BACHELOR OF TECHNOLOGY (MECHANICAL ENGINEERING) CREDIT BASED
KURUKSHETRA UNIVERSITY KURUKSHETRA
SCHEME OF STUDIES/EXAMINATION
SEMESTER III (w.e.f. session 2019-2020)

S. No.	Course No.	Course Name	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hrs.)
						Major Test	Minor Test	Practical	Total	
1	BS-201	Optics & Waves	3:0:0	3	3	75	25	0	100	3
2	BS-204	Higher Engineering Mathematics	3:0:0	3	3	75	25	0	100	3
3	ES-203	Basic Electronics Engineering	3:0:0	3	3	75	25	0	100	3
4	MEC-201	Theory of Machines	3:1:0	4	4	75	25	0	100	3
5	MEC-203	Mechanics of Solids-I	3:1:0	4	4	75	25	0	100	3
6	MEC-205	Thermodynamics	3:1:0	4	4	75	25	0	100	3
7	MEC-207L	Theory of Machines Lab	0:0:2	2	1	0	40	60	100	3
8	MEC-209L	Mechanics of Solids Lab	0:0:2	2	1	0	40	60	100	3
9	*MEC-211	Industrial Training-I	2:0:0	2	-	-	100	-	100	
10	**MC-901	Environmental Sciences	3:0:0	3	-	75	25	0	100	3
		Total		**30**	**23**	**450**	**230**	**120**	**800**	

*MEC-211 is a mandatory non-credit course in which the students will be evaluated for the industrial training undergone after 2nd semester and students will be required to get passing marks to qualify.

**MC-901 is a mandatory credit-less course in which the students will be required to get passing marks in the major test.

Note: Detailed syllabus for 3rd Semester is yet to be provided by the Kurukshetra university.

Bachelor of Technology (Mechanical Engineering)Kurukshetra University, Kurukshetra

SCHEME OF STUDIES/EXAMINATIONS(w.e.f. 2015-16 onwards)

Semester – V

S. No.	*Course No.*	*Course Title*	*Teaching Schedule*				*Allotment of Marks*				*Duration of Exam (Hrs.)*
			L	*T*	*P*	*Hours/ Week*	*Theory*	*Sessional*	*Practical*	*Total*	
1	*ME-301N*	*I.C. Engine & Gas Turbine*	*3*	*1*	*0*	*4*	*75*	*25*	*0*	*100*	*3*
2	*ME-303N*	*Fluid Machines*	*3*	*1*	*0*	*4*	*75*	*25*	*0*	*100*	*3*
3	*ME-305N*	*Heat Transfer*	*3*	*1*	*0*	*4*	*75*	*25*	*0*	*100*	*3*
4	*ME-307N*	*Industrial Engineering*	*3*	*1*	*0*	*4*	*75*	*25*	*0*	*100*	*3*
5	*ME-309N*	*Machine Design-I*	*2*	*4*	*0*	*6*	*75*	*25*	*0*	*100*	*3*
6	*ME-311N*	*Production Technology-II*	*4*	*0*	*0*	*4*	*75*	*25*	*0*	*100*	*3*
7	*ME-313N*	*I.C. Engine Lab*	*0*	*0*	*2*	*2*	*0*	*40*	*60*	*100*	*3*
8	*ME-315N*	*Fluid Machines Lab*	*0*	*0*	*2*	*2*	*0*	*40*	*60*	*100*	*3*
9	*ME-317N*	*Heat Transfer Lab*	*0*	*0*	*2*	*2*	*0*	*40*	*60*	*100*	*3*
10	*ME-319N*	*Industrial Training (Viva-Voce)**	*2*	*0*	*0*	*2*	*0*	*40*	*60*	*100*	*3*
		Total	*20*	*8*	*6*	*34*	*450*	*310*	*240*	*1000*	

