S-25 March, 2013 AC after Circulars from Cirular No.153 & onwards — 68 -

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO. ACAD/NP/M.E./New Syllabi/190/2013

It is hereby informed to all concerned that, recommendation of the Faculty of Engineering and Technology, the Hon'ble Vice-Chancellor has accepted the *"NEW Syllabi with Cumulative Grade Point Average [CGPA] for [1] M.E. [Manufacturing Process], [2] M.E. [Automation] and M.E. [CSE & IT]"* on behalf of the <u>Academic Council Under Section-14(7) of the Maharashtra Universities Act, 1994</u> as appended herewith.

This is effective from the Academic Year 2013-2014 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.No. ACAD/ NP/ M.E./
NEW SYLLABI / 2013/14101-09
<u>V.C.14[7] A-08.</u>

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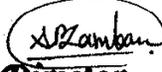
Director,
Board of College and
University Development.

Date:- 15-06-2013.   ★★★★★★

Copy forwarded with compliments to :-

1] The Principals, affiliated concerned Colleges, Dr. Babasaheb Ambedkar Marathwada University.
2] The Director, University Network & Information Centre, UNIC, with **a request to upload the above all syllabi on University Website [www.bamu.net].**

Copy to :-

1] The Controller of Examinations,
2] The Superintendent, [Engineering Unit],
3] The Programmer [Computer Unit-1] Examinations,
4] The Programmer [Computer Unit-2] Examinations,
5] The Superintendent, [Eligibility Unit] ,
6] The Director, [E-Suvidha Kendra], in-front of Registrar's Quarter, Dr. Babasaheb Ambedkar Marathwada University,
7] The Record Keeper, Dr. Babasaheb Ambedkar Marathwada University.

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S/150613/-*

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD.

New Syllabus of

M.E.

(MANUFACTURING PROCESSING ENGINEERING)

[*Effective from the Academic Year 2013-14 & onwards*]

Dr. Babasaheb Ambedkar Marathwada University Aurangabad.

Faculty of Engineering & Technology

Rules and Regulations for M.E. & M.Tech. -2014

➢ **What is a credit system**

A credit system is a systematic way of describing an educational program by attaching credits to its components. The definition of credits in higher education systems may be based on different parameters, such as student workload, learning outcomes and contact hours.

➢ **Advantages of the Credit System**

- Represents a much-required shift in focus from teacher-centric to learner-centric education since the work load estimated is based on the investment of time in learning, not in teaching.

- Helps to record course work and to document learner work load realistically since all activities are taken into account-not only the time learners spend in lectures or seminars but also the time they need for individual learning and the preparation of examinations etc.

- Segments learning experience into calibrated units, which can be accumulated in order to gain and academic award.

- Helps self-paced learning. Learners may undertake as many credits as they can cope with without having to repeat all the courses in a given semester if they fail in one or more courses. Alternatively, they can choose other courses and continue their studies.

➢ **What is Grading?**

The word Grade derived from the Latin word gradus, meaning, step. Grading, in the educational context is a method of reporting the result of a learner's performance subsequent to his evaluation. It involves a set of alphabets which are clearly defined and designated and uniformly understood by all the stake holders. A properly introduced grading system not only provides for a comparison of the learner's performance but it

also indicate the quality of performance with respect to the amount of efforts put in and the amount of knowledge acquired at the end of the courses by the learners.

➢ CURRICULUM:

1.1 Curriculum:

Every program with specialization has a prescribed course structure which in general terms is known as Curriculum. It prescribes course to be studied in each semester; the relevant information containing course structure along with detail syllabus for each course of each program is updated periodically and is uploaded on the website.

1.2 Semesters:

The Faculty of Engineering & Technology implements a credit based curriculum and grade based evolution system for P.G. program is of four semesters. The academic courses are delivered in the first two semesters. Dissertation work is carried out by a student in the third and fourth semester. The first semester begins in the last week of July ends by the last week of November while the second semester begins in the first week of January and ends by the second week of May. Total duration for each semester is generally of 20 weeks including the period of examination, evaluation and grade declaration.

