Department	Mathematics
Course Code	MM(ME)101
Title of Course	Advanced Engineering Mathematics
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L +1T
Total Contact Hours	39
Course Out Come	**CO1:** Apply the concept of statistical tools for analysing data samples and drawing inference on a given data set. **CO2:** Learn and apply the concept of Eigen values, Eigen vectors, diagonalizationto "reduce" a linear operation to separate, simpler, problemswhich is used in many decompositions and in solving Differential Equations. **CO3**: Analyse and solve engineering problems used in control theory bylearning to solvedifferential equation using Laplace Transform and Fourier Transform. **CO4**: Ability to solve linear equations and ordinary differential equations usingnumerical method. **CO5**: Understand different techniques to solve the ordinary and Partial differential equations that are present in different problems of engineering sciences.

Department	Mechanical Engineering
Course Code	MME 101
Title of The Course	Advanced Dynamics of Machinery
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	4 L
Total Contact Hours	48
Course Outcomes	CO1: To **explore** Generalised Forces and Coordinates. Lagrangian Equations and Hamilton's Principle. CO2: To be able to **design** Mechanical Vibration: Single, two and multi-degree of freedom systems. Distributed mass and elasticity. CO3: To be able **to design** Cam dynamics. Balancing of rotors, Field balancing. CO4: To **explore** control systems, transfer function, mathematical modeling of physical systems,time-domain analysisand PID Control. CO5: **To explore** frequency domain analysis, stability analysis, bode plot, state-space.

Department	Mechanical Engineering
Course Code	MME 102
Title of The Course	Advanced Production Methods
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	4 L
Total Contact Hours	48
Course Outcomes	CO1: ***Gain*** knowledge of various casting, welding and forming methods. (Remembering) CO2: ***understand*** the effect of casting parameters on casting properties, effects of welding and forming processes on microstructure and metal properties. (Understanding) CO3: ***apply*** various manufacturing processes for different industrial applications. (Applying) CO4: critically ***analyze*** the effects of process parameters of different manufacturing processes on metal properties. (Analyzing) CO5: ***evaluate*** and *solve* different industrial problems related to manufacturing and provide solutions. (Evaluating) CO6: ***design*** gating system for industrial castings. (Creating)

Department	Mechanical Engineering
Course Code	MME103A
Title of Course	Advanced Metal Cutting Theory
Nature of Course	Elective [2015-16 (7); 2016-17(1); 2017-18(8); 2018-19(9); 2019-20(4)]
Type of Course	Lecture
Contact Hours	L + T= 4+0
Total Contact Hours	48
Course Out Come	**CO1:** To **Explain** metal cutting tool theories and Implement it to solve simple numerical on related concepts. **CO2:** To **Understand** the cause and effect of cutting temperature and cutting tool failure. **CO3:** To **Understand** the improvement of machinability by evaluation of optimum cutting velocity and tool life **CO4:** To **Analyze** various NTM Processes and Solve various numerical problems. **CO5: To evaluate** the role of each NTM process parameter during machining of various advanced materials. **CO6:** To **Create** Machining Models of various advanced manufacturing processes for achieving maximum MRR and minimum surface roughness while machining various advanced materials.

Department	Mechanical Engineering
Course Code	MME103B
Title of Course	Production Tooling and Equipment
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	L + T= 4+0
Total Contact Hours	48
Course Out Come	. . **CO1:** Design of single point cutting tools & Form tools**.** **CO2:** Design of Milling cutters & Broach design. **CO3:** Operational planning and Turret tool layout. **CO4:** Design of press tools & Jigs and Fixtures.

Department	Mechanical Engineering
Course Code	MME103C
Title of Course	Advanced Machining Process
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	L + T= 4+0
Total Contact Hours	48
Course Out Come	**CO1:** To study of Non-traditional machining **CO2:**To Mechanical Non-Traditional Machining Processes **CO3:** To Thermal Non-Traditional Machining Processes

Department	Mechanical Engineering
Course Code	MME104A
Title of Course	Numerical Method & Optimization Technique
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	L + T= 4+0
Total Contact Hours	48
Course Out Come	**CO1:** Approximate and errors in computation & Solution of simultaneous algebric equations **CO2:** Numerical differentiation and integration & Numerical solution of ordinary and partial differentiation equations **CO3:** Non-linear programming & Geometric programming. **CO4:** Dynamic programming & Integer programming.