ICGT			
Lecture No.	**Topics to be Covered**	**References**	**Remarks**
1	Heat engines; Internal and external combustion engines;		
2	Classification of I.C		
3	Cycle of operations in four strokes and two-stroke IC engines;		
4	Wankle Engine.		
5	Air standard cycles: Assumptions made in air standard cycles;		
6	Otto cycle; Diesel cycle; Dual combustion cycle;		
7	Comparison of Otto, diesel and dual combustion cycles;		
8	Sterling and Ericsson cycles; Air standard efficiency,		
9	Specific work output. Specific weight; Work ratio;		
10	Mean effective pressure; Deviation of actual engine cycle from ideal cycle.		
CHAPTER 2			
11	Mixture requirements for various operating conditions in S.I. Engines;		
12	Elementary carburetor, Calculation of fuel air ratio; The complete carburetor;		
13	Requirements of a diesel injection system; Type of injection system; Petrol injection;		
14	Requirements of ignition system; Types of ignition systems, ignition timing; Spark plugs		
15	S.I. engines; Ignition limits; Stages of combustion in S. I. Engines; Ignition lag;		
16	Velocity of flame propagation; Detonation; Effects of engine variables on detonation;		

17	Theories of detonation; Octane rating of fuels; Pre-ignition;		
18	; S.I. engine combustion chambers. Stages of combustion in C.I. Engines		
19	; Delay period; Variables affecting delay period;		
20	Knock in C.I. Engines; Cetane rating; C.I. Engine combustion chambers.		
CHAPTER 3			
21	Functions of a lubricating system, Types of lubrication system; Mist,		
22	Wet sump and dry sump systems; Properties of lubricating oil; SAE rating of lubricants;		
23	; Engine performance and lubrication; Necessity of engine cooling;		
24	Disadvantages of overcooling; Cooling systems; Air-cooling, Water-cooling;		
25	Performance parameters; BHP, IHP, Mechanical efficiency;		
26	Volumetric efficiency; Specific fuel consumption (BSFG, ISFC); Thermal efficiency		
27	Heat balance; Basic engine measurements; Fuel and air consumption, Brake power, I		
28	Indicated power and friction power, Heat lost to coolant and exhaust gases; Performance curves;		
29	Pollutants from S.I. and C.I. Engines; Methods of emission control,		
30	Alternative fuels for I.C. Engines; The current scenario on the pollution front.		
	CHAPTER 4		
31	Working of a single stage reciprocating air compressor;		
32	Calculation of work input; Volumetric efficiency;		
33	Isothermal efficiency; Advantages of multi stage		
34	Two stage compressor with inter-cooling; Perfect inter cooling;		

35	Optimum intercooler pressure; Rotary air compressors and their applications; Isentropic efficiency.		
36	Brayton cycle; Components of a gas turbine plant;		
37	Open and closed types of gas turbine plants; Optimum pressure ratio; I		
38	Improvements of the basic gas turbine cycle; Multi stage compression with inter-cooling;		
39	Multi stage expansion with reheating between stages;		
40	Exhaust gas heat exchanger; Application of gas turbines		

FM

Lecture No.	Topics to be Covered	References	Remarks
1	Impact of water jet: On Stationary		
2	Moving Flat &Curved Plates		
3	On Series of vanes Flat & Radial;		
4	On Series of vanes Flat & Radial;		
5	Ship Propulsion by Jets; Numericals.		
6	DIMENSIONAL ANALYSIS:		
7	Units and dimensions; Dimensional homogeneity;		
8	Dimensional analysis: Rayleigh Method & Buckingham’s Pi-Theorem;		
9	Applications & limitations of dimensional analysis;		
10	Dimensionless numbers; Similitude laws; Numericals.		

