GOVERNMENT COLLEGE OF TECHNOLOGY, COIMBATORE - 641013

OFFICE OF THE CONTROLLER OF EXAMINATIONS

BRANCH: MECHANICAL ENGINEERING

CURRICULUM: IV SEMESTER

Sl. No	Course Code	Course Title	Category	Continuous Assessment Marks	End Sem Marks	Total Marks	Credits			
							L	T	P	C
THEORY										
1	16MBS401	Numerical Methods	BS	50	50	100	3	2	0	4
2	16MES402	Applied Electronics and Microprocessors	ES	50	50	100	3	0	0	3
3	16MPC403	Kinematics of Machines	PC	50	50	100	3	0	0	3
4	16MPC404	Engineering Thermodynamics	PC	50	50	100	3	0	0	3
5	16MPC405	Metrology and Measurements	PC	50	50	100	3	0	0	3
6	16MPC406	Manufacturing Technology II	PC	50	50	100	3	0	0	3
PRACTICAL										
7	16MPC407	Machine Drawing and Drafting Laboratory	PC	50	50	100	0	0	4	2
8	16MPC408	Metallurgy and Metrology Laboratory	PC	50	50	100	0	0	4	2
		TOTAL		400	400	800	18	2	8	23

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10.11.2017

CONTROLLER OF EXAMINATIONS

16MBS401 **NUMERICAL METHODS** **CATEGORY: BS**

(Common to Civil, Mechanical and Electrical Engineering)

L	T	P	C
3	2	0	4

COURSE OBJECTIVES:

- *To familiarize with numerical solutions of equation with one variable and system of equations.
- *To obtain the knowledge of numerical interpolation, numerical differentiation and numerical integration.
- *To acquire knowledge of numerical solution to first order ordinary differential equations using single and multi step techniques.
- *To gain the knowledge of numerical solution to second order partial differential equations using explicit and implicit methods.

UNIT - I SOLUTIONS OF EQUATIONS AND EIGEN VALUE PROBLEMS (9+6)

Iterative method- Newton Raphson method for single variable and simultaneous equations with two variables - Solutions of linear system of equations - Gauss Elimination, Gauss Jordan, Gauss Seidel method - Eigenvalue of a Matrix by Power method.

UNIT - II INTERPOLATION (9+6)

Operators - Relation between the operators-Newton's divided difference formula - Lagrange's and Hermite's polynomials - Newton Forward and backward difference formula - Stirling's and Bessel's central difference formulae.

UNIT - III NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION (9+6)

Numerical approximation of derivatives using interpolation polynomials - Numerical integration by Trapezoidal, Simpson's one third and Simpson's three eighth rules - Two point and three point Gaussian quadrature formula - Double integration using Trapezoidal and Simpson one third rule - Difference equation.

UNIT - IV NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (9+6)

Taylor series method - Euler method - Modified Euler method - Fourth order Runge Kutta method for solving first order equations - Predictor and corrector methods: Milne's and Adam Bashforth methods

UNIT - V NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS (9+6)

Finite difference solutions for the second order ordinary differential equations-Finite difference solutions for one dimensional Heat Equation (Both Explicit and Implicit Methods) –One dimensional wave equation-Laplace and Poisson equation

Contact Periods:

Lecture: 45 Periods Tutorial: 30 Periods Practical: 0 Periods Total: 75 Periods

Text Books

1. *Kandasamy P, Thilagavathy K and Gunavathy K, "**Numerical Methods**" S.Chand& Co, Ramnagar, New Delhi, Reprint 2013.*
2. *Veerarajan T and Ramachandran T, **"Numerical Methods with Programming in C"**, McGraw Hill Education Pvt Ltd, New Delhi, Ist Edition, Reprint,2016.*