1.3 Course Credit:

Education is organized around the semester-based credit system of study. The prominent features of the credit system are a process of continuous evaluation of a student's performance/progress and flexibility to allow a student to progress at an optimum pace suited to his/her ability or convenience, subject to fulfilling minimum requirements for continuation.

A student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, grade point average is calculated. A minimum grade point average is required to be maintained for satisfactory progress and continuation in the program. Also a minimum number of earned credits and a minimum grade point average should be acquired in order to qualify for the degree. All programmes are defined by the total credit requirement and a pattern of credit distribution over courses of different categories.

1.4 Course credits assignment

Each courses, except a few special courses, has a certain number of credits assigned to it depending upon its lecture, tutorial and laboratory contact hours in a week. This weightage is also indicative of the academic expectation that includes in-class contact and self-study outside of class hours.

Lectures and Tutorials: One lecture or tutorial hour per week per semester is assigned one credit.

Seminar/Contact Hours per week per semester is assigned one credit

Practical/Laboratory: One laboratory hour per week per semester is assigned half credit.

Example: Course: XYZ Engg: 3 credits (3-1-2)

The credits indicated for this course are computed as follows:

3 hours/week lectures = 3 credits

1 hours/week tutorial = 1 credit

2 hours/week practical = 2 x 0.5 = 1 credit

2 hours/week seminar = 2 x 0.5 = 1 credit

Dissertation seminar/Contact Hours = 1 x 1= 1 credit

(3-1-2) 3 credit course = (**3** h Lectures + **1** h Tutorial + **2** h Practical/Dissertation seminar) per week i.e. 6 Contact hours per week

1.5 Earning Credits

At the end of every course, a letter grade is awarded in each course for which a student had registered. On obtaining a pass grade, the student accumulates the course credits as earned credits. A student's performance is measured by the number of credits that he/she has earned and by the weighted grade point average.

The credit system enables continuous evaluation of a student's performance, and allows the students to progress at an optimum pace suited to individual ability and convenience, subject to fulfilling minimum requirement for continuation.

1.6 Evaluation System

1. Semester Grade Point Average (SGPA) =

    $$\frac{\text{SUM (course credits in passed courses X earned grade points)}}{\text{SUM (Course credits in registered courses)}}$$

2. Cumulative Grade Point Average (CGPA) =

    $$\frac{\text{SUM (course credits in passed courses X earned grade points) of all Semester}}{\text{SUM (Course credits in registered courses) of all Semester}}$$

3. At the end of M.E & M. Tech Program, student will be placed in any one of the divisions as detailed below.(According to AICTE Handbooks 2013-2014)

    I^{st} Division with distinction   : CGPA ≥ 8.25 and above

    I^{st} Division   : CGPA ≥ 6.75 and < 8.25

    IInd Division   : CGPA ≥ 6.75 and < 6.25

As per AICTE Handbook (2013-14), new gradation suggested as follows,

Table 1

Grade Point	Equivalent Range
6.25	55%
6.75	60%
7.25	65%
7.75	70%
8.25	75%

Conversion of CGPA to percentage marks for CGPA ≥ 5.0 can be obtained using equations.

Percentage marks = (CGPA X10) – 7.5

An example of these calculations is given below:

Typically one example for academic performance calculations of semester –I

Table 2

Course No. (1)	Course Credit (2)	Grade Awards (3)	Earned Credit (4)	Grade Points (5)	Points Secured (6)=(4) x (5)
Subject 1	4	B	4	6	24
Subject 2	4	C	4	5	20
Subject 3	4	O	4	10	40
Subject 4	4	A+	4	8	32
Subject 5	4	C	4	5	20
Lab-1	2	A+	2	9	18
Lab-2	1	A+	1	9	9
Seminar-I	1	A+	1	9	9
Total	24		24	61	172

1. Semester Grade Point Average (SGPA) = $\dfrac{(172)}{(24)} = 7.16$

2. Cumulative Grade Point Average (CGPA) =
   Cumulative points earned in all passed courses = 172 (past semester) + 172 (this sem.) = 344

