VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

SCHEME OF TEACHING AND EXAMINATION FOR

M.TECH.-PRODUCTION ENGINEERING (MPE)

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		
16MPE31	Seminar / Presentation on Internship (After 8 weeks from the date of commencement)	-	-	-	25	-	25	20
16MPE 32	Report on Internship	-	-	-	25	-	25	
16MPE 33	Evaluation and Viva-voce of Internship	-	-	-	–	50	50	
16MPE34	Evaluation of Project Phase 1				50	-	50	1
	Total	**-**	**-**	**-**	**100**	**50**	**150**	**21**

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M.TECH.-PRODUCTION ENGINEERING (MPE)

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		
16MPE41	Maintenance Engineering & Management	4	--	3	20	80	100	4
16MPE42X	Elective-III	3	-	3	20	80	100	3
16MPE43	Evaluation of Project Phase-II	-	-	-	50	-	50	3
16MPE44	Evaluation of Project Work and Viva-voce	–	-	-	-	100+100	200	10
Total		**7**	**-**	**06**	**90**	**360**	**450**	**20**

Elective – III	
Sub. Code	**Name of the Subject**
14 MPE 421	Industrial Design & Ergonomics
14 MPE 422	Smart Materials & Structures
14 MPE 423	Rapid Prototyping
14 MPE 425	Advanced Manufacturing Practices

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

MAINTENANCE ENGINEERING & MANAGEMENT

Subject Code	: **16MPE41**	IA Marks	: 20
No. of Lecture Hours/Week	: 04	Exam Hours	: 03
Total No. of Lecture Hours	: 50	Exam Marks	: 80

MODULE 1
Failure Statistics: Breakdown time distributions, Poisson, Exponential and Normal Distributions.

MODULE 2
Maintenance Planning: Overhaul and Repair: Meaning and Difference, optimal overhaul/Repair/Replace maintenance policy for equipment subject to breakdown.

MODULE 3
Replacement Decisions: Optimal interval between preventive replacements of equipment subject to breakdown, group replacement.

MODULE 4
Maintenance Systems: Fixed Time Maintenance, Condition based Maintenance, Operate to Failure, opportunity maintenance, Design out maintenance, total productive maintenance.

MODULE 5
Inspection Decision: Optimal Inspection frequency, (for maximization of profit and minimization of downtime), Non-destructive Inspection, Lubrication program development, CPM and PERT in maintenance.

Scheduling techniques. Spare parts Management. Repair cycle, Repair Complexity and Maintenance Control Indices. Concept of Terrotechnology.

TEXT BOOKS:

1. **Management of Industrial Maintenance** - Kelly and M.J. Harris - Butterworth and Company Limited.
2. **Maintenance, Replacement and Reliability** - AKS Jardine - Pitman Publishing.
3. **Preventive Maintenance** - Joseph D. Patton - Instrument Society of America.
4. **Maintenance and Spare Parts Management** - P. Gopala Krishnan and AX. Bannerjee .
5. **Industrial Maintenance** - H.P. Garg - ISBN – 8121901685.

REFERENCE BOOKS

1. **Plant Engineering Hand Book** - Stainer - McGraw Hill.
2. **Maintenance Engineering Hand Book** - Lindley R. Higgins
3. **Maintenance Engineering Hand Book** - L.C. Morrow

ELECTIVE -III

INDUSTRIAL DESIGN & ERGONOMICS

Subject Code	: **16MPE421**	IA Marks	: 20
No. of Lecture Hours/Week	: 03	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

MODULE 1

Introduction: An approach to industrial design - elements of design structure for industrial design in engineering application in modem 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.

SMART MATERIALS & STRUCTURES

Subject Code	: **16MPE422**	IA Marks	: 20
No. of Lecture Hours/Week	: 03	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

MODULE 1

Overview of Smart Materials, Structures and Products Technologies.

Smart Materials (Physical Properties) Piezoelectric Materials, Electrostrictive Materials, Magnetostrictive Materials, Magnetoelectric Materials. Magnetorheological Fluids, Electrorheological Fluids, Shape Memory Materials, Fiber-Optic Sensors.

MODULE 2

Smart Sensor, Actuator and Transducer Technologies:

Smart Sensors: Accelerometers; Force Sensors; Load Cells; Torque Sensors; Pressure Sensors; Microphones; Impact Hammers; MEMS Sensors; Sensor Arrays Smart Actuators: Displacement Actuators; Force Actuators; Power Actuators; Vibration Dampers;Shakers; Fluidic Pumps; MotorsSmart Transducers: Ultrasonic Transducers; Sonic Transducers.

MODULE 3

Measurement, Signal Processing, Drive and control Techniques

Quasi-Static and Dynamic Measurement Methods; Signal Conditioning Devices; Constant Voltage, Constant Current and Pulse Drive Methods; Calibration Methods; Structural Dynamics and Identification Techniques; Passive, Semi-Active and Active Control; Feedback and Feed forward Control Strategies.