CHAPTER 2			
11	: Classification of Hydraulic Machines; Hydropower plant& its Components; Surge tank and its type;		
12	Classification of turbines; Effective head, available power & Efficiencies.		
13	PELTON TURBINE: Components; Work done & efficiency; Design: Number & Dimensions of Buckets, Speed ratio, Jet ratio, Run-away speed,		
14	jet velocity, mean wheel diameter, number of jets, maximum efficiency; Governing; Numericals.		
15	FRANCIS TURBINE: Components; Work done & efficiency; Design: Runner,		
16	Width-Diameter ratio, Speed ratio, Flow ratio; Outward vs. Inward flow reaction turbines; Governing; Numericals.		
17	AXIAL FLOW TURBINES: Propeller Turbine; Kaplan turbine; Components,		
18	Work done Power & Efficiency, Governing; Draft Tube: Efficiency &Types; Numericals.		
19	DESIGN & OPERATIONAL PARAMETERS: Model testing of turbines;		
20	Specific Speed; Unit quantities; Performance Characteristic curves.		
CHAPTER 3			
21	Introduction; Components; Various Heads; Euler's head and its variation with vane shapes;		
22	Euler's head and its variation with vane shapes;		
23	Effect of finite number of vanes		
24	vanes; Losses & efficiencies; Minimum starting speed; Limitation of suction lift;		
25	Net Positive Suction Head (NPSH); Priming; Cavitation and its effects,		
26	Cavitation parameters, Detection and Prevention of Cavitation; Multistage pumps; Specific speed and Performance; Numericals.		
27	RECIPROCATING PUMPS: Introduction;		

28	Working principles; Classification; Components; Discharge Coefficient & slip; Work &Power input		
29	Indicator diagram; Effect of Friction, Acceleration and Pipe friction;		
30	Maximum speed; Air vessels; Comparison with centrifugal pumps; Model testing of pumps; Numericals.		
	CHAPTER 4		
31	Propeller pump; Jet pump;		
32	Airlift pump; Gear pump;		
33	Screw pump;		
34	Vane pump; Radial piston pump;		
35	Submersible pump; Pump problems.		
36	Submersible pump; Pump problems.		
37	Hydraulic accumulators; Hydraulic intensifier; Hydraulic lift;		
38	Hydraulic crane; Hydraulic coupling;		
39	Torque converter; Hydraulic ram.		
40	Torque converter; Hydraulic ram.		

HT

Lecture No.	**Topics to be Covered**	**References**	**Remarks**
1	definition of heat, modes of heat transfer;		
2	basic laws of heat transfer,		

3	application of heat transfer, simple problems.		
4	Fourier equation, electrical analogy of heat conduction; thermal conductivity		
5	the general conduction equation in cartesian, cylindrical and spherical coordinates,		
6	steady one dimensional heat conduction without internal heat generation: conduction through plane and composite wall,		
7	steady one dimensional heat conduction without internal heat generation: conduction through plane and composite wall,		
8	the cylindrical shell; the spherical shell; critical thickness of insulation; variable thermal conductivity,		
9	steady one dimensional heat conduction with uniform internal heat generation: the plane slab; cylindrical and spherical systems,		
10	unsteady heat conduction: lumped parameter analysis, introduction to Heisler charts.		
CHAPTER 2			
11	Newton's law of cooling, convective heat transfer coefficient, Nusselt number, convection boundary layers: Introduction of velocity and thermal boundary		
12	local and average convection coefficient, functional form of the solution of boundary layer equations,		
13	Physical significance of the dimensionless parameters, Reynolds analogy, External Forced Convection: Introduction to empirical method of solution,		
14	parameters, Reynolds analogy, External Forced Convection: Introduction to empirical method of solution,		
15	flow over a flat plate with both conditions of constant heat flux and constant temperature, cylinder in cross flow, flow over a sphere, al and inclined plates,		
16	Internal Forced Convection: Introduction to velocity profile, pressure gradient and friction factor in fully developed flow,		