   Cumulative earned credits = 24 (past semesters) +24 (this sem) = 48

   $\dfrac{\sum (172 + 172)}{\sum (24 + 24)} = 7.16$

➢ **System Evaluation Table**

Table 3

Grade	Grade Points	Marks Obtained (%)	Description Performance
		Regular Semester	
O	10	91-100	Outstanding
A++	09	86-90	Excellent
A+	08	76-85	Very Good
A	07	66-75	Good
B	06	56-65	Fair
C	05	46-55	Average
D	04	40-45	Poor
F	00	Below 40	Fail
EE			Incomplete
WW			Withdrawal
XX	--	--	Detained
ABSENT	--	--	Absent
PP	--	--	Passed (Audit Course)
NP	--	--	Not Passed (Audit Course)

> **Grade Awards:**

i) A ten point rating scale shall be used for the evaluation of the performance of the student to provide letter grade for each course and overall grade for the Master's Programme. Grade points are based on the total number of marks obtained by him/her in all the heads of examination of the course. These grade points and their equivalent range of marks are shown separately in Table-4.

Table 4: Ten point grades and grade description

Sr.No.	Equivalent Percentage	Grade Points	Grade	Grade Description
1	90.00 – 100	10	O	Outstanding
2	80.00 – 89.99	9	A++	Excellent
3	70.00 – 79.99	8	A+	Exceptional
4	60.00 – 69.99	7	A	Very Good
5	55.00 – 59.99	6	B+	Good
6	50.00 – 54.99	55	B	Fair
7	45.00 – 49.99	5	C+	Average
8	40.01 – 44.99	4.5	C	Below Average
9	40	4.00	D	Pass
10	<40	0.00	F	Fail

ii)   Non appearance in any examination/assessment shall be treated as the student have secured zero mark in that subject examination/assessment.

iii)   Minimum D grade (4.00 grade points) shall be the limit to clear/pass the course/subject. A student with F grade will be considered as 'failed' in the concerned course and he/she has to clear the course by reappearing in the next successive semester examinations.

iv)   Every student shall be awarded Grade points out of maximum 10 points in each subject (based on 10 Point Scale). Based on the Grade points obtained in each subject, Semester Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) shall be computed. Results will be announced at the end of each semester and cumulative Grade card with CGPA will be given on completion of the course.

Proposed Coding System of M.E/M.Tech Subjects

Six Digit Code for a subject (PG Course)

Sr. No.	Digits ⟶ Branch ↓	1 2 3 Branch code	4 Year	5 6 Subject
1	Electronics	MEX	PG I year – 6	**Semester –I/III**
2	Electronics & Communication	MEC	PG II Year - 7	1-20 Theory
3	Electronics & Telecom.	MET		21-30 Practical
4	Digital Communication	MDC		31 Dissertation-I
5	Embedded System	MES		41-49 Electives
6	Structure Engineering	MSE		**Semester –II/IV**
7	Environmental Engineering	MEV		51-70 Theory
8	Water Resource Engineering	MWR		71-80 Practical
9	Computer Engineering	MCE		81 Dissertation-II
10	Computer Network	MCN		91-99 Electives
11	Software Engineering	MSW		
12	Mechanical Engineering	MME		
13	Thermal Engineering	MTE		
14	CAD/CAM	MCC		
15	Manufacturing	MMF		
16	Heat Power	MHP		
17	Design Engineering	MDE		
18	Machine Design	MMD		
19	Automation	MEA		
20	Chemical Engineering	MCH		
21	Computer & IT	MCI		
22	Production Process	MMP		
23	M.Tech Computer Science	MTC		
24	M.Tech Food Processing	MTF		
25	M.Tech Mechanical	MTM		

Note: - Kindly, Allot Same Code for same Electives/ subjects for different branches to avoid repetitions of Question papers/settings/assessments.

