

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM**  
**SCHEME OF TEACHING AND EXAMINATION FOR**  
**M.TECH.-MANUFACTURING SCIENCE & ENGINEERING (MSE)**

**III Semester: INTERNSHIP**

**CREDIT BASED**

Course Code	Subject	No. of Hrs./Week		Duration of the Exam in Hours	Marks for		Total Marks	CREDITS
		Lecture	Practical / Field Work		I.A.	Exam		
16MSE31	Seminar / Presentation on Internship (After 8 weeks from the date of commencement)	-	-	-	25	-	25	20
16MSE 32	Report on Internship	-	-	-	25	-	25	
16MSE 33	Evaluation and Viva-voce of Internship	-	-	-	-	50	50	
16MSE34	Evaluation of Project Phase 1				50	-	50	1
	<b>Total</b>	-	-	-	<b>100</b>	<b>50</b>	<b>150</b>	<b>21</b>

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**IV Semester**

**CREDIT BASED**

Subject Code	Subject	No. of Hrs./Week		Duration of Exam in Hours	Marks for		Total Marks	CREDITS
		Lecture	Field Work / Assignment / Tutorials		I.A.	Exam		
16MSE41	Tool Design	4	--	3	50	100	150	4
16MSE42X	Elective-III	4	-	3	50	100	150	4
16MSE43	Evaluation of Project Phase-II	-	-	-	25	-	25	1
16MSE44	Evaluation of Project Work and Viva-voce	-	-	3	-	100+100	200	18
<b>Total</b>		<b>12</b>	<b>07</b>	<b>09</b>	<b>150</b>	<b>400</b>	<b>550</b>	<b>28</b>
<b>Grand Total (I to IV Sem.) : 2400 Marks; 94 Credits</b>								

<b>Elective – III</b>	
<b>Sub. Code</b>	<b>Name of the Subject</b>
16 MSE 421	Industrial Design & Ergonomics
16 MSE 422	Advanced Manufacturing Practices
16 MSE 423	Advanced Fluid Power Systems
16 MSE 424	Project Management

**Note:**

- 1) Project Phase – I : 6 weeks duration shall be carried out between II and III Semesters. Candidates in consultation with the guides shall carryout literature survey / visit to Industries to finalise the topic of dissertation. .
- 2) Project Phase – II : 16 weeks duration during 4 semester. Evaluation shall be done by the committee constituted comprising of HOD as Chairman, Guide and senior faculty of the Department.
- 3) Project Evaluation: Evaluation shall be taken up at the end of 4 semester. Project work and evaluation and Viva Voce examination shall be conducted.
  - a. Internal Examiner shall carry out the evaluation for 100 marks
  - b. External Examiner shall carry out the evaluation for 100 marks.
  - c. The average of marks allotted by the internal and external examiner shall be the final marks of the project evaluation.
  - d. Viva-Voce examination of project work shall be conducted jointly by Internal and External examiner for 100 marks

## IV SEMISTER

### TOOL DESIGN

Subject Code	: 16MSE41	IA Marks	: 20
No. of Lecture	: 04	Exam Hours	: 03
Hours/Week			
Total No. of Lecture	: 50	Exam Marks	: 80
Hours			

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#### MODULE 1

**Tool-design Methods:** Introduction, the design procedure, drafting and design techniques in tooling drawing

**Tool-making Practices:** Introduction, tools of the tool maker, hand finishing and polishing, screws and dowels, hole location, jig-boring practice, installation of drilling bushings, punch and die bushings, punch and die manufacture, EDM, EDM for cavity applications, tracer and duplicating mills for cavity applications, low-melting tool materials.

**Tooling Materials and Heat Treatment:** Introduction, properties of materials, ferrous tooling materials, non-ferrous tooling materials, non-metallic tooling materials, heat treatment and tool design.

#### MODULE 2

**Design of Cutting Tools:** Introduction, the metal cutting process, revision of metal cutting tools-single point cutting tools, milling cutters, drills and drilling, reamers, taps. Selection of carbide tools, determining the insert thickness for carbide tools.

**Design of Tools for Inspection and Gauging:** Introduction, work piece quality criteria, principles of gauging, types of gages and their applications, amplification and magnification of error, gage tolerances, selection of material for gages, indicating gages, automatic gages, gauging positionally tolerance parts, problems.