Reference Books

1. *Grewal B S., **"Higher Engineering Mathematics"**, Khanna Publishers, New Delhi, 43rd Edition,2014.*
2. *Balagurusamy E, **"Numerical Methods"**, McGraw Hill Education Pvt Ltd, New Delhi, I Edition Reprint, 2016.*
3. *Dr.Manish Goyal, **"Statistics and Numerical Methods"**, University Science Press, New Delhi,2010*
4. *Dr. J.S. Chitode, **"Numerical Methods"**, Technical Publications, Pune, 2010.*
5. *Ken F.Riley , Mike P.Hobson and Stephen J. Bence, **"Fundamentals of Engineering Numerical Analysis"**, Cambridge University Press,New Delhi, 2015.*

COURSE OUTCOMES

Upon completion of the course, the student will be able to

CO 1: Understand the numerical solutions to algebraic, exponential, logarithmic, transcendental and linear system of simultaneous equations.

CO 2:Acquire fluency in numerical interpolation techniques with equal and unequal intervals.

CO 3: Understand the techniques of finite differences to apply for numerical differentiation, numerical quadrature and numerical cubature.

CO 4: Understanding numerical solution to first order ordinary differential equations by different methods like single step and multistep etc.,.

CO 5: Understanding numerical solution to second order partial differential equations by different methods using finite differences.

COURSE ARTICULATION MATRIX

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	L								M			M	H	
CO2	H			H						H			M	H	
CO3	H	M	M			L				H	M		L	H	
CO4	H	H								H	H		M	H	
CO5	H	H								H	H		L	H	
16MB S401	H	M	L	L		L				H	M		L	M	

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16MES402 **APPLIED ELECTRONICS AND MICROPROCESSORS** **CATEGORY: ES**

(Common to Production Engineering)

L	T	P	C
3	0	0	3

PRE-REQUISITE

16MES105 Basics of Electrical and Electronics Engineering

COURSE OBJECTIVES:

* *To equip the students with the basic knowledge of analog and digital electronic circuits and microprocessor*

UNIT - I ANALOG ELECTRONIC CIRCUITS (9)

Review of characteristics of transistors - Need for biasing – DC Load line analysis - Biasing of BJT-Types of Biasing - Fixed and Self biasing - RC Coupled amplifier - Class A Power amplifier - Class B pushpull amplifier - Distortion in amplifiers. Concept of feedback - Oscillators - Barkhausen criterion - RC phase shift oscillator - Hartley Oscillator - Colpitts Oscillator

UNIT – II DIGITAL CIRCUITS (9)

Binary number system – AND, OR, NOT, NAND, NOR and XORgate – Combinational circuits - Adders and subtractors. Flip flops – RS flip flop, JK, D, T flip flops. A/D and D/A converters - weighted resistor DAC -R-2R ladder DAC - servo tracking A/D - successive approximation A/D converter -Dual slope ADC - Memories - ROM - EPROM – EEPROM-RAM

UNIT – III 8085 ARCHITECTURE AND PROGRAMMING (9)

Block diagram of microcomputer – Architecture of 8085 – Pin configuration – Instruction formats - Instruction set –Addressing modes – Simple assembly language programs.

UNIT – IV TIMING DIAGRAM AND INTERRUPTS (9)

Instruction cycle - machine cycle -Timing diagram: OP code fetch cycle, Memory and I/O read cycle, memory and I/O write cycle, interrupt acknowledge machine cycle. Interrupts - Hardware Interrupts - Vectored Interrupts - Non-vectored interrupts – Priority interrupts - Data transfer schemes - synchronous transfer, asynchronous transfer, interrupt driven transfer and DMA transfer

UNIT – V INTERFACING AND APPLICATIONS (9)

Interfacing of Input and output devices – Applications of microprocessor - Temperature control – Stepper motor control – Traffic light control- Digital clock- EPROM Programmer.