DEGREE OF MASTER OF ENGINEERING/TECHNOLOGY
(Course with effective from academic year: 2013-2014)

I	1	The examination for the Degree of Master of Engineering & Technology will be held in four semesters, M.E./M.Tech. Semester-I, M.E./M.Tech. Semester-II, M.E. ./M.Tech Semester-III, and M.E./M.Tech. Semester-IV in case of full time course. And for part time additional semester V & VI
II		**Rules & Eligibility**
	1	Rule for admission to P.G. Degree course in Engineering and Technology as per rules and regulation of AICTE/DTE & Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
III		**Evaluation method**
	1	Each theory course will be of 100 marks and be divided in to internal examination of 20 marks and semester examination of 80 marks (20+80=100 marks). Each practical course will be of 50/100 marks
	2	There shall be minimum two class tests within a semester. First based on 30% syllabus taught and second based on 30% syllabus taught. The setting of question paper and assessment will be done by the concerned teacher who has taught the syllabus. Average marks obtained out of two examinations will be considered for the preparation of final sectional marks/ grade.
	3	The Question papers in theory subjects shall be set by the Examiners appointed for the purpose by the University on the recommendations of the Board of studies of the concerned PG Course.
	4	The assessment of the Practical for any subject will be done by recognized post-graduate teacher appointed by University.
	5	To pass the examination a candidate must obtain a minimum CGPA of 6.25 (CGPA to the scale of 10).
	6	Candidate who secures CGPA $\geq$ 6.25 and CGPA < 6.75 declared to have passed examination in second class.
	7	Candidate who secures CGPA $\geq$ 6.75 and CGPA < 8.25 declared to have passed examination in first class.
	8	Candidate who secures CGPA $\geq$ 8.25 declared to have passed examination in

		first class with distinction.
IV	1	In case candidates fails to get less than D grade in one or more heads of passing examination, he will be allowed at his option, to reappear for only those heads of passing in which he has failed or got less than D grade at subsequent examinations.
	2	The grades obtained by the candidate in any head of passing at the examination will be carried forward unless the candidates reappear for the head of passing in accordance with ref. IV (1)
	3	In case the candidate passes in all heads of passing under M.E./M.Tech. Semester-I, M.E./M.Tech. Semester-II examination and obtained a minimum CGPA of 6.25 in M.E./M.Tech Semester-I, M.E./M.Tech Semester-II taken together as required under ref. II(2) above, he will not be allowed to reappear for any head of passing under M.E. Semester-I, M.E. Semester-II in accordance with ref. III(5)
	4	A candidate will not be allowed to appear for M.E. ./M.Tech Semester-III examination unless he passes in all heads of passing under M.E. ./M.Tech Semester-I, M.E./M.Tech Semester-II examination and obtains a minimum CGPA of 6.25.
	5	Whenever a candidate reappears for M.E. ./M.Tech Semester-III and M.E./M.Tech. Semester-IV examinations he will have to resubmit the dissertation with suitable modification and must also reappear for oral examination on it.
	6	A candidate registered for M.E./M.Tech Examination must clear his examination within five years from the date of registration.
V		**Attendance Requirement**
	1	Each semester of the course shall be treated as a separate unit for calculation of the attendance
	2	A candidate shall be considered to have satisfied the attendance requirement if he/she has attended not less 75% of the class in each subject of all the semesters (Theory, Laboratory, Semester Practical training and Dissertation work) actually conducted up to the end of the semester.
	3	A Candidate, who does not satisfy the attendance required, mentioned as above, shall not be eligible to appear for the Examination of that semester and

		shall be required to repeat that semester along with regular students later.
	4	The Principal of the concerned College shall display regularly, the list of such candidates who fall short of attendance, on the Notice Boards.
	5	The list of the candidates falling short of attendance shall be sent to the University at least one week prior to the commencement of theory/practical examination, whichever is earlier.
VI	.	The following are the syllabi in the various subjects of the examination for the Degree of Master of Engineering/Technology.

