STUDY:** Importance, types of production, applications, work study, method study and time study, work sampling, PMTS, micro-motion study, rating techniques, MTM, work factor system, principles of Ergonomics, flow process charts, string diagrams and Therbligs

# UNIT – IV

**STATISTICAL QUALITY CONTROL:** Quality control, Queuing assurance and its importance, SQC, attribute sampling inspection with single and double sampling, Control charts – and R – charts and S charts and their applications, numerical examples.

# UNIT – V

**TOTAL QUALITY MANAGEMENT**: zero defect concept, quality circles, implementation, applications, ISO quality systems. six sigma – definition, basic concepts

**VALUE ANALYSIS:** Value engineering, implementation procedure, enterprise resource planning and supply chain management.

# UNIT – VI

**RESOURCE MANAGEMENT:** Concept of human resource management, personnel management and industrial relations, functions of personnel management, Job-evaluation, its importance and types, merit rating, quantitative methods, wage incentive plans, types.

**PROJECT MANAGEMENT (PERT/CPM):** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems).

# **TEXT BOOKS:**

1. Industrial Engineering and management / O.P Khanna/Khanna Publishers.

2. Industrial Engineering and Production Management/Martand Telsang/S.Chand & Company Ltd. New Delhi

- 1. Industrial Management / Bhattacharya DK/Vikas publishers
- 2. Operations Management / J.G Monks/McGrawHill Publishers.
- 3. Industrial Engineering and Management Science/T.R. Banga,S.C.Sharma, N. K. Agarwal/Khanna Publishers
- 4. Principles of Management /Koontz O' Donnel/McGraw Hill Publishers.
- 5. Statistical Quality Control /Gupta/Khanna Publishers
- 6. Industrial Engineering and Management /NVS Raju/Cengage Publishers

Semester	VII	L	Т	Р	С	Course Code
Regulation	V18	3	0	0	3	V18MET23
Name of the Course	Composite Materials Professional Elective –II					
Branch	Mechanical Engineering					

After Successful completion of this course the student will be able to

CO1	Explain the required properties, reinforcements and uses of various composites.	K2
CO2	Explain how common fibers are produced and how the properties of the fibers are related to the internal structure and the interfaces obtained.	K2
CO3	Illustrate the processing techniques for polymer matrix, ceramic matrix and metal matrix composites and list out their properties and applications	K3
CO4	Analyze different ceramic composite materials	K4
CO5	Examine the processing of ceramic matrix composites	K3
CO6	Evaluate mechanical properties of composite materials	K5

# UNIT-I

Introduction, Classification of Composite materials based on structure and matrix and reinforcements, Advantages and applications of composites, Functional requirements of reinforcement and matrix materials. Difference between composites and metals & alloys, Properties of composites in comparison with standard materials

# UNIT-II

**TYPES OF REINFORCEMENTS AND THEIR PROPERTIES:** Glass, Carbon, Boron, Aramid,  $Al_2O_3$  and SiC fibers. Nature and manufacture of glass, carbon and aramid fibers, Comparison of fibers. Role of interfaces: Wettability and Bonding, the interface in Composites, Interactions and Types of bonding at the Interface.

# UNIT-III

Fabrication of Polymeric Matrix Composites, Structure and properties of Polymeric Matrix Composites, Interface in Polymeric Matrix Composites, Applications, Recycling of PMCs

# UNIT-IV

**FABRICATION OF METAL MATRIX COMPOSITES (MMC):** Solid state fabrication, Liquid state fabrication and In-situ fabrication techniques. Interface in Metal Matrix Composites. Mechanical bonding, Chemical bonding and Interfaces in In-situ Composites. MMC: Properties and Applications.

# UNIT -V

**FABRICATION OF CERAMIC MATRIX COMPOSITES (CMC):** Processing of CMCs: Cold Pressing and Sintering, Hot Pressing, Reaction Bonding Processes, Infiltration, Sol–Gel process. Interface in CMCs. Properties of CMCs, Applications of CMCs.

# UNIT -VI

**MECHANICAL TESTING OF COMPOSITES AND THEIR CONSTITUENTS:** Measurement of Constituent Material Properties Fiber Tests, Neat Resin Matrix Tests, Constituent Volume Fraction Measurement. Measurement of Basic Composite Properties: Tensile Tests, Compressive Tests, Shear Tests, Flexure Tests, Fiber/Matrix Interface Tests.

# **TEXT BOOKS:**

- 1. Composite Materials Science & Engineering, K.K. Chawla, Springer-Verlag, New York, 1987.
- 2. Principles of Composite Material Mechanics, Ronald F. Gibson
- 3. An Introduction to Composite Materials, Hull, Cambridge, 2nd Edt. 1997.

- 1. Composites, Engineered Materials Handbook, Vol.1, ASM International, Ohio, 1988.
- 2. Structure and Properties of Composites, Materials Science and Technology, Vol. 13, VCH, Weinheim, Germany, 1993
- 3. Composite Materials: Engineering and Science, F.L. Matthews and R.D. Rawlings, Chapman & Hall, London, 1994.