Contact Periods:

Lecture: 45 Periods Tutorial: 0 Periods Practical: 0 Periods Total: 45 Periods

Text Books:

1. *S.Salivahanan, N.Sureshkumar and A.Vallavaraj, "**Electronic Devices and Circuits**", 2nd Edition,Tata McGrawHill, 2008.*
2. *Morris Mano M., **"Digital Design"**, Prentice Hall Of India Pvt. Ltd. 2008.*
3. *Ramesh S. Goankar, **"Microprocessor Architecture and Programming and Applications 8085 / 8080a"**, Penram International Publishing (India) 2004.*

Reference Books:

1. *Mathur S.P., Kulshreshtha D.C., Chadha P.R. **"Electronic Devices and Applications and Integrated Circuits"**, Umesh Publications, 2004.*
2. *Krishna Kant, "Microprocessor and Microcontroller Architecture, Programming and System Design using 8085,8086, 8051 and 8096", PHI, 2011.Ajit Pal, **"Microprocessor Principles and Applications"**, Tata Mcgraw Hill, New Delhi 1999.*
3. *Allen Mottershead "**Electronic Devices and Circuits**", Prentice Hall of India, 2008.*
4. *Charles H.Roth, Jr, "**Fundamentals of Logic Design**", 4th Edition, Jaico Publishing House, 2006.*

COURSE OUTCOMES:

Upon completion of this course, the students will have:

CO1:Knowledge about bipolar junction and field effect transistors.
CO2: Knowledge on the design of amplifiers and oscillators.
CO3: Knowledge about combinational and sequential logic circuits.
CO4: Basic knowledge about A/D and D/A converters.
CO5: In-depth knowledge on architecture and programming concepts of 8085 microprocessor.
CO6: Exposure to various interfacing circuits for real time applications.

COURSE ARTICULATION MATRIX

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H		L										H		
CO2	H		L										H		
CO3	H		L										H		
CO4	L												H		
CO5	M		M										H		
CO6	M		M										H		
16ME S402	M		L										H		

16MPC403 **KINEMATICS OF MACHINES** **CATEGORY: PC**

L	T	P	C
3	0	0	3

PRE-REQUISITES:

16MES107 Engineering Graphics
16MES206 Engineering Mechanics

COURSE OBJECTIVES:

* *To familiarize students with the basic of mechanisms, friction drives, to build confidence on the basics of gear theory and its nomenclature.*

UNIT - I BASICS OF MECHANISMS **(9)**

Terminology and definition – Degree of freedom– Higher and Lower pair – Mobility – Grashoff's law – Various types of Mechanisms- Description of mechanisms-Inversions of four bar chain and slider crank chains – Mechanical advantage – Transmission angle - Springs as links- Practical considerations- pin joints vs sliders,short links, linkages vs cams

UNIT - II KINEMATIC ANALYSIS **(9)**

Velocity and acceleration analysis on simple mechanisms – Graphical and analytical techniques- Instantaneous center of velocity – Coriolis component – Klein's construction for slider crank chain.

UNIT - III FRICTION DRIVES **(9)**

Belt and rope drive – Open and cross belt drive – Belt materials – Creep and slip - Ratio of tensions – Effect of centrifugal force – condition for maximum power – Friction in Journal Bearing - Flat pivot bearing - Friction clutches – Single plate – Multi plate – Cone clutches-Brakes - Shoe brake and Internal Expanding brake only.

UNIT - IV CAMS **(9)**

Types of cams and followers – Determination of cam profiles, pressure angles for SHM, uniform acceleration and retardation with reciprocating and oscillating followers – Knife-edge, roller and flat – practical design considerations- Special cams and its applications.

UNIT - V GEARS **(9)**

Gear terminology- Types of gearing – Pressure angle and undercutting - Law of gearing –Interference – gear corrections - Gear trains – Simple, compound, reverted and epicyclic.