Part – I

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Proposed Structure for ME (Manufacturing Processing Engineering) w.e.f Academic Year 2013-14

Semester – I

Code	Subject	Contact Hrs/Week				Examination Scheme (Marks)						Duration of Theory Examination	Credit
		L	T	P	Total	CT	TH	TW	P	Total			
MMP 601	Theory of Metal Cutting	3	1	-	4	20	80	-	-	100	3 Hrs.	4
MMP 602	Quantitative Techniques in Decision Making & Numerical Methods	3	1	-	4	20	80	-	-	100	3 Hrs.	4
MMP 603	Theory of Metal Forming	3	1	-	4	20	80	-	-	100	3 Hrs.	4
MMP 604	Computer Integrated Manufacturing and Automation	3	1	-	4	20	80	-	-	100	3 Hrs.	4
MMP 641	Elective-I	3	1	-	4	20	80	-	-	100	3 Hrs.	4
MMP 621	QTDM&NM Lab	-	-	4	4	-	-	50	-	50	-	2
MMP 622	CIM&A Lab	-	-	2	2	-	-	-	50	50	-	1
MMP 623	Seminar	-	-	2	2	-	-	-	50	50	-	1
	Total of Part – I	15	5	8	28	100	400	50	100	650		24

Elective – I

1. Composite and Smart Materials.

2. Advanced Foundry Technology.

3. Simulation & Modeling of Manufacturing Systems.

Part – II

Code	Semester – II Subject	Contact Hrs/Week				Examination Scheme (Marks)						Credit
		L	T	P	Total	CT	TH	TW	P	Total	Duration of Theory Examination	
MMP 651	Advanced Joining Processes.	3	1	-	4	20	80	-	-	100	3 Hrs.	4
MMP 652	Product Data Management.	3	1	-	4	20	80	-	-	100	3 Hrs.	4
MMP 653	Surface Engineering.	3	1	-	4	20	80	-	-	100	3 Hrs.	4
MMP 654	Industrial Design and Ergonomics.	3	1	-	4	20	80	-	-	100	3 Hrs.	4
MMP 691	Elective – II.	3	1	-	4	20	80	-	-	100	3 Hrs.	4
MMP 671	AJP Lab.	-	-	4	4	-	-	50	-	50	-	2
MMP 672	SE Lab.	-	-	2	2	-	-	-	50	50		1
MMP 673	Mini Project.	-	-	2	2	-	-	-	50	50		1
	Total of Part – II	15	5	8	28	100	400	50	100	650		24

Elective – II

1. Research Methodologies.

2. Finite Element Methods.

3. Quality and Reliability Engineering.

Part – III

Semester – III

Code	Subject	Teaching Scheme (Hrs. Per Week)				Examination Scheme (Marks)						Credit
		L	CH	P	Total	CT	TH	TW	P	Total	Duration of Theory Examination	
MMP 731	Dissertation (Part - I)	-	12	-	12	-	-	50	50	100	-	12
	Total of Part – III		12		12			50	50	100		12

Part – IV

Semester – IV

Code	Subject	Teaching Scheme (Hrs. Per Week)				Examination Scheme (Marks)						Credit
		L	T	P	Total	CT	TH	TW	P	Total	Duration of Theory Examination	
MMP 781	Dissertation (Part - II)	-	20	-	20	-	-	100	200	300	-	20
	Total of Part –IV		20		20			100	200	300		20
	Grand Total									1700		

L: Lecture hours per week   **T:** Tutorial Hours per week   **P:** Practical hours per week   **CT:** Class Test

TH: University Theory Examination   **TW:** Term Work   **P:** Practical / Oral Examination

Total :- SEM-I + SEM-II + SEM-III + SEM-IV
= 24 + 24 + 12 + 20
= 80

Total Contact Hours
SEM-I + SEM-II + SEM-III + SEM-IV
= 28 + 28 + 12 + 20 = 88

SEMESTER - I

MMP 601 - THEORY OF METAL CUTTING

Teaching Scheme:

Lecture - 03 Hrs.

Tutorial - 01 Hrs.

Credit: 04

Examination Scheme:

Theory Paper - 80 Marks

Class Test - 20 Marks

1. **INTRODUCTION** (8 HRS)

Need for rational approach to the problem of cutting materials-observation made in the cutting of metals-basic mechanism of chip formation -thin and thick zone modes-types of chips-chip breaker-orthogonal Vs oblique cutting-force velocity relationship for shear plane angle in orthogonal cutting-energy consideration in machining-review of Merchant, Lee and Shafter theories-critical comparison.