Department	Mechanical Engineering

Course Code	MME104B
Title of Course	Advanced CAD/CAM
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	L + T= 4+0
Total Contact Hours	48
Course Out Come	**CO1:** Introduction to Computer Graphics Fundamentals & Geometric Modelling. **CO2:** Parametric Representation of Synthetic Surfaces. **CO3:** Geometric Modelling-3d

Department	Mechanical Engineering
Course Code	MME-104C
Title of The Course	Elective -II(Production Planning & Control)
Nature of Course	Elective [2015-16 (7); 2016-17(1); 2017-18(8); 2018-19(9); 2019-20(4)]
Type of Course	Lecture
Contact Hours	4 L
Total Contact Hours	48
Course Outcomes	CO1: **Analyzing** and **Understanding** organisation of PPC, PPC function, product design and development. CO2**: Evaluate** sale forecasting, machine utilisation and flow balancing, production scheduling of single and multi product. CO3: **Create** Deterministic and Stochastic ordering system. CO4: **Understanding** and **applying** Quality control, plant layout, PERT & CPM.

Department	Mechanical Engineering
Course Code	MME104D
Title of Course	Conduction and Radiation Heat Transfer
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	L + T= 4+0

Total Contact Hours	48
Course Out Come	**CO1:** Derivation of heat conduction equation **CO2:** Transient heat conduction **CO3:** Fundamentals of thermal radiation

Department	Mechanical Engineering
Course Code	MME 191
Title of Course	Advanced Manufacturing Lab
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	4P
Course Outcomes	CO1: **Understand** geometry of Robot manipulator CO2: **Demonstrate** various axes movement of vertically articulated robot arm CO3: **Demonstrate** various axes movement & operation of CNC Lathe Trainer CO4: **Perform** Part Programming on CNC Lathe for Multi Stepped Shaft & Single Stepped Shaft with Round End. CO5: **Demonstrate** various axes movement & operation of CNC Mill Trainer CO6: **Apply** Part Programming on CNC Milling for Single Slot, Curve Slot and Square Loop.

Department	Mechanical
Course Code	MME 192
Title of The Course	Material Testing Laboratory
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	4 P
Total Contact Hours	44 P
Course Outcomes	CO1: To **Examine** the defects (crack) on given samples by suitable non destructive test like DP test, MP test etc.

	CO2: To **Examine** & **Analyze** the microstructure of prepared metallographic samples. CO3: To **find** out Ericson Index of a sheet metal by Deep Drawing Test CO4: To **Determine** toughness to judge the shock absorbing ability of given samples using Impact test CO5: To **Evaluate** fatigue limit of cylindrical specimen using fatigue testing machine.

Department	Mechanical Engineering
Course Code	MME 181
Title of Course	Seminar-I
Nature of Course	Compulsory
Type of Course	SESSIONAL
Contact Hours	2P
Total Contact Hours	24
Course Outcomes	CO1: **Develop** interest towards research oriented field with ability to search the literature and brief report preparation. CO2: **Develop** the skills, competencies and points of view needed by Engineering professionals CO3: **Discuss** and critically think about topics of current intellectual importance. CO4: **Improve** interpersonal & communication skills and awareness about the industrial environment. CO5: **Improve** in logical and rational interaction.

Department	Mechanical Engineering
Course Code	MME 201
Title of Course	Advanced Machine Design
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	4L
Total Contact Hours	48
Course Out Come	**CO1: Understanding** hydrodynamic lubrication of sliders and bearings **evaluate** long and short bearings, pressure distribution, oil film thickness, load

	carrying capacity, friction and heating of journal bearings. **CO2: Demonstrate** torsion of noncircular shafts, press fitted assemblies and rotating discs. **CO3**: **Understanding** and **Analysing** fatigue strength, fluctuating loads, cumulative fatigue damage. **CO4**: **Evaluating** dynamic loads on gears, contact stress.

Department	Mechanical Engineering
Course Code	MME 202
Title of The Course	Production & Operation Management
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	4 L
Total Contact Hours	48
Course Outcomes	CO1: ***knowledge*** about production and operations management key terminologies frequently used in industries. (Remembering) CO2: **understand** the nature of quality, and quality control, operating techniques and Capacity planning, MRP II, Work measurement, facility layout and assembly line balancing, multiple criteria decision making methods, Line of Balance (LOB), Markov model. (Understanding) CO3: ***apply*** HR in operation management- manpower planning, training & development, health, safety, welfare, remuneration & Incentive scheme. (Applying) CO4: ***analyze*** forecasting models and critically look into inventory management system**,** Material requirement planning, planning for production and operation scheduling. CO5: **evaluate** different statistical quality control tools for assessing quality control in industrial production systems. (Evaluating) CO6: ***design*** and *implement* quality control system in industrial production and operations system. (Designing)

Department	Mechanical Engineering
Course Code	MME- 203A
Title of The Course	Professional Elective (Design of material handling equipment)
Nature of Course	Elective [2015-16 (7); 2016-17(1); 2017-18(8); 2018-19(9); 2019-20(4)]
Type of Course	Lecture
Contact Hours	4 L