Contact Periods:

Lecture: 45 Periods **Tutorial: 0 Periods** **Practical: 0 Periods** **Total: 45 Periods**

Text Books:

1. *Thomas Bevan, **"Theory of Machines"**, Pearson Education Limited, 2010*
2. *Rattan S S, **"Theory of Machines"**, Tata McGraw -Hill Publishers, New Delhi, 2009.*

Reference Books:

1. *Shigley J.E AndUicker J.J, **"Theory of Machines and Mechanisms"**, Mcgraw Hill Inc,1995.*
2. *V.P.Singh, **"Theory of Machines"**, Dhanapatrai & Sons, 2005*
3. *George H.Maritn, "**Kinematics and Dynamics of Machines"**, Waveland PrInc, 2002.*
4. *R L Norton, "**Kinematics and Dynamics of Machinery"**, McGraw-Hill, 2009.*
5. *C. E. Wilson, P. Sadler, "**Kinematics and Dynamics of Machinery"**, 3rd edition, Pearson Education, 2014.*

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: *Design mechanisms for practical applications.*

CO2: *Synthesis of mechanisms for given conditions.*

CO3: *Select appropriate type of friction drives gear for a specific application.*

CO4: *Construct cam profile for given follower motion.*

CO5: *Sizing the gear or gear trains.*

COURSE ARTICULATION MATRIX

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H	H	L	M	L	L	L	H	L	L	L	H	H	M
CO2	H	H	M	L	M	L	M	L	H	L	L	L	H	H	M
CO3	H	H	H	L	M	L	M	L	M	L	L	L	H	H	M
CO4	H	M	H	L	M	L	H	L	L	L	L	L	H	M	M
CO5	H	H	M	L	M	L	M	L	M	L	L	L	H	M	M
16MP C403	H	H	H	L	M	L	M	L	M	L	L	L	H	H	M

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16MPC404 **ENGINEERING THERMODYNAMICS** **CATEGORY: PC**

L	T	P	C
3	0	0	3

PRE-REQUISITES:

16MBS103 Applied physics

16MBS104 Engineering chemistry

COURSE OBJECTIVES:

* *To expose thermodynamic concepts, processes and cycles for analyzing the thermodynamic systems*

UNIT - I CONCEPT OF THERMODYNAMICS **(9)**

Basic definitions, Microscopic and Macroscopic approach, Types of systems – Thermodynamic processes – Point and Path function – Thermodynamic equilibrium – Quasi-static process. Heat and work – Zeroth law – First law of thermodynamics – Applications to closed and open systems – Steady flow processes – applications

UNIT - II SECOND LAW OF THERMODYNAMICS AND ENTROPY **(9)**

Limitations of First law – Kelvin-Plank and Clausius statements – Heat engines – Refrigerators – heat pumps-efficiency and COP – Carnot cycle – Entropy – principle of increase in entropy – reversibility and irreversibility – applications.

UNIT - III IDEAL AND REAL GASES **(9)**

Equation of state – Ideal and Real gases – Properties calculations - Generalized compressibility chart - Vanderwaal's Equation – specific heats C_p and C_v - Joule-Thomson coefficient – ideal gas mixtures.

UNIT - IV COMBUSTION **(9)**

Fuels – Combustion equations- Stoichiometric air-fuel ratio – Exhaust and flue gas analysis – practical analysis of combustion products – Dissociation – internal energy and enthalpy of reaction – Enthalpy of formation – Calorific value of fuels – power plant thermal efficiency – practical determination of calorific values – air fuel – vapour mixtures.

UNIT - V PROPERTIES OF STEAM AND VAPOUR POWER CYCLE **(9)**

Properties of steam – use of steam tables and Mollier chart – dryness fraction calculations. Basic Rankine cycle – Rankine cycle with reheating and regeneration – Application of Binary vapour cycle.