Semester	VII	L	Т	Р	С	Course Code	
Regulation	V18	3	0	0	3	V18MET24	
Name of the Course	Refrigeration & Air Conditioning Professional Elective –II						
Branch	Mechanical Engineering						

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

CO1	Apply the concept of refrigeration to various systems.	K3
CO2	Employ the methods to improve performance of vapor compression systems.	K3
CO3	Identify eco-friendly refrigerants and understanding various VCR System Components.	K2
CO4	Describe vapour absorption systems.	K2
CO5	Analyze cooling and heating loads in an air conditioning system.	K4
CO6	Explain various air conditioning systems.	K2

# UNIT – I

**INTRODUCTION TO REFRIGERATION:** Necessity and applications – Unit of refrigeration and C.O.P. –Mechanical refrigeration – Types of ideal cycles of refrigeration.

Air refrigeration: Bell Coleman cycle - Open and Dense air systems – Refrigeration needs of Air crafts-Refrigeration systems used in air crafts and Problems.

# UNIT – II

**VAPOUR COMPRESSION REFRIGERATION:** Working principle and essential components of the plant –simple vapour compression refrigeration cycle – COP – Representation of cycle on T-S and p-h charts – Effect of sub cooling and super heating – Cycle analysis – Actual cycle influence of various parameters on system performance – Use of p-h charts – Problems.

#### UNIT – III

Refrigerants – Classification – Desirable properties of an ideal refrigerant – Common refrigerants used – Nomenclature of refrigerants .

VCR System Components: Compressors – General classification – comparison – Advantages and Disadvantages. Condensers – Classification – Working Principles. Evaporators – Classification – Working Principles. Expansion devices – Types – Working Principles.

#### UNIT - IV

**VAPOR ABSORPTION SYSTEM:** Calculation of maximum COP – description and working of Water-Ammonia Systems, Water-Lithium Bromide System. Principle of operation three fluid absorption system, salient features.

#### UNIT – V

**INTRODUCTION TO AIR CONDITIONING:** Psychometric properties & Processes – Characterization of sensible and latent heat loads — Need for ventilation, Consideration of infiltration – Load concepts of RSHF, GSHF- Problems, concept of ESHF and ADP temperature.

Requirements of industrial air conditioning, Air conditioning load calculations.

#### UNIT – VI

**AIR CONDITIONING SYSTEMS:** Classification of equipment, Components related to Air- Conditioning Systems- filters, grills and registers, fans and blowers.

# **TEXT BOOKS:**

- 1. A Course in Refrigeration and Air conditioning, SC Arora & Domkundwar, Dhanpatrai
- 2. Refrigeration and Air Conditioning, CP Arora, TMH.
- 3. Refrigeration and Air Conditioning / Manohar Prasad / New Age

- 1. Principles of Refrigeration /Dossat / Pearson Education.
- 2. Basic Refrigeration and Air-Conditioning / Ananthanarayanan / TMH
- 3. Stoecker, W. F., and Jones, J. W., Refrigeration and Air-Conditioning, McGraw Hill, New Delhi.
- 4. Data Book: Refrigerant and Psychrometric Properties Tables and Charts [SI Units], MathurM. L., and Mehta F. S., Jain Brothers.

Semester	VII	L	Т	Р	С	Course Code	
Regulation	V18	3	0	0	3	V18MET25	
Name of the Course	Total Quality Management   Professional Elective –III						
Branch	Mechanical Engineering						

After the completion of this course, the students will be able to

CO1	Understand the importance of significance of quality & to understand the concept of Quality.	K2
CO2	Develop quality improvement teams & to implement Quality Implementation Programs.	K3
CO3	Identify requirements of quality improvement programs & bench marketing	K2
CO4	Apply the tools and techniques of quality management to manufacturing and services processes.	K3
CO5	Apply the concepts of comprehensive quality management and the challenges of putting them into practice.	K3
CO6	Apply the quality management methods for analysing and solving problems of organization.	K3

# UNIT – I

**INTRODUCTION:** The concept of TQM, Quality and Business performance, attitude and involvement of top management, communication, culture and management systems. Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs, Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

# UNIT – II

**CUSTOMER FOCUS AND SATISFACTION**: The importance of customer satisfaction and loyalty-Crating satisfied customers, Understanding the customer needs, Process Vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships.

# UNIT – III

**BENCH MARKETING:** Evolution of Bench Marketing, meaning of Bench marketing, benefits of bench marketing, the bench marketing process, pitfalls of bench marketing.

# UNIT – IV

**ORGANIZING FOR TQM**: The systems approach, Organizing for quality implementation, making the transition from a traditional to a TQM organizing, Quality Circles. Productivity, Quality and Reengineering:

#### $\mathbf{UNIT} - \mathbf{V}$

**THE COST OF QUALITY:** Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost Information, Accounting Systems and Quality Management.

#### $\mathbf{UNIT} - \mathbf{VI}$

**QUALITY MANAGEMENT SYSTEM (QMS):** Introduction to QMS. Universal Standards of Quality: ISO around the world, The ISO9001 ANSI/ASQCQ-Series Standards, benefits of ISO9001 certification, the third party audit, Documentation ISO9001 and services, the cost of certification implementing the system.