17	mean temperature, energy balance considering constant surface heat flux and for constant surface temperature,		
18	convection correlations for laminar flow in circular tubes both in entry region and in the fully developed region,		
19	Natural convection: Physical considerations, governing equations (without derivations), functional form of the solution of governing equations,		
20	empirical correlations for external free convection flow over the vertical plate, horizontal and inclined plates, horizontal cylinder and sphere.		
CHAPTER 3			
21	fundamental concepts, absorption,		
22	reflection and transmission, black body concept,		
23	monochromatic and total emissive power,		
24	Planck's distribution law, Stefan Boltzman law,		
25	Wien's displacement law, Kirchoff's law,		
26	intensity of radiation, Lambert's cosine law,		
27	heat transfer between black surfaces, radiation shape factor,		
28	heat transfer between non-black surfaces: infinite parallel planes, infinite long concentric cylinders		
29	small gray bodies and small body in large enclosure,		
30	electrical network approach, radiation shields.		
	CHAPTER 4		
31	: governing equation for fins of uniform cross section,		
32	temperature distribution and heat dissipation rate in infinitely long fin, fin insulated at tip		
33	temperature distribution and heat dissipation rate in infinitely long fin, fin insulated at tip		

34	fin insulated at tip, fin losing heat at tip;		
35	fin insulated at tip, fin losing heat at tip;		
36	efficiency and effectiveness of fins.		
37	classification of heat exchangers; overall heat transfer coefficient,		
38	logarithmic mean temperature difference,		
39	effectiveness of heat exchangers		
40	NTU method of heat exchanger design, applications of heat exchangers.		

IE

Lecture No.	Topics to be Covered	References	Remarks
1	Method study;		
2	Basic procedure,		
3	Recording techniques (Charts and diagrams);		
4	Elemental breakdown;		
5	Micro-motion studies; Therbligs; SIMO-		
6	chart principles of motion- economy. Introduction;		
7	Objectives; techniques (time) information recording; methods of things		
8	Time study allowances; work sampling technique,		
9	Performances rat ing and its determinant ion technique,		

10	Performance rating and its determination PMTS; M.T.M., Work factor.		
CHAPTER 2			
11	Principle of organization; Importance		
12	characteristics of organization		
13	Organization theories; Classical Organization theory;		
14	; Neo-Classical organization theory,		
15	modern organization theory; Types of organization		
16	Military or line organization, Functional organization,		
17	line and staff organization, Committee objectives of PPC;		
18	Functions of PPC Preplanning and planning; Routing		
19	Estimating; scheduling; master schedule;		
20	Daily schedule; Gantt chart; Dispatching;		
CHAPTER 3			
21	Introduction, Objectives and importance of sales forecasting,		
22	Types of forecasting,		
23	Methods of sales forecasting,		
24	Collective opinion method, Delphi technique,		
25	economic indicator method; Regression analysis,		
26	introduction, Functions of inventory;		

27	Types of inventory;		
28	Control importance functions, Inventory costs		
29	factors affecting inventory control, Various inventory controls models		
30	A.B.C. analysis, lead-time calculations		
	CHAPTER 4		
31	Introduction, Objective;		
32	Concept and life cycle of a product and V.E.; Steps in V.E		
33	Methodology and techniques, Fast diagram, Matrix method.		
34	Various concepts in industrial engineering.		
35	a) WAGES AND INCENTIVES ; Concept ; Types, plans,		
36	Desirable characteristics.		
37	b) SUPPLY CHAIN MANAGEMENT; Its Definition, Concept, Objectives, Applications,		
38	Benefits, some successful cases in Indian Industries.		
39	c) JIT; Its definition, concept, importance, misconception, relevance, Applications, Elements of JIT (brief description)		
40	d) TIME MANAGEMENT; Introduction, steps of time man agreement, Ways for saving		
	MD		
Lecture No.	**Topics to be Covered**	**References**	**Remarks**

1	Design concepts, overall design considerations, codes and standards,		
2	methodology for solving machine component problems.		
3	Engineering materials: properties, ferrous metals, non-ferrous metals		
4	plastics and composite materials,		
5	BIS system of designation of steels, selection of engineering materials.		
6	esign against static load: Modes of failure, factor of safety, stress concentration:		
7	causes and mitigation, Design against fluctuating load		
8	Fluctuating stresses, endurance limit, low cycle and high cycle fatigue,		
9	notch sensitivity, endurance limit-approximate estimation, reversed stresses- design for finite and infinite life,		
10	cumulative damage in fatigue, Soderberg and Goodman Lines, Modified Goodman Diagrams.		
CHAPTER 2			
11	Basic types of screw fastening, Bolts of uniform strength, locking devices,		
12	terminology of screw threads,		
13	ISO metric screw threads,		
14	materials and manufacture,		
15	design of bolted joints, bolted joints with eccentric loads.		
16	Cotter and Knuckle Joints: design of cotter and knuckle joints.		
17	Riveted and Welded Joints:		
18	Riveted joints for boiler shell according to I. B. R., riveted structural joint,		