Contact Periods:

Lecture: 45 Periods **Tutorial: 0 Periods** **Practical: 0 Periods** **Total: 45 Periods**

Text Books:

1. *Nag. P.K., "**Engineering Thermodynamics**", Tata McGraw Hill Company, 5th Edition, 2013.*
2. *Yunus Cengel, **"Thermodynamics"** Tata McGraw Hill Company, 8th Edition, 2014*

Reference Books:

1. *Kothandaraman, C.P., **"Thermal Engineering"**, Dhanpat Rai & Sons, 1998.*
2. *Holman, J.P., **"Thermodynamics"** McGrawhill Company, 2000.*
3. *Rajput, R.K. **"Thermal Engineering"** Laxmi Publications 8th Edition. 2010.*
4. *Ballaney P.L., **"Thermal Engineering"**, Khanna Publisher. 1996.*
5. *Mahesh. M. Rathore, "Thermal Engineering", Tata Mc Graw Hill Education Private Limited 1 st edition, 2010.*

COURSE OUTCOMES:

On completion of this course, students will be able to

CO 1: apply thermodynamic principles to real life thermodynamic problems

CO 2: analyze the principles of entropy generation

CO 3: identify the characteristics of gases

CO 4: apply the principles of combustion to thermal analysis problems

CO 5: appreciate and analyze the vapour power cycles

COURSE ARTICULATION MATRIX:

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H	M	M			M	L				H	L	M	M
CO2	H	H	M	M	L	L	L					M	M	H	L
CO3	H	M	M	H			L					H	M	H	L
CO4	H	H	M	H	M		H					M	M	H	L
CO5	H	H	H	M	L		L					L	M	H	L
16MPC404	H	H	M	M	L	L	M	L				M	M	H	L

16MPC405 **METROLOGY AND MEASUREMENTS** **CATEGORY: PC**

L	T	P	C
3	0	0	3

PRE-REQUISITE

16MBS103 Applied physics

COURSE OBJECTIVES:

* *To acquire knowledge on various measuring instruments, measuring machines and principles of measurements of form, strain, force, torque, pressure, temperature and flow*

UNIT – I LINEAR AND ANGULAR MEASUREMENTS **(9)**

Length Standards - Length Measuring instruments - Vernier instruments - micrometer, height gauge, dial indicators, Bore gauges, Slip gauges, Comparators -Mechanical, Electrical, Optical & Pneumatic, Optical Projector. Angle measuring instruments - Bevel protractor, Sprit level, Sine bar, Autocollimator, Angle dekkor, Interferometry.

UNIT – II FORM MEASUREMENT **(9)**

Screw thread terminology- Measurement of effective diameter by two wire and three wire methods - errors in threads- Measurement of pitch, profile errors and total composite errors, Gear tooth terminology-Methods of measurements of runout, pitch, profile, lead, backlash, tooth thickness-composite method of inspection - Parkinson gear tester, Measurement of surface finish - Stylus probe instruments - profilometer-Tomlinson and Talysurf instrument-Straightness, Flatness and Roundness measurement.

UNIT – III MEASURING MACHINES AND ADVANCES IN METROLOGY **(9)**

Tool maker's microscope - Computer controlled CMM - Universal measuring machine - Automatic and multidimensional inspection machine - Computer aided inspection -Machine vision-Laser interferometer.

UNIT - IV MEASUREMENTS: STRAIN, FORCE, TORQUE AND PRESSURE MEASUREMENTS **(9)**

Electrical, Metallic Resistance Strain Gauge – Strain Gauge Ballast / Bridge circuit - Load cells - hydraulic and pneumatic systems - Pressure measuring transducers - Elastic and diaphragms – Mechanical, Hydraulic, Electric and Transmission Dynamometers.

UNIT - V TEMPERATURE, FLUID FLOW AND VIBRATION MEASUREMENTS **(9)**

Bi-Metallic strips - pressure thermometers, thermo couples, optical and radiation pyrometer - Flow measurement - Obstruction meters - Pitot tubes - Rotameters – Turbine type meters, magnetic flow meters - hot wire anemometer - vibrometers and accelerometers – seismic accelerometers.