# **TEXT BOOKS:**

- 1. Total Quality Management / Joel E.Ross/Taylor and Franscis Limited
- 2. Total Quality Management/P.N.Mukherjee/PHI

3. Total Quality Management Paperback / R Kesavan, C Elanchezhian, B Vijaya Ramnath / I K International Publishing House

- 1. Beyond TQM / Robert L.Flood
- 2. Statistical Quality Control / E.L. Grant / McGraw Hill.
- 3. Total Quality Management- A Practical Approach/H. Lal
- 4. Quality Management/Kanishka Bedi/Oxford University Press/2011
- 5. Total Engineering Quality Management/Sunil Sharma/Macmillan

Semester	VII	L	Т	Р	С	Course Code	
Regulation	V18	3	0	0	3	V18MET26	
Name of the Course	<b>Finite Element Methods</b> Professional Elective – III						
Branch	Mechanical	Enginee	ering				

After the completion of this course, the students will be able to

CO1	Use the concepts of variational methods and weighted residual methods in FEM.	K3
CO2	Use Finite Element Formulation for solving the problems.	K3
CO3	Solve the problems of Truss elements by FEM.	K3
CO4	Solve the problems of Beam s elements by FEM.	K3
CO5	Use FEM to solve 2D CST problems.	K3
CO6	Analyze finite element method for problems involving dynamics and heat transfer.	K4

# UNIT-I

**INTRODUCTION TO FINITE ELEMENT METHOD:** stress and equilibrium, strain – displacement relations, stress-strain relations, plane stress and plane strain conditions, variational and weighted residual methods, the concept of potential energy, one-dimensional problems.

# UNIT – II

**FINITE ELEMENT FORMULATION:** Discretization of the domain, element shapes, discretization procedures, assembly of stiffness matrix, bandwidth, node numbering, mesh generation, interpolation functions, convergence requirements, Treatment of Boundary conditions, Derivation of element stiffness matrix for Bar elements and problems

# UNIT – III

**ANALYSIS OF TRUSSES:** Finite element modelling, coordinates and shape functions, assembly of global stiffness matrix and load vector, finite element equations, treatment of boundary conditions, stress, strain and support reaction calculations.

# UNIT – IV

**ANALYSIS OF BEAMS:** Derivation of Element stiffness matrix for beam element, derivation of load vector for concentrated and UDL, Problems on Cantilever, simply supported beams with point and uniformly distributed loads.

# UNIT-V

**CST AND AXISYMMETRIC ELEMENTS:** Finite element modelling of two-dimensional stress analysis with constant strain triangles and treatment of boundary conditions, formulation of axisymmetric problems, **HIGHER ORDER AND ISOPARAMETRIC ELEMENTS:** One dimensional quadratic and cubic elements in natural coordinates, two dimensional four noded isoparametric elements, numerical integration.

#### UNIT – VI

**STEADY STATE HEAT TRANSFER ANALYSIS:** one dimensional analysis of a fin and two dimensional analysis of thin plate, analysis of a uniform shaft subjected to torsion.

**DYNAMIC ANALYSIS:** Formulation of finite element model, element consistent and lumped mass matrices, evaluation of eigen values and eigen vectors, free vibration analysis.

# **TEXT BOOKS:**

1. The Finite Element Methods in Engineering / S. S Rao / Pergamon.

- 1. Finite Element Method with applications in Engineering / YM Desai, Eldho& Shah /Pearson publishers
- 2. An introduction to Finite Element Method / JN Reddy / McGraw Hill
- 3. The Finite Element Method for Engineers Kenneth H. Huebner, Donald L. Dewhirst, Douglas E. Smithand Ted G. Byrom / John Wiley &Sons (ASIA) Pte Ltd.
- 4. Finite Element Analysis/ P.Seshu
- 5. Finite Element Methods: Basic Concepts and Applications ByChennakesava R. Alavala
- 6. Finite Element Analysis: for students & Practicing Engineers / G.LakshmiNarasaiah / BSP Books Pvt. Ltd.
| Semester           | VII  | L | Т | Р | С | Course Code |
|--------------------|--|---|---|---|---|-------------|
| Regulation         | V18  | 3 | 0 | 0 | 3 | V18MET27    |
| Name of the Course | Micro Electro Mechanical Systems (MEMS)<br>Professional Elective – III |   |   |   |   |             |
| Branch             | Mechanical Engineering   |   |   |   |   |             |

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

CO1	Understand about the basics of MEMS, Methods of Micro machining.	K2			
CO2	Interpret various Mechanical sensors & Actuators	K3			
CO3	Illustrate the working principles of various Thermal sensors and Actuators & its applications.				
CO4	Differentiate between different types of MOEMS devices	K2			
CO5	Illustrate and explain various Magnetic sensors and Actuators & its applications	K3			
CO6	Illustrate and explain various micro-fluidic devices & its applications	K3			

# UNIT – I

**INTRODUCTION:** Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

### UNIT – II

**MECHANICAL SENSORS AND ACTUATORS:** Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

# UNIT – III

**THERMAL SENSORS AND ACTUATORS:** Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA).

### UNIT – IV

**MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS:** Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch.

#### UNIT – V

**MAGNETIC SENSORS AND ACTUATORS:** Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, by directional micro actuator.

### UNIT – VI

**MICRO FLUIDIC SYSTEMS:** Applications, considerations on micro scale fluid, fluid actuation methods, dielectro phoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, opto electro wetting (OEW), micro fluid dispenser, micro needle, micro pumps.