Total Contact Hours	40
Course Outcomes	CO1: Can **classify** materials based on lump size, abrasiveness, flowability, chemical reactivity etc. CO2:Ability to **design** and **select** the Bulk material handling conveying equipments such as Belt conveyor, Appron conveyor, Scrapper and screw conveyor, Pneumatic conveyor. CO3: Ability to **design** and **select** the equipments of Roller chain conveyor, Bucket elevator. Vibratory conveyor. CO4: Can **classify** the lifting equipment based on their duty condition CO5: Ability to understand the application of the hand operated Lifting equipments and can **apply** them in the appropriate areas. CO6: Ability to **design** and **selec**t the equipment of EOT cranes.

Department	Mechanical Engineering
Course Code	MME- 203B
Title of The Course	Theory of Elasticity and Plasticity
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	4 L
Total Contact Hours	40
Course Outcomes	CO1: Stresses and strains, Equations of equilibrium and compatibility. Plane stress and plain stress problems in rectangular and polar coordinates. CO2: Thick walled cylinders and curved bars Stress concentrations. Torsion of prismatic bars and thin members, Membrane and other analogies. CO3: Principle of virtual work, Castigliano's theorem, Reciprocal theorem, Energy methods. Introduction to plasticity, yield criterions. CO4: Plastic analysis of beams, cylinders and shells Rotating disk Unsymmetric bending.

Department	Mechanical Engineering
Course Code	MME- 203C
Title of The Course	Design and performance of Machine Tools
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	4 L
Total Contact Hours	40

Course Outcomes	CO1: Machine Tools Drives: Layout and Design of Speed and Feed Gear boxes, Stepless speed variation. Machine tool guides beds and columns. CO2: Hydrostatic and hydrodynamic lubrication Design of lead screws, recirculating ball. CO3: Ability to **design** and **select** the equipments of Roller chain conveyor, Bucket elevator. Vibratory conveyor. CO4: Control of machine tools: Hydraulic and Electrical controls, Numerical control Static and dynamic acceptance tests, Built in inspection units.

Department	Mechanical Engineering
Course Code	MME 203D
Title of Course	Advanced Welding Technology
Nature of Course	Elective
Type of Course	Theory
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1: To study of Cold welding, Resistance welding & Friction welding CO2: To study of TIG welding, MIG welding, Submerged arc welding, Electro-slag welding, Plasma welding and cutting & Electron beam welding, Thermit welding, Underwater welding CO3: To study of Welding electrodes & Residual stresses and distortion in welding CO4: To study of Metallurgy of welding, Weldability & Welding defects.

Department	Mechanical Engineering
Course Code	MME 204A
Title of Course	Advanced Robotics
Nature of Course	Elective [2015-16 (7); 2016-17(1); 2017-18(8); 2018-19(9); 2019-20(4)]
Type of Course	Theory

Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1: Demonstrate Robotic Anatomy and Illustrating industrial applications of Robots. CO2: Analyse Kinematics of Robotic manipulators and actuators. CO3: Design Planning of manipulator trajectories using polynomials (upto 5^{th} order) CO4: Demonstrate Robotic Sensors (tactile & non-tactile) and Robotic End Effectors. CO5: Comprehend offline & online Robot Programming and write program blocks using VAL-II for pick-and-place movements. CO6: Analyze economics of robotics based on payback period & rate of return on investment.

Department	Mechanical Engineering
Course Code	MME 204B
Title of Course	Engineering Fracture Mechanics
Nature of Course	Elective
Type of Course	Theory
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1: Brief review: Strength, stiffness and toughness properties of materials, principles of elasticity and plasticity, stress concentration. CO2: Different modes of crack opening, Stresses and displacement around the stationary crack under static load CO3: To know Effects of small-scale yielding, thickness and plastic energy dissipation.and propagation of crack and its stability. CO4: Brief introduction to analytical and numerical methods in fracture mechanics.

Department	Mechanical Engineering

Course Code	MME 204C
Title of Course	Finite Element Methods in Engineering
Nature of Course	Elective
Type of Course	Theory
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1: To know fundamental Concept: Historical background – Matrix approach – Application to the continuum – Discretisation – Matrix algebra – Gaussian elimination – Governing equations for continuum CO2: Analyse 1-d and 2-d Problems: 1-d structural problems CO3: To know Isoparametric element CO4: Introduction to Non-linearity,

Department	Mechanical Engineering
Course Code	MME 204D
Title of Course	Composite Material & Structure
Nature of Course	Elective
Type of Course	Theory
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1: Introduction: Definition, Characteristics and classification, application of composite materials CO2: To know Micromechanicalbehaviour and macro-mechanical behaviour of a lamina & Elastic moduli and Poisson's ratios of an unidirectional composite lamina CO3: Analyze the Principles of anisotropic elasticity CO4: Theories of laminated composite and failure analysis