19	eccentrically loaded riveted joint, types of welded joints,		
20	strength of welds under axial load, welds under eccentric loading.		
CHAPTER 3			
21	Shaft design on strength basis and torsional rigidity basis,		
22	ASME code for shaft design,		
23	ASME code for shaft design,		
24	design of hollow shaft on strength basis and torsional rigidity basis.		
25	Keys		
26	Design of square and flat keys.		
27	Levers: Hand and foot levers,		
28	cranked lever, lever for a lever safety valve,		
29	Bell crank lever.		
30	Miscellaneous levers.		
	CHAPTER 4		
31	Types of shaft couplings,		
32	design of sleeve		
33	muff coupling		
34	clamp coupling,		
35	rigid flange couplings		
36	bushed-pin flexible couplings		

37	Curved Beams:		
38	Design of crane hook. Pipe Joints		
39	Design of circular		
40	oval shaped and square flanged pipe joints		
	PT-II		
Lecture No.	**Topics to be Covered**	**References**	**Remarks**
1	Power sources used in Machine tools, estimation of power requirement for machine tool Drives,		
2	hydraulic drives in machine tools,		
3	Role and general constituents of the Kinematics Structure of machine tools,		
4	different forms of machine tool kinematic structure, mechanism.		
5	Commonly used in machine tool kinematic systems, method of changing speed feed in machine Tools,		
6	need of large no of speeds and feed in machine tools,		
7	method of changing speed and feed in machine tools.		
8	Design of speed gearbox of machine tool, procedural steps in design of SGB,		
9	Layout of spindle speed in machine tools, selection of gear layout and ray-diagram for speed gearbox,		
10	determination of dimensions of the gears and shafts of speed gear box.		
CHAPTER 2			

11	Thread casting, thread chasing,		
12	thread rolling, die-threading and tapping,		
13	thread milling, thread grinding		
14	thread measurement and inspection.		
15	Introduction, Classification of gear production method,		
16	Gear generation processes: gear hobbing,		
17	gear shaping, rack planning.		
18	Gear finishing methods: shaving,		
19	roll finishing, burnishing,		
20	grinding, lapping, honing.		
CHAPTER 3			
21	Introduction, Need for unconventional processes, Classification of unconventional machining processes,		
22	process selection, Abrasive jet machining (AJM),		
23	Water jet machining(WJM), Ultrasonic machining(USM)		
24	chemical machining (CHM), Electrochemical machining (ECM), Electric discharge machining (EDM), Wire cut EDM,		
25	laser beam machining(LBM), Electron beam machining (EBM); their process parameters,		
26	Principle of metal removal , applications, advantages and limitations.		
27	Introduction, effects of vibration on machine tools,		
28	source of vibration, types of machine tool vibrations:		
29	self-excited vibration (chatter), causes of self-excited vibration, chatter prediction,		

30	avoidance of chatter and vibration on existing machine tools and on proposed machine tools, vibration control and isolation.		
	CHAPTER 4		
31	Introduction to Jig and fixtures,		
32	locating and clamping,		
33	design principles common to jig and fixtures		
34	types of jig and fixtures,		
35	indexing jig and fixtures		
36	automated jigs and fixtures.		
37	Fundamentals jig and fixture design,		
38	jig and fixture construction		
39	materials for jig and fixtures,		
40	tolerance and error analysis, analysis of clamping forces.		