### **TEXT BOOKS:**

1. MEMS, Nitaigour Premchand Mahalik, TMH Publishing co.

- 1. Foundation of MEMS, Chang Liu, Prentice Hall Ltd.
- 2. MEMS and NEMS, Sergey Edwrd Lyshevski, CRC Press, Indian Edition.
- 3. MEMS and Micro Systems: Design and Manufacture, Tai-Ran Hsu, TMH Publishers.
- 4. Introductory MEMS, Thomas M Adams, Richard A Layton, Springer International Publishers.

Semester	VII	L	Т	Р	С	Course Code
Regulation	V18	3	0	0	3	V18CSTOE05
Name of the Course	Artificial Intelligence Open Elective – II					
Branch	Mechanical Engineering					

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

CO1	Illustrate the concept of intelligent systems and current trends in AI.	K2
CO2	Apply Problem solving, Problem reduction and Game Playing techniques in AI.	K3
CO3	Illustrate the Logic concepts in AI.	K2
CO4	Explain the Knowledge representation techniques in AI.	K2
CO5	Describe Expert systems and their applications.	K2
CO6	Illustrate Uncertainty Measures.	K2

### UNIT – I

**INTRODUCTION TO ARTIFICIAL INTELLIGENCE:** Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, current trends in AI

UNIT – II

**PROBLEM SOLVING: STATE-SPACE SEARCH AND CONTROL STRATEGIES:** Introduction, General Problem Solving, Characteristics of problem, Exhaustive searches, Heuristic search techniques, Iterative deepeninga\*, constraint satisfaction

**PROBLEM REDUCTION AND GAME PLAYING:** Introduction, problem reduction, game playing, alpha betapruning, two-player perfect information games

### UNIT – III

**LOGIC CONCEPTS:** Introduction, Propositional Calculus, Proportional Logic, Natural Deduction system, Axiomatic system, Semantic tableau system in proportional logic, Resolution Refutation in Propositional logic, Predicate Logic

### UNIT - IV

**KNOWLEDGE REPRESENTATION:** Introduction, approaches to Knowledge representation, Knowledge representation using Semantic Networks, Extended Semantic Networks for KR, Knowledge representation using Frames

#### $\mathbf{UNIT} - \mathbf{V}$

**EXPERT SYSTEMS AND APPLICATIONS:** Introduction phases in building Expert Systems, Expert System versus Traditional Systems, Rule-based Expert Systems, Blackboard systems, Truth maintenance systems, applications of Expert Systems.

UNIT – VI

**UNCERTAINTY MEASURE:** Probability theory- Introduction, Probability Theory, Bayesian Belief networks, Certainty Factor Theory, Dempster-Shafer theory

### **TEXT BOOK:**

1. Artificial Intelligence, Saroj Kaushik, 1st Edition, Cengage Learning.

- 1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B Nair, 3rd Edition, Tata McGraw Hill Education Private Limited., 2009
- 2. Artificial Intelligence- A modern Approach, 3rd Edition, Stuart Russel, Peter Norvig, Pearson Education.

Semester	VII	L	Т	Р	С	Course Code
Regulation	V18	0	0	3	1.5	V18MEL12
Name of the Course	Simulation Lab					
Branch	Mechanical Engineering					

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

CO1	Apply the tools like ANSYS or FLUENT in solving real time problems and day to day problems.	K3
CO2	Develop drawings for various components.	K3
CO3	Practice programming on CNC Machines.	K3

List of experiments:

1. **DRAFTING:** Development of part drawings for various components in the form of orthographic and isometric representation of dimensioning and tolerances scanning and plotting. study of script, DXE and IGES files.

2. **PART MODELING:** Generation of various 3D models through protrusion, revolve, shell sweep. creation of various features. study of parent child relation. feature based and boolean based modelling surface and assembly modelling. study of various standard translators. Design simple

components.

- 3. a) Determinationofdeflectionandstressesin2Dand3Dtrussesandbeams.
  - b) Determination of deflections component and principal and Von-mises stresses in plane stress, plane strain and Axisymmetric components.
  - c) Determination of stresses in 3D and shell structures (at least one example in each case)
  - d) Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.
  - e) Steady state heat transfer Analysis of plane and Axisymmetric components.
- 4. a) Study of various post processors used in NC Machines.
  - b) Machining of simple components on NC lathe and Mill by transferring NC Code / from a CAM package. Through RS 232.
  - c) Practice on CNC Sinutrain Turning
  - d) Practice on CNC Sinutrain Milling
  - e) CNC programming forturned components using FANUC Controller
  - f) CNC programming for milled components using FANUC Controller
  - g) Automated CNC Tool path & G-Code generation using

Pro/E/MasterCAM**Packages to be provided to cater to drafting, modeling & analysis from the following:**CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEFEM, Gibbs CAM, Master CAM etc.