2. **SYSTEM OF TOOL NOMENCLATURE** (8 HRS)

Nomenclature of single point cutting tool-System of tool nomenclature and conversion of rake angles-nomenclature of multi point tools like drills, milling-conventional Vs climb milling, mean cross sectional area of chip in milling-specific cutting pressure.

3. **THERMAL ASPECTS OF MACHINING** (8 HRS)

Heat distribution in machining-effects of various parameters on temperature-methods of temperature measurement in machining-hot machining- cutting fluids.

4. **TOOL MATERIALS, TOOL LIFE AND TOOL WEAR** (8 HRS)

Essential requirements of tool materials-development in tool materials-ISO specification for inserts and tool holders-tool life-conventional and accelerated tool life tests-concept of machinability index-economics of machining.

5. **WEAR MECHANISMS AND CHATTER IN MACHINING** (8 HRS)

Processing and Machining – Measuring Techniques – Reasons for failure of cutting tools and forms of wear-mechanisms of wear-chatter in machining-factors effecting chatter in machining-types of chatter-mechanism of chatter.

REFERENCES:

1. Shaw. M. C., "*Metal Cutting Principles*", Oxford Clare don press, 1984.

2. Bhattacharya. A., "*Metal Cutting Theory and Practice*", Central Book Publishers, India, 1984.

3. Boothroid D.G. & Knight W.A., "*Fundamentals of Machining and Machine Tools*", Marcel Dekker, Newyork, 1989.

MMP 602 - QUANTITATIVE TECHNIQUES IN DECISION MAKING AND NUMERICAL METHODS

Teaching Scheme:

Lecture - 03 Hrs.

Tutorial - 01 Hrs.

Credit: 04

Examination Scheme:

Theory Paper - 80 Marks

Class Test - 20 Marks

1. INTRODUCTION   (2 HRS)

Statistics and managerial decisions, statistical data and Operations Research techniques.

2. FUNDAMENTALS OF STATISTICS, PROBABILITY AND PROBABILITY DISTRIBUTIONS   (6 HRS)

Measures of central tendency and location, Measure of dispersion, skewness and kurtosis, Probability and rules of probability, Random variables and probability distributions - Binomial, Poisson, Hyper geometric and Normal.

3. LINEAR PROGRAMMING PROBLEM   (8 HRS)

Formulation of L.P.P., Solution of L.P.P. by graphical method, Solution of L.P.P. by simplex method, Concept of duality and solution of dual problems, Solution of L.P.P. by dual simplex method and Sensitivity analysis.

4. TRANSPORTATION AND ASSIGNMENT PROBLEMS   (8 HRS)

Structure of transportation problem and various methods to find B.F.S., Optimality test of transportation problems by MODI method, Solution of degeneracy and unbalanced transportation problems, Assignment problems and solution by Hungarian method and Traveling Salesman problem.

5. NETWORK ANALYSIS   (6 HRS)

PERT and CPM, Network construction and determination of critical path, Calculation of ES, EF, LS, LF, TF, FF and IF, Crashing of a project, Scheduling of a project and resource leveling.

6. NUMERICAL METHODS   (10 HRS)

Solution of Transcendental and polynomial equations, Solution of Linear simultaneous equations, Gauss eliminations, Gauss Jordan, Gauss-Seidel iteration methods, power method to determine eigen value and eigen vector, Least square technique for linear regression, polynomial regression, multiple linear regression, Interpolation, Newton's divided difference formula, Numerical integration and differentiation, Trapezoidal rule, Simpson's rules, Romberg Integration, Derivatives using forward difference, backward

3

difference, divided difference, central difference formulae, Solution of ordinary differential equations, Predictor-Corrector method, Runge - Kutta methods, Milnes method, shooting method, Finite difference methods. Solution of higher order and simultaneous differential equations, Solution of partial differential equations, Finite difference methods for solution of parabolic, Hyperbolic and Elliptic equations.

REFERENCES:

1. Srivastava U.K., "*Quantitative Techniques for Managerial Decisions*", New Age International Private Limited - ISBN Number: 8122401899.