SCHEME OF STUDIES/EXAMINATIONS(w.e.f. 2015-16 onwards)

Semester – VII

S. No.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs.)
			L	T	P	Hours/ Week	Theory	Sessional	Practical	Total	
1	ME-401N	Measurement and Control	4	0	0	4	75	25	0	100	3
2	ME-403N	Mechatronics	4	0	0	4	75	25	0	100	3
3	HS-401N	Entrepreneurship	3	0	0	3	75	25	0	100	3
4		DEC – I*	4	0	0	4	75	25	0	100	3
5		DEC –II*	3	0	0	3	75	25	0	100	3
6	ME-405N	Measurement and Control Lab	0	0	2	2	0	40	60	100	3
7	ME-407N	Mechatronics Lab	0	0	2	2	0	40	60	100	3
8	ME-409N	Project-I**	0	0	8	8	0	100	100	200	3
9	ME-411N	Industrial Training (Viva-Voce)***	2	0	0	2	0	40	60	100	3
10	ME-413N	Seminar-I	0	2	0	2		100	0	100	
		Total	20	2	12	34	375	445	280	1100	

M&C			
Lecture No.	Topics to be Covered	References	Remarks

1	Definition, application of measurement instrumentation,		
2	functional elements of a generalized measuring system,		
3	measuring standards, types of measurement,		
4	types of input to measuring instruments and instrument system, classification of measuring instruments,		
5	merits and demerits of mechanical measuring systems,		
6	comparison of mechanical measuring system with electrical measuring systems, calibration.		
7	Introduction, types of error, types of uncertainties,		
8	propagation of uncertainties in compound quantity, Static performance parameters: accuracy, precision, resolution		
9	static sensitivity, linearity, hysteresis, dead band, backlash, and drift, sources of error		
10	selection of measuring instruments, mechanical and electrical loading		
CHAPTER 2			
11	Introduction, relative motion, measuring devices, electromechanical,		
12	optical, photo electric, Moore-Fringe, pneumatic,		
13	absolute motion devices, seismic devices, spring mass & force balance type		
14	calibration, hydraulic load cell, pneumatic load cell, elastic force devices,		
15	separation of force components, electro mechanical methods, torque transducer, torque meter.		
16	Measurement of Strain and Vibrations:		
17	Type of strain gauges and their working, strain gauge circuits, Mcleod gauge		
18	Pirani gauge, temperature compensation, strain rosettes, analysis of strains.		

19	Vibration and noise measurement: Seismic instruments,		
20	vibration pick-ups and decibel meters		
	CHAPTER 3		
21	Moderate pressure measurement, monometers, elastic transducer, dynamic effects of connecting tubing,		
22	high pressure transducer, low pressure measurement, calibration and testing, quantity meters		
23	positive displacement meters, flow rate meters, variable head Meters, variable area meters		
24	rotameters, pitot-static tube meter, drag force flow meter, turbine flow meter,		
25	electronic flow meter, electro-magnetic flow meter, hot-wire anemometer.		
26	Temperature Measurement: Introduction,		
27	measurement of temperature, non-electrical methods – solid rod thermomete		
28	bimetallic thermometer, liquid in- glass thermometer, pressure thermometer, electrical methods		
29	electrical resistance thermometers, semiconductor resistance sensors (thermistors), thermo-electric sensors, thermocouple materials,		
30	radiation methods (pyrometry), total radiation pyrometer, selective radiation pyromete		
	CHAPTER 4		
31	Introduction,		
32	classification of control systems,		
33	control system terminology,		
34	servomechanism,		
35	process control and regulators,		

36	manual and automatic control systems,		
37	physical systems and mathematical models		
38	linear control systems, Laplace transform,		
39	transfer function,		
40	block diagram, signal flow graphs.		