Semester	VII	L	Т	Р	С	Course Code
Regulation	V18	0	0	3	1.5	V18MEL13
Name of the Course	Production Drawing Lab					
Branch	Mechanical Engineering					

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

CO1	Recognise the need of limits, fits and tolerances, and apply the same on part drawings for manufacturing.	K2
CO2	Illusttrate the Geometric Dimensioning and tolerancing, able to apply GD&T to a part drawing.	K3
CO3	Indicate various surface roughness symbols on part drawings for manufacturing.	K2
CO4	Assess the raw material requirements, final cost of the component and heat treatment process.	K3
CO5	Develop skill to produce detailed drawings from assembly drawings.	K3
CO6	Construct press tools, die-casting dies and jigs and fixtures using computer aided design software.	K3

# PART-A

**LIMITS, FITS AND TOLERANCES:** Types of fits, exercises involving selection and interpretation of fits and estimation of limits from tables.

**GEOMETRIC DIMENSIONING AND TOLERANCING:** Introduction to GD&T ,terminology & basic rules, features and material conditions, maximum material condition, least material condition, regardless of feature's size, datums, datum reference frame, **form tolerances, orientation tolerances, profile tolerances, runout tolerances.** 

**ADDING GD&T TO A DRAWING/DESIGN** – size, location, orientation & form, choosing datums, indication of form and position tolerances on drawings, preparation of bill of material

**SURFACE ROUGHNESS AND ITS INDICATIONS:** Definition, types of surface roughness indication-Surface roughness obtained from various manufacturing process, recommended surface roughness on mechanical components, heat treatment and surface treatment symbols used on drawings.

# PART-B

Drawing of parts from assembly of stuffing box, piercing and blanking die, Die casting die, Box jig, machining fixture with indication of size, tolerance, roughness, form and position tolerances using Computer aided design software.

### **TEXT BOOKS:**

1. Production and Drawing - K.L. Narayana& P. Kannaiah/New Age Publication

2. Tool Engineering & Design\_G.R.Nagpal/Khannapublishers,1<sup>st</sup>edition, Khanna Publishers, 2009

- 3. MachineDrawingwithAutoCAD-PohitandGhosh,1<sup>st</sup> edition, Pearso, 2017
- 4. Geometric dimensioning and tolerancing- James D. Meadows/B.S Publications.

- 1. MachineDrawingbyNagpal,1<sup>st</sup> edition, khanna publishers,2009
- 2. Machinedrawing, AjeetSingh, 2<sup>nd</sup>edition, TMH, 2016
- 3. Engineering Metrology, R.K. Jain, Khanna Publications.

# **VIII Semester**

Semester	VIII	L	Т	Р	С	Course Code
Regulation	V18	3	0	0	3	V18MET28
Name of the Course	Automobile Engineering					
Branch	Mechanical Engineering					

#### **Course Outcomes:**

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

CO1	Understand various components in four wheel automobile.	K2
CO2	Differentiate between different types of transmission systems used in automobile.	K4
CO3	Examine steering geometry and steering systems used in automobile.	K3
CO4	Interpret suspension, breaking and electrical systems in automobile.	K3
CO5	Understand various safety systems used in automobile.	K2
CO6	Practice engine service for different components in automobile.	K3

## UNIT – I

**INTRODUCTION:** Components of four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction, turbo charging and super charging – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarbonisation, Nitriding of crank shaft.

### UNIT – II

**TRANSMISSION SYSTEM:** Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, construct mesh, synchromesh gear boxes, epicyclic gear box, over drive torque converter. propeller shaft – Hotch – Kiss drive, Torquetube drive, universal joint, differential rear axles – types – wheels and tyres.

### UNIT – III

**STEERING SYSTEM:** Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears– types, steering linkages.

### $\mathbf{UNIT} - \mathbf{IV}$

**SUSPENSION SYSTEM:** Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

**BRAKING SYSTEM:** Mechanical brake system, hydraulic brake system, master cylinder, wheel cylinder tandem master cylinder requirement of brake fluid, pneumatic and vacuum brakes.

**ELECTRICAL SYSTEM:** Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

# UNIT – V

**ENGINE SPECIFICATION AND SAFETY SYSTEMS:** Introduction- engine specifications with regard to power, speed, torque, no. of cylinders and arrangement, lubrication and cooling etc.

Safety: Introduction, safety systems - seat belt, air bags, bumper, anti lock brake system (ABS), wind shield, suspension sensors, traction control, mirrors, central locking and electric windows, speed control.

### UNIT – VI

**ENGINE SERVICE:** Introduction, service details of engine cylinder head, valves and valve mechanism, piston connecting rod assembly, cylinder block, crank shaft and main bearings, engine reassembly-precautions.

### **TEXT BOOKS:**

- 1. Automotive Mechanics Vol. 1 & Vol. 2 / Kirpal Singh/standard publishers
- 2. Automobile Engineering / William Crouse/TMH Distributors
- 3. Automobile Engineering/P.S Gill/S.K. Kataria & Sons/New Delhi.