2. H. Taha, "*Operations Research*", Prentice Hall India – 8 Edition.

3. Hillier and Liberman, "*Introduction to Operations Research*", McGraw Hill International, ISBN 10: 0072321695.

4. M. K. Jain/SRK Iyengar /R.K. Jain, "*Numerical Methods for Scientific and Engineering Computations*", Wiley Eastern Ltd., 1985.

5. Curtis F Gerald/ Patric O.,Wheatley, "*Applied Numerical Analysis*", Addison Wesley, 1989.

6. Terrence / Akai, "*Applied Numerical Methods for Engineers*", Wiley, 1994.

MMP 603 - THEORY OF METAL FORMING

Teaching Scheme:

Lecture - 03 Hrs.

Tutorial - 01 Hrs.

Credit: 04

Examination Scheme:

Theory Paper - 80 Marks

Class Test - 20 Marks

1. INTRODUCTION TO FORMING PROCESS (4 HRS)

Introduction to metal forming, Effect of temperature on forming process-hot working, cold working. Effect of Metallurgical structure, Effect of speed of deformation work of Plastic deformation, Friction in forming operation.

2. FORGING (8 HRS)

Classification, various stages during forging, Forging equipment, brief description, deformation in compression, forging defects. Residual stresses in forging.

3. ROLLING OF METALS (6 HRS)

Classification, forces and geometrical relationships in rolling

4. VARIABLES IN ROLLING (6 HRS)

Deformation in rolling, Defects in rolled products, Residual stresses in rolled products. Torque and Horsepower.

5. EXTRUSION (6 HRS)

Classification, Extrusion equipment, variables in extrusion, Deformation in extrusion, Extrusion defects, Work done in extrusion.

6. DRAWING (6 HRS)

Principles of Rod and wire drawing, variables in wire drawing, Residual stresses in rod, wire and tube drawing, Defects in Rod and wire drawing.

7. SHEET METAL FORMING (4 HRS)

Introduction, Forming methods, shearing and Blanking, Bending, stretch forming, deep drawing, redrawing operations, Defects in formed products.

REFERENCES:

1. Mechanical Metallurgy - Dieter G.E. - Mc Graw Hill Publications.
2. Principles of Metal Working - R.Rowe - Amold London – 1965.
3. Metals Handbook – ASM - Volume II -.ASM
4. Fundamentals of working of Metals - Sach G. - Pergamon Press.

MMP 604 - COMPUTER INTEGRATED MANUFACTURING AND AUTOMATION

Teaching Scheme:	Examination Scheme:
Lecture - 03 Hrs.	Theory Paper - 80 Marks
Tutorial - 01 Hrs.	Class Test - 20 Marks
Credit: 04	

1. **PRODUCTION DEVELOPMENT THROUGH CIM**   **(6 HRS)**

   Computers in Industrial manufacturing, Product cycle & Production development cycle, Introduction of CAD/CAM & CIM, sequential and concurrent engineering, soft and hard prototyping.

2. **COMPUTER PROCESS MONITORING**   **(6 HRS)**

   Process control methods, direct digital control, supervisory computer control, steady state optimal control, on line search strategies, adaptive control.

3. **COMPUTER AIDED QUALITY CONTROL**   **(8 HRS)**

   The computer in Q.C, automated inspection principles and methods, Contact inspection methods, non-contact inspection methods, machine vision system, optical inspection method, sensors, coordinate, measuring machine, Computer-Aided testing, Integration of CAQL with CAD/CAM.

4. **COMPUTER INTEGRATED MANUFACTURING**   **(10 HRS)**

   Fundamentals of CAD/CAM, Computerized Manufacturing planning systems, shop floor control & automatic identification techniques. Computer Network for manufacturing and the future automated factor.

5. **ANALYSIS OF AUTOMATED FLOW LINES**   **(6 HRS)**

   Analysis of transfer lines without storage with storage buffer single stage, Double stage, Multistage with problems, Automated assembly systems, Design for automated assembly, parts feeding devices, analysis of Multi station assembly machine, Analysis of Single stage assembly machine.

6. **AUTOMATED MATERIAL HANDLING STORAGE**   **(4 HRS)**

   Material functions, types of material handling equipment, analysis of material handling systems, design of system, conveyor system, automated guided vehicle systems, automated storage/retrieval systems, caroused storage systems work in process storage, interfacing handling & storage with manufacturing.