MECHATRONICS

Lecture No.	Topics to be Covered	References	Remarks
1	Evolution, Scope, Measurement Systems,		
2	Control Systems,		
3	open and close loop systems, .		
4	sequential controllers		
5	microprocessor based controllers,		
6	mechatronics approach.		
7	Basics of Digital Technology: Number System,		
8	Boolean algebra,		
9	Logic Functions, Karnaugh Maps,		
10	Timing Diagrams, Flip-Flops, Applications		

CHAPTER 2

11	Introduction, performance terminology.		
12	-Displacement,		
13	Position and Proximity,		
14	Velocity and motion, force,		
15	Fluid Pressure		
16	Temperature Sensors-Light Sensors		
17	Selection of Sensors-Signal Processing.		
18	Pneumatic and Hydraulic actuation systems: actuation systems		
19	Pneumatic and hydraulic systems, directional control valves		
20	pressure control valves, cylinders, process control valves, rotary actuators.		
CHAPTER 3			
21	Mechanical systems, types of motion,		
22	kinematics chains, cams, gear trains,		
23	ratchet and pawl, belt and chain drives,		
24	bearings, mechanical aspects of motor selection.		
25	Microprocessor: Introduction		
26	Architecture, Pin Configuration, Instruction set,		
27	Programming of Microprocessors using 8085 instructions		
28	Interfacing input and output devices		
29	-Interfacing D/A converters and A/D converters, Applications,		

30	Temperature control, Stepper motor control, Traffic light controller.		
	CHAPTER 4		
31	Introduction, Basic structure,		
32	Input/output Processing,		
33	Programming, Mnemonics		
34	Timers, Internal relays and counters, Data handling,		
35	Analog Input/Output, Selection of a PLC.		
36	Analog Input/Output, Selection of a PLC.		
37	Robotics: Introduction,types ,		
38	Robot drive systems Robot end effectors,		
39	Robot drive systems Robot end effectors,		
40	selection parameters of a robot, applications		

ENTREPRENEURSHIP

Lecture No.	Topics to be Covered	References	Remarks
1	Concept and Definitions; Entrepreneurship		
2	Economic Development;		
3	Types of Entrepreneurs;		
4	Factor Affecting Entrepreneurial Growth –		

5	Economic, Non-Economic Factors		
6	EDP Programme		
7	Entrepreneurial Training		
8	Traits/Qualities of an Entrepreneurs;		
9	Manager Vs. Entrepreneur,		
10	types of entrepreneurships, Entrepreneurial myths		
CHAPTER 2			
11	Entrepreneurial Opportunity Search		
12	Identification;Criteria to Select a Product		
13	Identification;Criteria to Select a Product		
14	Conducting Feasibility Studies;		
15	Conducting Feasibility Studies;		
16	Sources of business ideas,		
17	launching a new product; export marketing,		
18	Methods of Project Appraisal		
19	Project Report Preparation		
20	Project Planning and Scheduling. Sources of finance for entrepreneurs.		
CHAPTER 3			
21	Definition of Small Scale;		
22	Rationale		

23	Objective;Scope;		
24	SSI; Registration;		
25	NOC from Pollution Board;		
26	Machinery and Equipment Selection		
27	Role of SSI in Economic Development of India;		
28	major problem faced by SSI,MSMEs – Definition and Significance in Indian Economy		
29	MSME Schemes		
30	Challenges and Difficulties in availing MSME Schemes.		
	CHAPTER 4		
31	Director of Industries; DIC;		
32	SIDO;SIDBI;		
33	Small Industries Development Corporation (SIDC);		
34	SISI; NSIC		
35	State Financial Corporation SIC; Venture Capital		
36	Concept, venture capital financing schemes offered by various financial institutions in India		
37	Concept, venture capital financing schemes offered by various financial institutions in India		
38	Legal issues – Forming business entity,		
39	considerations and criteria		
40	requirements for formation of a Private/Public Limited Company		

NCM			
Lecture No.	**Topics to be Covered**	**References**	**Remarks**
1	Introduction		
2	need of Non-conventional machining processes,		
3	Rapid prototyping processes, their classification,		
4	Rapid prototyping processes, their classification,		
5	consideration in process selection.		
6	Ultrasonic Machining: Element of process,		
7	design of cutting tool		
8	metal removal mechanism,		
9	effect of parameters, economic consideration,		
10	limitation and applications, surface finish		
CHAPTER 2			
11	Element of process, process chemistry,		
12	, metal removal mechanism		
13	tool design, accuracy,		
14	surface finish and work material characteristics		
15	economic consideration, advantage		
16	limitation and application, Electrochemical grinding,		