**Locating and Clamping Methods:** Introduction, basic principle of location, locating methods and devices, basic principle of clamping.

#### MODULE 3

**Design of Drill Jigs:** Introduction, types of drill jigs, general considerations in the design of drill jigs, drill bushings, methods of construction, drill jigs and modern manufacturing.

**Design of Fixtures:** Introduction, types of fixtures, fixtures and economics.

**Design of Press-working Tools:** Power presses, cutting operations, types of die-cutting operations - and their design, evolution of blanking and progressive blanking

#### MODULE 4

**Design of Sheet Metal Bending, Forming and Drawing Dies:** Introduction, bending dies, forming dies, drawing dies. Evolution of a draw die, progressive dies and selection of progressive dies. Strip development for progressive dies, evolution of progressive dies, examples of progressive dies. Extrusion dies, drop forging dies and auxiliary tools, problems.

**Tool Design for Joining Processes:** Introduction, tooling for physical joining processes, tooling for soldering and brazing, tooling for mechanical joining processes, problems.

#### MODULE 5

**Tooling for Casting:** Introduction, tooling for sand casting, shell moulding, metal moulding and die-casting, problems.

**Tool Design for NC Machine Tools** :Revision of NC control, fixture design for NC machine tools, cutting tools and tool-holding methods, automatic tool chargers and tool positioners.

**Plastics as Tooling Materials** : Introduction, plastics commonly used as tooling materials, application. of epoxy plastic tools, construction methods, metal forming operations with Urethane dies, calculating forces for Urethane pressure pads, problems.

**TEXT BOOKS:**

1. **Tool Design** - Cyril Donaldson, GH Lecain and VC Goold - TMH Publishing Co Ltd., New Delhi, - 3<sup>rd</sup> editions, 2000.
2. **Fundamentals of Tool Design** – ASTME - PHI (P) Ltd., New Delhi -1983.

**REFERENCE BOOKS:**

1. **Cutting Tool Design** - Rodin - Mir publications -1968.
2. **Metal cutting & Tool Design** - Arshinov - Mir Publishers , Moscow – 1970.
3. **Press working of metals** – Hinman - McGraw Hill – 1950.

## ELECTIVE -III

### INDUSTRIAL DESIGN & ERGONOMICS

Subject Code	: 16MSE421	IA Marks	: 20
No. of Lecture Hours/Week	: 03	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

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#### MODULE 1

**Introduction:** An approach to industrial design - elements of design structure for industrial design in engineering application in modern manufacturing systems.

**Ergonomics and Industrial Design:** Introduction - general approach to the man-machine relationship-workstation design-working position.

#### MODULE 2

**Control and Displays:** shapes and sizes of various controls and displays-multiple displays and control situations - design of major controls in automobiles, machine tools etc., - design of furniture design of instruments.

#### MODULE 3

**Ergonomics and Production:** Ergonomics and product design ergonomics in automated systems-expert systems for ergonomic design, Anthropomorphic data and its applications in ergonomic design limitations of anthropomorphic data - use of computerized database.

#### MODULE 4

**Visual Effects of Line and Form:** The mechanics of seeing psychology of seeing, general influences of lined and form.

**Colour:** colour and light - colour and objects - colour and the eye colour consistency - colour terms - reactions to colour and colour continuation - colour on engineering equipments.

#### MODULE 5

**Aesthetic Concepts:** Concept of unity - concept of order with variety - concept of purpose style and environment - Aesthetic expressions. Style-components of style - house style, observations style in capital goods.

**Industrial Design in Practice:** General design - specifying design equipments - rating the importance of industrial design – industrial design in the design process.

#### TEXT BOOKS:

1. **Industrial design for Engineers** - Mayall W.H. - London Cliffee Books Ltd. - 1988.
2. **Applied Ergonomics Hand Book** - Brien Shakel (Edited) - Butterworth Scientific, London – 1988.