Contact Periods:

Lecture: 45 Periods **Tutorial: 0 Periods** **Practical: 0 Periods** **Total: 45 Periods**

Text Books:

*1.Jain.R.K., **"Engineering Metrology"**,Khanna Publishers, Delhi, 2004.*

*2.Thomas G. Beckwith, Roy D, Marangoni, John H.Lienhard V., **"Mechanical Mesurements"**,Addtion Wesley Publishing Company, 2004*

Reference Books:

1. *Gupta. I.C., **"A text book of Engineering Metrology"**,DhanpatRai& Sons, Delhi, 2003*
2. *Holman J P., **"Experimental Methods for Engineers"** McGraw Hill Book Company, 2004*
3. *Jain R K, **"Mechanical and Industrial Measurements"**, Khanna Publishers, Delhi, 2004.*
4. *Charles Reginald Shotbolt, **"Metrology for Engineers"**, 5th edition, Cengage Learning EMEA,1990.*
5. *Backwith, Marangoni, Lienhard, **"Mechanical Measurements"**, Pearson Education , 2006.*

COURSE OUTCOMES:

On completion of this course, students will be able to

CO1: *select and use appropriate measuring instruments for different applications.*

CO 2:*apply the knowledge of various measurement techniques for industrial needs.*

CO 3:*estimate mechanical and thermo physical properties*

CO 4:*apply the knowledge measurements in quality control*

CO5: *use advantage in metrology in quality control*

COURSE ARTICULATION MATRIX

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M	L	L	M			H						L	L	
CO2	H		M	H										M	
CO3		M	L	H									M	L	
CO4			M		M	H	L						M	M	
CO5		M				L					M		L	H	
16MP C405	L	L	L	M	L	L	L				L		L	M	

16MPC406 **MANUFACTURING TECHNOLOGY II** **CATEGORY: PC**

L	T	P	C
3	0	0	3

PREREQUISITES:

16MPC304 Manufacturing Technology I

COURSE OBJECTIVES:

* *To understand the mechanics of metal cutting, working of machine tools such as automats, major metal cutting processes and study the basics of nontraditional machining processes.*

UNIT – I THEORY OF METAL CUTTING **(9)**

Mechanism of metal cutting – types – cutting force – chip formation – Merchant's circle diagram – calculations – tool geometry – machinability – tool wear – tool life – cutting tool materials – cutting fluids – types.

UNIT – II AUTOMATS, SHAPING AND PLANING MACHINES **(9)**

Capstan and turret lathes – construction - indexing mechanism - operations - working principle of single and multi - spindle automats – shaping and planning machines – types – construction - mechanism – principle of operation – different shaping operations - work holding devices.

UNIT – III DRILLING, BROACHING AND GRINDING MACHINES **(9)**

Drilling machines – specifications, types - feed mechanism, operations – drill tool nomenclature – broaching – specifications, types, tool nomenclature, broaching operations – grinding – types of grinding machines – grinding wheels, specifications – bonds – mounting and reconditioning of grinding wheels.

UNIT – IV MILLING AND GEAR GENERATING MACHINES **(9)**

Milling – specifications – types - cutter nomenclature – types of cutters – milling processes – indexing – gear forming in milling – gear generation - gear shaping and gear hobbing – specifications - cutters –coated tools & inserts- cutting spur and helical gears - bevel gear generators – gear finishing methods.

UNIT – V NON-TRADITIONAL MACHINING **(9)**

Classification of machining processes - process selection - ultrasonic machining – abrasive jet machining – water jet machining - laser beam machining – electron beam machining – plasma arc machining.

Contact Periods:

Lecture: 45 Periods **Tutorial: 0 Periods** **Practical: 0 Periods** **Total: 45 Periods**

Text Books

*1.Hajra Choudhry S.K. and Bose S.K., **"Workshop Technology Vol II"**, Media Promoters and Publishers Pvt. Ltd., Bombay, 2004*

*2. Sharma P.C., **"A Text Book of Production Technology"**, S.Chand & Company Ltd., New Delhi, 10th Revised* edition, *2010*

*3. P.N. Rao, **Manufacturing Technology Foundry, Forming and Welding**, Tata McGraw Hill 3rd Edition, 2009*