- 1. Automotive Engines Theory and Servicing/James D. Halderman and Chase D. Mitchell Jr.,/ Pearson education inc.
- 2. Automotive Engineering / K Newton, W.Steeds & TK Garrett/SAE
- 3. Automotive Mechanics: Principles and Practices/ Joseph Heitner/Van Nostrand Reinhold
- 4. Automobile Engineering / C Srinivasan / Mc Graw Hill

Semester	VIII	L	Т	Р	С	Course Code
Regulation	V18	3	0	0	3	V18MET31
Name of the Course	Name of the Course Process Planning & Cost Estimation   Professional Elective – IV					
Branch	Mechanical Engineering					

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

CO1	Understand the basic concepts of production, steps involved in types of process planning.	K2
CO2	Calculate the process parameters for various production processes.	K3
CO3	Prepare the types of estimates.	K3
CO4	Calculate depreciation cost and explain about different costs.	K3
CO5	Estimate production cost in forging, welding and foundry.	K2
CO6	Determine the machining time of different machining operations.	K4

### UNIT – I

**INTRODUCTION:** Types of production, standardization, simplification, product design and selectionprocess planning-methods, selection and analysis-steps involved in manual and computer aided process planning-Break even analysis.

### UNIT – II

**PROCESS PLANNING ACTIVITIES:** Calculation of process parameters for various production processes-Selection of jigs & fixtures-Selection quality assurance methods-Set of documents for process planning.

### UNIT – III

**ESTIMATION AND COSTING:** Aim and objective of cost estimation – Functions of estimation – Costing – Importance and aims of costing – Difference between costing and estimation. Types of estimates – Estimation procedure.

#### $\mathbf{UNIT} - \mathbf{IV}$

**COST ELEMENTS:** Material cost – Determination of material cost, labour cost, Expenses — Analysis of overhead expenses – Factory expenses, Administrative expenses – Selling and Distributing expenses – Allocation of over head expenses. Cost of product – Illustrative examples Depreciation: Depreciation – Causes of Depreciation – Methods of Depreciation calculation.

#### $\mathbf{UNIT} - \mathbf{V}$

**ESTIMATION OF PRODUCTION COST**: Estimation in forging shop – Losses in forging – forging cost – Illustrative examples. Estimation in welding shop – Gas cutting – Electric welding - Illustrative examples. Estimation in foundry shop – Estimation of pattern cost and casting cost - Illustrative examples.

#### UNIT – VI

**MACHINING TIME ESTIMATION**: Estimation of Machining Time for Lathe operations – Estimation of Machining Time for Drilling, Boring, Shaping, Planning, Milling and Grinding operations - Illustrative examples.

#### **TEXT BOOKS:**

- 1. M.Adithian and B.S. Pabla, Estimation and Costing, Konark publishers Pvt. Ltd., 1989.
- 2. A.K.Chitale and R.C.Gupta, Product Design and Manufacturing, Prentice Hall Pvt. Ltd., 2005

- 1. Namua Singh, System Approach to computer integrated Design and Manufacturing, John Wiley & Sons, Inc., 1996.
- 2. Joseph G Monks, Operation Management, Theory & Problems, McGraw Hill Book Company, 1987.
- 3. T.R.Banga and S.C.Sharma, Estimations and Costing, Khanna Publishers, 1988.
- 4. G.B.S.Narang and V.Kumar, Production and Costing, Khanna Publishers, 1995.
- 5. Sinha B.P Mechanical estimating & costing Tata McGrawhill publishing co., 1995

Semester	VIII	L	Т	Р	С	Course Code	
Regulation	V18	3	0	0	3	V18MET32	
Name of the Course	Non Destructive Evaluation Professional Elective – IV						
Branch	Mechanical Engineering						

After Successful completion of this course the student will be able to

CO1	Identify the flaws in manufacturing process through radiographic inspection	K2
CO2	Explain the theory of wave propagation and inspect the components using ultrasonic test	K2
CO3	Identify various surface, subsurface flaws with LPT and ECT	K2
CO4	Explain the principle of eddy current test system, flaw detection and evolution	К2
CO5	Demonstrate the flaw detection using IRT test	K2
CO6	Find the industrial applications in railways, nuclear, aerospace etc	К3

#### UNIT – I

Introduction to non-destructive testing, Radiographic test, Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography.

### UNIT – II

**ULTRASONIC TEST:** Principle of Wave Propagation, Reflection, Refraction, Diffraction, Mode Conversion and Attenuation, Sound Field, Piezo-electric Effect, Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection, Effectiveness and Limitations of Ultrasonic Testing.

#### UNIT – III

**LIQUID PENETRANT TEST:** Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing.

**EDDY CURRENT TEST:** Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current Testing Effectiveness of Eddy Current Testing.

#### $\mathbf{UNIT} - \mathbf{IV}$

**MAGNETIC PARTICLE TEST:** Magnetic Materials, Magnetization of Materials, Demagnetization of Materials, Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle Test.

#### $\mathbf{UNIT} - \mathbf{V}$

**INFRARED AND THERMAL TESTING:** Introduction and fundamentals to infrared and thermal testing, Heat transfer –Active and passive techniques, Lock in and pulse thermography, Contact and non contact thermal inspection methods, Heat sensitive paints and papers, thermally quenched phosphors liquid crystals, techniques for applying liquid crystals, other temperature sensitive coatings, Inspection methods, Infrared radiation and infrared detectors, thermo mechanical behavior of materials, IR imaging in aerospace applications, electronic components, Honey comb and sandwich structures–Case studies.