## ADVANCED MANUFACTURING PRACTICES

Subject Code	: 16 MSE 422	IA Marks	: 20
No. of Lecture Hours/Week	: 03	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

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### MODULE 1

**Need of CPC for a company**, what CPC can do, CPC-getting the right tool.

**JIT – Introduction** – The spread of JIT Movement, some definitions of JIT, core Japanese practices of JIT, Creating continuous Flow Manufacture, Enabling JIT to occur, Basic elements of JIT, Benefits of JIT.

**Just in Time Production** – Primary purpose, profit through cost reduction, Elimination of over production, Quality control, Quality Assurance, Respect for Humanity, Flexible work Force, JIT Production Adapting to changing production Quantities, process layout for shortened lead Times, Standardization of operation, Automation.

**Sequence and Scheduling Used by Suppliers:** Monthly and daily Information. Sequenced withdrawal system by sequenced schedule table, problems and counter measures in applying the Kanban system to sub contractors.

### MODULE 2

**Toyota Production System**-The philosophy of TPS, Basic Frame work of TPS, Kanbans. Determining the Number of Kanbans in Toyota Production System.

- Kanban Number under Constant Quantity Withdrawal System.
- Constant Cycle, Non-constant Quantity Withdrawal System.

Supplier Kanban and the Sequence Schedule for Use by Suppliers.

- Later Replenishment System by Kanban.
- Sequenced Withdrawal System.
- Circulation of the Supplier Kanban within Toyota.

Production Smoothing in TPS

Production Planning

Production Smoothing

Adaptability to Demand Fluctuations

Sequencing Method for the Mixed Model Assembly Line to Realize Smoothed Production of Goal.

### MODULE 3

**Just-in-Time Production** with Total Quality Control just in time concept, cutting lot sizes, cutting set-up times, cutting purchase order costs, the JIT cause-Effect chain, Scrap/Quality Improvements, Motivational effects, Responsibility effects, small Group improvement Activities, withdrawal of Buffer Inventory, the total Quality Control Concept.

### MODULE 4

**Total Quality Control-Introduction**-Total Quality Control concepts, responsibility, learning from the west, TQC concepts categorized, Goals, Habit of improvement, perfection, Basics, process control, Easy to see Quality control as facilitator, small lot sizes, Housekeeping, Less than full capacity scheduling, Daily machine checking, Techniques and Aids, Exposure of problems, Fool proof Devices, Tools of Analysis, QC Circles, TQC in Japanese-owned US Electronics plant, TQC in Japanese-owned Automotive plants.

## **MODULE 5**

**Plant Configurations: Introduction**-ultimate plant configuration, job shop Fabrication, Frame Welding, Forming Frame parts from Tubing, Dedicated production lines, overlapped production, the daily schedule, Forward Linkage by means of Kanban, physical merger of processes, Adjacency, mixed Models, Automated production Lines, Pseudo Robots, Robots, CAD and Manufacturing, Conveyors and stacker Cranes, Automatic Quality Monitoring

### **TEXT BOOKS:**

1. **Japanese Manufacturing Techniques** - Richard Schonberger - Pearson Higher Education - ISBN: 0029291003 1982
2. **Just In Time Manufacturing** – Kargoanker (manual).
3. **Wind-chill** reference manual.

### **REFERENCE BOOKS:**

1. **An Integrated Approach To Just In Time** - Yasuhiro Monden - Toyota Production system.
2. **Lean Thinking** - James Womack - Simon & Schuster Adult - ISBN: 0743249275, 2003.
3. **The machine that changed the World** - James P. Womack, Daniel T Jones, and Daniel Roos - The story of Lean production – by– Harper Perennial edition published -1991.

## ADVANCED FLUID POWER SYSTEMS

Subject Code	: 16MSE423	IA Marks	: 20
No. of Lecture Hours/Week	: 03	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

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### MODULE 1

**Introduction:** Pascal Law, Advantages of Fluid Power, Applications of Fluid Power, Components of a Fluid Power.

**Hydraulic Power Unit:** Introduction, Pumping Theory, Pump Classification, Gear Pumps, (Vane Pumps- simple, balanced & pressure compensated vane pump, Vane design) Piston Pumps- Radial, Axial (Bent axis & Swash plate), Pump Performance, Pump Noise, Ripple in pumps.