Reference Books

1. *Serope Kalpakjian and Steven R.Schmid, "**Manufacturing Engineering and Technology**", Addison Wesley Longman (Singapore) Pte Ltd, Delhi, 2009*
2. *Jain R.K. and Gupta S.C., "**Production Technology**", Khanna Publishers, New Delhi, 1999*
3. *Richerd R Kibbe, John E. Neely, Roland O. Merges and Warren J.White **"Machine Tool Practices"**, Prentice Hall of India, 1998*
4. *Roy. A.Lindberg, **"Process and Materials of Manufacture"**, Fourth Edition, PHI/Pearson Education 2006.*

COURSE OUTCOMES:

On completion of this course, students will be able to

CO 1: apply the theory of metal cutting in real life machining.

CO 2: understand the operating mechanisms of lathe, shaping and planning machine.

CO 3: to gain knowledge on drilling, boring and grinding machines.

CO 4: know about principles, operation and working of milling and gear generating machine.

CO 5: non-traditional manufacturing methods.

COURSE ARTICULATION MATRIX

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1			M		H	L					M		M	M	
CO2	L	L	M	L	M										L
CO3		M				L								M	
CO4	L	M	L										M	M	
CO5	L				M								L	M	
16MPC406	L	L	L	L	L	L					L		L	M	L

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16MPC407 **MACHINE DRAWING AND DRAFTING LABORATORY** **CATEGORY: PC**

L	T	P	C
0	0	4	2

PRE-REQUISITES:

* 16MES107 Engineering Graphics

COURSE OBJECTIVES:

To create knowledge about standard presentation of components and symbols. It develops the knowledge to select proper tolerance and fit levels of appropriate machine components. Induces the knowledge to generate about 2-dimensional and 3-dimensional drawing with Auto CAD

UNIT – I CONVENTIONS, ABBREVIATIONS, AND SYMBOLS **(10)**

Interrupted views, partial views of symmetrical objects, conventional representation of the continuous square and circular rod ends, adjacent parts, common machine elements, abbreviations, description of tolerances and grades, types of fits and their descriptions, selection of fits from standard tables- fits for different applications- examples- geometrical tolerances- surface finish conventions.

UNIT – II PREPARATION OF ASSEMBLY DRAWING **(35)**

Cotter joint, knuckle joint, flange coupling, universal coupling, footstep bearing, Plummer block, connecting rod end, screw jack, lathe tailstock, stop valves.

UNIT – III AUTOCAD **(15)**

Basic tools and commands of AutoCAD, line types, dimensioning, 2D drawing of machine components, 3D models, importing and exporting files to other software.

Contact Periods:

Lecture: 0 Periods **Tutorial: 0 Periods** **Practical: 60 Periods** **Total: 60 Periods**

Text Books:

1. *Gopalakrishna K.R., **"Machine Drawing"**, Subhas Publishers, Bangalore, 2003.*
2. *Bhatt.N.D, **"Machine Drawing"**, Chorotar Publishing House, 2001.*

Reference Books

1. *Gill.P.S., "**Text Book of Machine Drawing"**, S.K. Kataria & Sons, Publishers & Distributors, Delhi, 1998.*
2. *Narayana K.L., Kanniah.P., Venkatareddy.K., **"Machine Drawing"**, New Age International Publishers, 2004.*
3. *James D. **"Engineering Graphics with AutoCAD 2002"**, Pearson Education, 2005.*
4. *Alan Kalameja, **"AutoCAD 2008: A tutor for Engineering Graphics"**, Auto Desk Press 2007*

COURSE OUTCOMES:

Upon completion of the course, student will be able to

CO1: ability to select proper joint for products design

CO2: ability to understand and initiate proper standards and codes

CO3: ability to use proper symbols and select proper tolerance values for appropriate applications

CO4: ability to communicate effectively in Industries (production line) through this subject knowledge

CO5: ability to develop the better drawing using Auto CAD software (blueprint) with full technical details as required