# UNIT – VI

**INDUSTRIAL APPLICATIONS OF NDE:** Span of NDE Activities Railways, Nuclear, Non-nuclear and Chemical Industries, Aircraft and Aerospace Industries, Automotive Industries, Offshore Gas and Petroleum Projects, Coal Mining Industry, NDE of pressure vessels, castings, welded constructions.

#### **TEXT BOOKS:**

- 1. Non destructive test and evaluation of Materials/J Prasad, GCK Nair/TMH Publishers
- 2. Ultrasonic testing of materials/ H Krautkramer/Springer
- 3. Non destructive testing/Warren, J Mc Gonnagle / Godan and Breach Science publishers
- 4. Nondestructive evaluation of materials by infrared thermography / X. P. V. Maldague, Springer-Verlag, 1st edition, (1993)

- 1. Ultrasonic inspection training for NDT/ E. A. Gingel/Prometheus Press,
- 2. ASTM Standards, Vol 3.01, Metals and alloys
- 3. Non-destructive, Hand Book R. Hamchand

Semester	VIII	L	Т	Р	С	Course Code	
Regulation	V18	3	0	0	3	V18MET33	
Name of the Course	Industrial Hydraulics and Pneumatics Professional Elective – IV						
Branch	Mechanical Engineering						

After Successful completion of this course the student will be able to

CO1	Understand the fundamentals of Fluid Power Systems	K2
CO2	Develop general concepts associated with Hydraulic actuators and cylinders.	K3
CO3	Identify Hydraulic elements in the design of circuits	K2
CO4	Illustrate various accumulators & intensifiers	K3
CO5	Develop the operation of pnuematics circuits and components typically used in industry.	К3
CO6	Examine the applications of Industrial Hydraulics and Pneumatics.	K3

# UNIT – I

**FUNDAMENTALS OF FLUID POWER SYSTEMS-INTRODUCTION** – types advantages, disadvantages & applications-fluid characteristics-terminologies used in fluid power-hydraulic symbols-hydraulic systems and components-sources- pumping theory-gear, vane & piston pumps.

#### UNIT-II

**FLUID POWER ACTUATORS :** Introduction-hydraulic actuators-hydraulic cylinders-types, construction, specifications and special types. hydraulic motors- working principle-selection criteria for various types-hydraulic motors in circuits- formulae-numerical problems

### UNIT-III

**HYDRAULIC ELEMENTS IN THE DESIGN OF CIRCUITS**- Introduction-control elements- direction control valve-check valve-pressure control valve-relief valve- throttle valve-temperature & pressure compensation-locations of flow controlvalve

#### UNIT-IV

ACCUMULATORS & INTENSIFIERS-types, size &function of accumulators- application & circuits of accumulators- intensifiers-circuit & applications.

### UNIT-V

**PNEUMATIC SYSTEMS-INTRODUCTION**-symbols used-concepts & components- comparison-types & specifications of compressors-arrangement of a complete pneumatic system-compressed air behaviour-understandingpneumatic circuits-direction control valves

### UNIT-VI

**APPLICATIONS-** Servo systems-introduction-closed loop, hydro-mechanical and electro hydraulic – conventional and proportional valves-characteristics of proportional and servo valves- PLC applications in fluid power – selected pneumatic / electro pneumatic circuit problems – failure and trouble shooting in fluid power systems.

### TEXT BOOKS:

- 1. Introduction to Hydraulics and Pneumatics by S. Ilango and V.Soundararajan, PHI, New Delhi
- 2. Applied hydraulics and pneumatics-T. Sunder Selwyn & R.Jayendiran, Anuradha Publications.

- 1. Oil Hydraulic Systems, S.R .Majumdar, McGrawHill Companies
- 2. Pneumatic Systems: Principles and Maintenance, Majumdar, McGrawHill

Semester	VIII	L	Т	Р	С	Course Code	
Regulation	V18	3	0	0	3	V18MET34	
Name of the Course	<b>Computational Fluid Dynamics</b> Professional Elective – V						
Branch	Mechanical Engineering						

After Successful completion of this course the student will be able to

CO1	Apply techniques in the numerical solution of fluid equations	K3
CO2	Apply numerical modeling and its role in the field of heat transfer and fluid flow.	К3
CO3	Develop methodologies used in CFD	K3
CO4	Comapre various discretization methods and solving methodologies.	K4
CO5	Apply skills in the actual implementation of CFD methods (e.g. boundary conditions, different numerical schemes etc.	К3
CO6	Apply the finite element methods in the application of CFD analysis to real life engineering designs.	К3

# UNIT – I

**ELEMENTARY DETAILS IN NUMERICAL TECHNIQUES:** Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition and instability, computational methods for error estimation, convergence of sequences.

# UNIT – II

**APPLIED NUMERICAL METHODS:** Solution of a system of simultaneous linear algebraic equations, iterative schemes of matrix inversion, direct methods for matrix inversion, direct methods for banded matrices.

**EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER:** Introduction, conservation of mass, Newton's second law of motion, expanded forms of navier-stokes equations, conservation of energy principle, special forms of the navier-stokes equations.