MODULE 4

Design, Analysis, Manufacturing : Case studies incorporating design, analysis, manufacturing and application issues involved in integrating smart materials and devices with signal processing and control capabilities to engineering smart structures and products.

MODULE 5

Applications of Engineering Smart Structures and Products

Emphasis on structures, automation and precision manufacturing equipment, automotives, consumer products, sporting products, computer and telecommunications products, as well as medical and dental tools and equipment.

TEXT BOOKS:

1. **Smart Materials and Structures** - M. V. Gandhi and B. So Thompson - Chapman & Hall, London; New York - 1992 (ISBN: 0412370107).
2. **Smart Structures and Materials** - B. Cui shaw - Artech House, Boston, - 1996 (ISBN :0890066817).
3. **Smart Structures: Analysis and Design** - V. Srinivasan - Cambridge University Press, Cambridge; New York - 2001 (ISBN: 0521650267).
4. **Materials, Properties, Applications** Electroceramics - A. J. Moulson and J. M. Herbert, - John Wiley & Sons,Chichester, West Sussex; New York - 2nd Edition, 2003 (ISBN: 0471497479).
5. **Materials and Amplifiers** Sensories: Force, Strain, Pressure, Acceleration and Acoustic Emission Sensors - G. Gautschi, Piezoelectric - Springer, Berlin; New York – 2002 (ISBN: 3540422595).
6. **Piezoelectric Actuators and Ultrasonic Motors** - K. Uchino - Kluwer Academic Publishers, Boston - 1997 (ISBN: 0792398114).

REFERENCE BOOKS:

1. **Handbook of Giant Magnetostrictive Materials** - G. Engdahl - Academic Press, San Diego, Calif.;

London - 2000 (ISBN: 012238640X).
2. **Shape Memory Materials** - K. Otsuka and C. M. Wayman - Cambridge University Press, Cambridge; New York - 1998(ISBN: 052144487X).
3. **Fiber Optic Sensors: An Introduction for Engineers and Scientists** - Eric Udd - John Wiley & Sons, New York - 1991 (ISBN:0471830070).
4. **Vibration Control of Active Structures: An Introduction** - Andre Preumont - Kluwer Academic Publishers, Dordrecht; Boston - 2nd Edition, 2002 (ISBN: 1402004966).

RAPID PROTOTYPING

Subject Code	:**16MPE423**	IA Marks	: 20
No. of Lecture Hours/Week	: 03	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

MODULE 1

Introduction: Need for the compression in product development, history of RP systems, Survey of applications, Growth of RP industry, and classification of RP systems.

Stereo Lithography Systems: Principle, Process parameter, Process details, Data preparation, data files and machine details, Application.

MODULE 2

Selective Laser Sintering and Fusion Deposition Modeling: Type of machine, Principle of operation, process parameters, Data preparation for SLS, Applications, Principle of Fusion deposition modeling, Process parameter, Path generation, Applications

Solid Ground Curing: Principle of operation, Machine details, Applications.

MODULE 3

Laminated Object Manufacturing: Principle of operation, LOM materials. Process details, application.

Concepts Modelers: Principle, Thermal jet printer, Sander's model market, 3-D printer. Genisys Xs printer HP system 5, object Quadra systems.

MODULE 4

Rapid Tooling: Indirect Rapid tooling -Silicone rubber tooling –Aluminum filled epoxy tooling Spray metal tooling, Cast kirksite, 3Q keltool, etc >Direct Rapid Tooling Direct. AIM, Quick cast process, Copper polyamide, Rapid Tool, DMILS, Prometal, Sand casting tooling, Laminate tooling soft Tooling vs. hard tooling.

MODULE 5

RP Process Optimization: factors influencing accuracy. Data preparation errors, Part building errors, Error in finishing, influence of build orientation.

TEXT BOOKS:

1. **Stereo lithography and other RP & M Technologies -** Paul F. Jacobs - SME, NY 1996.
2. **Rapid Manufacturing -** Flham D.T & Dinjoy S.S - Verlog London 2001.
3. **Rapid automated -** Lament wood - Indus press New York

REFERENCE BOOKS:

1. **Wohler's Report 2000 -** Terry Wohlers - Wohler's Association -2000.

ADVANCED MANUFACTURING PRACTICES

Subject Code	: **16 MPE424**	IA Marks	: 20
No. of Lecture Hours/Week	: 03	Exam Hours	: 03
Total No. of Lecture Hours	: 40	Exam Marks	: 80

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.

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

Supplier Kanban and the Sequence Schedule for Use by Suppliers.

a) Later Replenishment System by Kanban.
b) Sequenced Withdrawal System.
c) 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 lant 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.