COURSE ARTICULATION MATRIX

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M		L								H		H	L	
CO2	H							L			M		M		
CO3	L		H		L	M					M			M	L
CO4										H	L				L
CO5	L				H					M			M		
16MPC407	L		L		L	L		L		L	M		L	L	L

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16MPC408 **METALLURGY AND METROLOGY LABORATORY** **CATEGORY: PC**

L	T	P	C
0	0	4	2

METALLURGY LABORATORY

PRE-REQUISITES:

16MBS103 Applied physics

16MPC305 Engineering Metallurgy

COURSE OBJECTIVES:

* *To provide practical knowledge of specimen preparation for micro examination, study the microstructures, defects of ferrous and nonferrous materials*

LIST OF EXERCISES

1. Study of Metallurgical microscope
2. Preparation of Specimen for metallographic examination
3. Preparation and Study of Microstructure of steel, cast iron and non ferrous alloys
4. Study of Microstructure of heat treated and untreated steels
5. Study of Microstructure of heat treated and untreated cast iron
6. Measurement of inclusion rating and grain size
7. Determination of hardenability of steel by Jominy end quench test
8. Study of Bravais lattices with the help of models
9. Study of microstructure of weldment and cast components
10. Study of Non destructive testing

Contact Periods:

Lecture: 0 Periods **Tutorial: 0 Periods** **Practical: 30 Periods** **Total: 30 Periods**

COURSE OUTCOMES:

On completion of this course, students will be able to

CO1: *Demonstrate the specimen preparation methods.*

CO2: *Identify and analyze the microstructures and defects in ferrous and nonferrous engineering components*

COURSE ARTICULATION MATRIX

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	L	L	M	H	M	L	L	M	H	L	L	L	L	M	M
CO2	H	M	M	M	M	M	H	M	L	M	L	L	M	H	H
16MPC408	M	M	M	H	M	M	M	M	M	M	L	L	M	H	H

METROLOGY LABORATORY

COURSE OBJECTIVES:

* *To familiarize the basic concepts of measurements, various linear, angular and form measuring equipment, and their principles of operation.*

LIST OF EXPERIMENTS:

1. Study and use of Measuring Instruments.
2. Calibration of Dial gauge using Dial Calibration Tester.
3. Measurement of external taper angle using sine bar and slip gauges.
4. Measurement of internal and external dovetail angle using rollers.
5. Measurement of internal angle using spheres.
6. Measurement of external angle using rollers and slip gauges.
7. Measurement of spur gear tooth thickness using gear tooth vernier caliper.
8. Measurement of internal diameter and depth of the cylinder using spheres.
9. Measurement of effective diameter and pitch of screw thread using three wire method and pitch gauge.
10. Study of Autocollimator.
11. Study of Profile Projector.
12. Study of Tool Makers Microscope.
13. Study of Co-ordinate Measuring Machine.

Contact Periods:

Lecture: 0 Periods Tutorial: 0 Periods Practical: 30 Periods Total: 30 Periods

Reference Books

1. Laboratory Manual prepared by Department of Production Engineering.

2. Connie L Dotson, "Fundamentals of Dimensional Metrology", Cengage Learning (I) Private Limited, New Delhi, 2003.

3. Anand K Bewoor and Vinay A Kulkarni, "Metrology and Measurement", McGraw Hill Education (I) Private Limited, 2015.

COURSE OUTCOMES:

On completion of this course, students will be able to

CO1: explain the general concepts of measurements.

CO2: perform some linear, angular and form measurements, and record observations.

CO3: calibrate the measuring instruments.

CO4: explain about various methods of traditional and modern measurements that are used in the industry to measure product dimensions.

COURSE ARTICULATION MATRIX

CO/ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	L	L							M	L			L	M	
CO2	L	H							M	L			L	M	
CO3	L	H							M	L			M	L	
CO4	L	H			M				M	L			L	M	
16MPC408	L	H			L				M	L			L	M	