### UNIT – III

Steady flow, dimensionless form of momentum and energy equations, stokes equation, conservative body force fields, stream function - vorticity formulation. Finite difference applications in heat conduction and convention – heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

### $\mathbf{UNIT} - \mathbf{IV}$

Finite differences, discretization, consistency, stability, and fundamentals of fluid flow modeling: introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

# UNIT - V

Introduction to first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme

### UNIT – VI

**FINITE VOLUME METHOD:** Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and quadratic interpolation.

### **TEXT BOOKS:**

- 1. Numerical heat transfer and fluid flow / Suhas V. Patankar- Butter-worth Publishers.
- 2. Computational fluid dynamics Basics with applications John. D. Anderson / McGraw Hill.

- 1. Computational Fluid Flow and Heat Transfer/ Niyogi, Pearson Publications.
- 2. Fundamentals of Computational Fluid Dynamics Tapan K. Sengupta / Universities Press.
- 3. Computational fluid dynamics, 3rd edition/Wendt/Springer publishers

Semester	VIII	L	Т	Р	С	Course Code	
Regulation	V18	3	0	0	3	V18MET35	
Name of the Course	<b>Production Planning and Control</b> Professional Elective – V						
Branch	Mechanical Engineering						

After Successful completion of this course the student will be able to

CO1	Generalise structure, elements and functions of Production planning and Control.	K2
CO2	Apply the principles of different forecasting methods.	К3
CO3	Analyze principles of different inventory control systems.	K4
CO4	Generalise Routing, its procedure, factors affecting Routing procedure.	K2
CO5	Explain Scheduling methods, Planning and controlling aspects.	K2
CO6	Understand Dispatching procedure, types of follow up, applications of computers in production planning and control.	K2

### UNIT – I

Introduction: Definition – objectives and functions of production planning and control – elements of production control – types of production – organization of production planning and control department – internal organization of department.

#### UNIT – II

Forecasting– importance of forecasting – types of forecasting, their uses – general principles of forecasting – forecasting techniques – qualitative methods and quantitive methods.

#### UNIT – III

Inventory management– functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P–Systems and Q-Systems.

Introduction to MRP I, MRP II, ERP, JIT systems.

### $\mathbf{UNIT} - \mathbf{IV}$

Routing– definition – routing procedure –route sheets – bill of material – factors affecting routing procedure, schedule –definition – difference with loading.

### UNIT – V

Scheduling policies- techniques, standard scheduling methods. Line Balancing, aggregate planning, chase planning, expediting.

### $\mathbf{UNIT} - \mathbf{VI}$

Dispatching– activities of dispatcher – dispatching procedure – follow up – definition – reasons for existence of functions – applications of computers in production planning and control.

### **TEXT BOOKS:**

1. Elements of Production Planning and Control / Samuel Eilon.

2. Manufacturing, Planning and Control, Partik Jonsson Stig-Arne Mattsson, Tata Mc Graw Hill

Semester	VIII	L	Т	Р	С	Course Code	
Regulation	V18	3	0	0	3	V18MET36	
Name of the Course	<b>Energy Conservation and Management</b> Professional Elective – V						
Branch	Mechanical Engineering						

After Successful completion of this course the student will be able to

CO1	Understand the principles of Energy.	K2
CO2	Evaluate thermal Performance.	K5
CO3	Illustrate Energy Conservation Program.	K3
CO4	Predict the Energy Conservation Options	K2
CO5	Recognise the Strategies for Electricity and Management	K2
CO6	Express the Importance and Role of Energy Management	K2

# UNIT-I

Energy scenario, Principles of energy conservation, Energy consumption pattern, Resource availability.

### UNIT-II

Calculation of thermal performance, calculation of heat loss – heat gain, estimation of annual heating & cooling load factors that influence thermal performance, analysis of existing buildings.

### UNIT-III

Organizing for energy conservation program, the energy audit and energy information system, technology for energy conservation, co-generation of process, steam & electricity, computer controlled energy.

#### UNIT-IV

Commercial options in waste heat recovery equipment, cases of energy studies, energy conservation opportunity, Energy conservation in I. C. Engine.

### UNIT-V

Strategies for electricity and management, setting up an energy management programme, electricity saving technique by category of end use, Electrical end use in industries, energy & power management in industry, energy management strategies for industry, demand management.

### UNIT-VI

Importance and role of energy management, Energy economics, Payback period, Internal rate of return, life cycle costing.

### **TEXT BOOKS:**

1. Hamies, Energy Auditing and Conservation, Methods, Measurements, Management and Case Study, Hemisphere,

Washington, 1980

- 2. W.F.Kenny, Energy Conservation in Process Industry.
- 3. Trivedi, P.R, Jolka K.R., Energy Management, Commonwealth Publication, New Delhi, 1997.
- 4. C.B.Smith, Energy Management Principles, Pergamon Press, New York, 1981.

- 1. W.C. Turner, Energy Management, Hand Book.
- 2. Kreith, Economics of Solar Energy and Conservation Systems, Vol -3.
- 3. Witte, Larry C, Industrial Energy Management and Utilization, Hemisphere Publishers, Washinton, 1988.