**Hydraulic Actuators:** Linear actuator- cylinders, Mechanics of Hydraulic cylinder loading, limited rotation hydraulic actuator, cylinder cushioning, Gear, Vane & Piston motor, Motor performance, Hydrostatic transmission

### MODULE 2

**Power Controlling Elements – Valves :**

i) Directional Control Valves – Classification, 2/2, 3/2, 4/2 & 4/3 ways Dcv's, Different Centre configurations in 4/3 way valves, actuation of DCV's, Indirect actuation, Valve Lap – Lap during Stationary and during switching.

ii) Pressure Control Valves: Classification, opening & Closing Pressure difference, Cracking Pressure, Pressure Relief Valve – Simple & Compound type, Pressure reducing valve, sequence, unloading & Counter balance valve, Pressure switches.

iii) Flow Control valves – Fixed throttle, Variable throttle, Pressure Compensation principles, pressure compensated Flow control valve – Reducing & Relief type.

iv) Check valve, Pilot operated check valve.

### MODULE 3

**Hydraulic Circuit Design & Analysis:** Control of Single & double acting cylinder, Regeneration circuit, cylinder sequencing & Synchronizing circuit. Speed control of cylinder & Motors, Analysis of Hydraulic system with frictional losses, Accumulators & accumulator circuits.

**Pneumatic System:** Introduction, – Generation of compressed air, air receiver, servicing FRL unit, Air filter, pressure regulation, lubricator, Pneumatic cylinder & air motor – different types of cylinder, cushion assembly. Cylinder performance.

**Pneumatic Valve:** Directional control valves, impulse valve, Quick exhaust valve, shuttle valve, Twin pressure valve, Time delay valve,

### MODULE 4

**Pneumatic Circuit & Logic Circuits:-** Control of single and double acting cylinder, impulse operation, speed control, sequencing, Pneumatic Vacuum system AND, OR, NOT, NAND, NOR, YES Function, Logic circuits design using shuttle valve & twin pressure valve, Binary Arithmetic, logic & Boolean Algebra, use of kannough veitch map for pneumatic circuit design.

### MODULE 5

**Electrical Control in Fluid Power:** Contactors, & Switches, Relays, Limit switch, Electro hydraulic & Electro Pneumatic Circuits, Simple Cylinder reciprocation, interlocking using relays, Proximity switches, application of

proximity switches, Time dependent will dependent and travel dependent circuits.

**REFERENCE BOOKS:**

1. **Fluid Power with Application** - Anthony Esposito - Peason Education - 5<sup>th</sup> edition.
2. **Oil hydraulics -Principles & maintenance** - S.R. Majumdar - Tata M C Graw Hill
3. **Components & Application** - Bosch Rexroth didactic - Hydraulics Trainer - vol 1. Publication
4. **Pneumatic System, Principles and Maintenance** - S.R. Majumdar - Tata M C Graw Hill Publication.
5. **Pneumatics: Theory and Applications** - Bosch Rexroth didactic - Publication
6. **Electro Pneumatics** - Bosch Rexroth didactic - Vol. 2, Publication.

## PROJECT MANAGEMENT

Subject Code	: 16MSE 424	IA Marks	: 20
No. of Lecture Hours/Week	: 03	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

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### MODULE 1

**Introduction:** Projects, types of projects- public and private projects, project organization, structure and processes. Identification of Investment Opportunities, Market and Demand Analysis – Technical Analysis – Investment Outlay.

### MODULE 2

**Means of Financing:** Profitability and Breakeven Analysis – Cash Flows of Projects – Tax factor in investment Analysis – Interest – Compounding and Discounting.

### MODULE 3

**Appraisal Criteria and Selection of Investment:** Cost of Capital – Analysis of Risk – Financial Projection, Social Cost Benefit Analysis.

### MODULE 4

**Manpower Management in Projects:** Functional Approach to Manpower Management – The Element of decision Process – Project Team Concepts – Field Autonomy – Policies Governing Projects.

### MODULE 5

**Networks Technique in Project Management:** PERT/CPM Analysis – Administrative aspects of Capital Investment.

### REFERENCE BOOKS:

1. **Projects** – Appraisal, preparation, budgeting and implementation Prasannachandra – Tata McGraw Hill.
2. **Hand book of Project Management**– Dennis Lock.
3. **Project Management** – Dennis lock.