Department	Mechanical Engineering

Course Code	MME 205A
Title of Course	Advance metrology
Nature of Course	Elective [2015-16 (7); 2016-17(1); 2017-18(8); 2018-19(9); 2019-20(4)]
Type of Course	Theory
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1- **Apply** knowledge of various tools and techniques used to determine geometry and dimensions of components in engineering applications and used quality tools to produce quality product CO2- **Apply** knowledge of Inspection of spur gear and thread elements. CO3- **Develop** the ability to design of part, tolerances and fits. CO4- **Understand** principles of measuring instruments and gauges and their uses. CO5- **Develop** the ability for evaluation and inspection of surface roughness. CO6 - **Apply** knowledge of Inspection of Engineering parts with various precision instruments.

Department	Mechanical Engineering
Course Code	MME 205B
Title of Course	Value & Ethics in Industrial management
Nature of Course	Elective
Type of Course	Theory
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1- To know Value and ethics in engineering profession CO2- Knowledge of Appropriate technology movement of E.F. Schumacher CO3- Business and social responsibility CO4- The students will learn ethical management in Indian Industry

Department	Mechanical Engineering
Course Code	MME 205C
Title of Course	Statistical Process Control
Nature of Course	Elective
Type of Course	Theory
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1- To know History of statistical process control CO2- Knowledge of different types of control charts, CO3- Introduction to process capability. CO4- Introduction to Acceptance sampling

Department	Mechanical Engineering
Course Code	MME 205D
Title of Course	Engineering System & Control
Nature of Course	Elective
Type of Course	Theory
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1- System concepts and models.

	CO2- Knowledge of Open and closed loop control systems, Block diagrams, Transfer functions. CO3- Transient and steady state responses, Modifying error signals. CO4- The students will learn principles of Stability

Department	Mechanical Engineering
Course Code	MME 291
Title of The Course	Advanced Machine Design Lab.
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	4P
Total Contact Hours	48
Course Outcomes	CO1: **Applying** software like CATIA/PRO E design analysis of mechanical components CO2: **Applying** code/hand book design mechanical components. CO3: **Applying** manufacturers catalogue selection of mechanical components.

Department	Mechanical Engineering
Course Code	MME 281
Title of Course	Seminar-II
Nature of Course	Compulsory
Type of Course	SESSIONAL
Contact Hours	2P
Total Contact Hours	24

Course Outcomes	CO1: **Develop** interest towards research oriented field with ability to search the literature and brief report preparation. CO2: **Develop** the skills, competencies and points of view needed by Engineering professionals CO3: **Discuss** and critically think about topics of current intellectual importance. CO4: **Improve** interpersonal & communication skills and awareness about the industrial environment. CO5: **Improve** in logical and rational interaction.

Department	Mechanical Engineering
Course Code	MME 381
Title of Course	Project & Thesis (Phase-I)
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	
Total Contact Hours	
Course Outcomes	CO1: Select topic of the project & Generating its objectives CO2: Practice finding relevant course material on the Internet and non-electronic sources CO3: Prepare work plan and Preliminary report CO4: Prepare presentation and explaining it to the audience

Department	Mechanical Engineering
Course Code	MME 382

Title of Course	Seminar & Viva-Voce
Nature of Course	Compulsory
Type of Course	SESSIONAL
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1: **Develop** interest towards research oriented field with ability to search the literature and brief report preparation. CO2: **Develop** the skills, competencies and points of view needed by Engineering professionals CO3: **Discuss** and critically think about topics of current intellectual importance. CO4: **Improve** interpersonal & communication skills and awareness about the industrial environment. CO5: **Improve** in logical and rational interaction.

Department	Mechanical Engineering
Course Code	MME 481
Title of Course	Project & Thesis (Phase-II)
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	
Total Contact Hours	
Course Outcomes	CO1: Select topic of the project & Generating its objectives CO2: Practice finding relevant course material on the Internet and non-electronic sources CO3: Prepare work plan and Preliminary report CO4: Prepare presentation and explaining it to the audience

Department	Mechanical Engineering

Course Code	MME 482
Title of Course	Seminar & Viva-Voce
Nature of Course	Compulsory
Type of Course	SESSIONAL
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1: **Develop** interest towards research oriented field with ability to search the literature and brief report preparation. CO2: **Develop** the skills, competencies and points of view needed by Engineering professionals CO3: **Discuss** and critically think about topics of current intellectual importance. CO4: **Improve** interpersonal & communication skills and awareness about the industrial environment. CO5: **Improve** in logical and rational interaction.