17	debarring and honing, chemical machining.		
18	EDM: Principal and metal removal mechanism, generators		
19	electrode feed control, electrode material, tool electrode tool design		
20	EDM wire cutting, surface finish, accuracy and application		
	CHAPTER 3		
21	Principal		
22	metal removal mechanism of abrasive and water jet machining,		
23	process variables, d		
24	design of nozzle, advantage,		
25	limitation and application.		
26	Plasma arc machining		
27	Electron beam machining, Laser beam machining		
28	their principal of metal removal mechanism		
29	process parameter		
30	advantage and limitations.		
	CHAPTER 4		
31	Fundamentals, process chain, physics of processes, principal and process mechanism of SLA,		
32	FDM, and SLS processes,		
33	their advantage and limitations, application of RP process,		
34	RP data format, STL file format, STL file problems,		

35	STL file repair, others translators and formats.		
36	Rapid Tooling Process: Introduction		
37	fundamentals, classifications, indirect RT processes,		
38	principal of Silicon Rubber Molding, Epoxy Tooling, Spray Metal Tooling,		
39	Pattern for investment casting, Vacuum casting and vacuum forming processes,		
40	direct RT processes, Shape Deposition manufacturing, their advantage, limitations and applications		
	AMT		
Lecture No.	**Topics to be Covered**	**References**	**Remarks**
1	Machining of Plastics, Unit heads, Plastics cooling, electro forming,		
2	Surface Cleaning and Surface Treatments		
3	Surface Coatings, Paint Coating and Slushing,		
4	Adhesive Bonds, Adhesive Bond Joints, Adhesives, Surface Coating for Tooling,		
5	Graphite Mould Coating, Vacuum Mould Process. Introduction, Types of Composites materials,		
6	Agglomerated Materials, Reinforced materials, Laminates		
7	Surface Coated Materials, Production of Composite Structures,		
8	Fabrication of particulate composite Structures,		
9	Fabrication of reinforced Composite, Fabrication of Laminates,		
10	Machining, Cutting and Joining of Composites		

CHAPTER 2			
11	Introduction, Polymerization, Addition of Polymers, Plastics,		
12	Types of plastics,		
13	Properties of Plastics,		
14	Processing of Thermoplastic Plastics,		
15	Plastics, Injection Moulding,		
16	Casting of Plastics, Machining of plastics,		
17	other processing methods of plastics Introduction, casting,		
18	thread chasing, Thread Rolling		
19	Die Threading and Tapping, Thread Milling,		
20	Thread Measurement and Inspection.		
CHAPTER 3			
21	Theoretical basis of metal forming,		
22	classification of metal forming processes,		
23	classification of metal forming processes,		
24	cold forming,		
25	hot working		
26	Warm working,		
27	Effect of variables on metal forming processes		

28	Methods of analysis of manufacturing processes,		
29	Open Die forging,		
30	Rolling Power Rolling, Drawing, Extrusion.		
	CHAPTER 4		
31	Introduction, Product Application, Limitation of Die Casting, Die Casting Machines,		
32	Molten metal Injection systems, lot chamber machines,		
33	Cold chamber machines, Die casting Design, Design of Die casting Dies, T		
34	Types of Die casting Dies, Die design, Die material, Die Manufacture,		
35	Die Lubrication and Coating, Preheating of Dies, Vacuum Die Casting		
36	Recent trends In Die Casting Process. Definition, Cost accounting or costing		
37	Elements of costing, cost structures, Estimation of cost elements, Methods of estimating,		
38	Data requirements of cost estimating, Steps in making cost estimate,		
39	Chief factors in cost estimating, Numerical examples		
40	calculation of machining times, Estimation of total unit time		