Laboratory Exercises:

1. To become familiar with the use of a kinematics graphics simulator in order to perform robot motion and programming.
2. To use trajectory planning concepts on the model of a single-link robotic manipulator.
3. To familiarize students with the use of a vision system.
4. Simulation of Cutting/Milling operations on a computer using CAM packages.
5. To simulate a manufacturing system using discrete-event simulation techniques. To enable Students to have a Systems-Wide View of manufacturing systems. A 3-D graphics manufacturing-oriented simulation software on a PC-type computer should be used. A simple manufacturing system is modeled first and the effects of local changes examined. Then, students make changes to the manufacturing system in order to increase throughput, reduce in-process inventories, and so on. The effects of resource failure and repair times are also examined.

REFERENCES:

1. Zimmers & Grover, "*CAD/CAM*" , PHI.
2. P.Radhakrishna, "*CAD/CAM/CIM*", New Age International - 2nd edition.
3. M.P. Grover, "*Automation, Production systems & Computer Aided Manufacturing*", Prentice Hall - 1984.
4. Zeid, "*CAD/CAM*", Mc-Graw Hill - 2005.
5. P.N.Rao, "*CAD/CAM*", TMH.- 2nd edition, 2004.
6. Koren.Y,, "*Robotics for Engineering*", Mc-Graw Hill - 1985.
7. Rooks B., "*Robert vision & Sensory Controls*", North Holland. - (ed) vol-3.

MMP 641-A EL-I COMPOSITE AND SMART MATERIALS

Teaching Scheme: Examination Scheme:

Lecture - 03 Hrs.   Theory Paper - 80 Marks

Tutorial - 01 Hrs.   Class Test - 20 Marks

Credit: 04

A. COMPOSITE MATERIALS

1. INTRODUCTION TO COMPOSITE MATERIALS (3 HRS)

Definition, Classification, Types of matrices & reinforcements, characteristics & selection, Fiber reinforced composites, laminated composites, particulate composites, prepegs, sandwich construction.

2. MANUFACTURING: LAYUP AND CURING OF POLYMER COMPOSITES

(5 HRS)

Open and closed mould processing – Hand layup techniques Bag moulding and filament winding. Pultrusion, Pulforming, Thermoforming, Injection moulding, Cutting, Machining and joining, tooling, Quality assurance Introduction, material qualification, types of defects, NDT methods.

3. FABRICATION OF POLYMER COMPOSITES (4 HRS)

Cutting, machining, drilling, mechanical fasteners & adhesive bonding joining computer aided design manufacturing tooling fabrication equipment

4. DESIGN OF FIBER REINFORCED POLYMER COMPOSITE STRUCTURES

(5 HRS)

Introduction, Composite structural design, Design criteria, Laminate design, Mathematical analysis of the laminate, Design of composite stiffeners.

5. APPLICATION DEVELOPMENTS (3 HRS)

Aircrafts, missiles, space hardware, automobile, electrical and electronics, marine, recreational and sports equipment-future potential of composites.

B. SMART MATERIALS

1. OVERVIEW (3 HRS)

Overview of Smart Materials, Structures and Products Technologies.

2. SMART MATERIALS (PHYSICAL PROPERTIES) (4 HRS)

Piezoelectric Materials, Electrostrictive Materials, Magnetostrictive Materials, Magnetoelectric Materials. Magnetorheological Fluids, Electrorheological Fluids, Shape Memory Materials, Fiber-Optic Sensors.

3. **SMART SENSOR, ACTUATOR AND TRANSDUCER TECHNOLOGIES (4 HRS)**

Smart Sensors: Accelerometers; Force Sensors; Load Cells; Torque Sensors; Pressure Sensors; Microphones; Impact Hammers.

4. **MEMS**   **(5 HRS)**

Sensors; Sensor Arrays Smart Actuators: Displacement Actuators; Force Actuators; Power Actuators; Vibration Dampers; Shakers; Fluidic Pumps; Motors Smart Transducers: Ultrasonic Transducers; Sonic Transducers.

5. **DESIGN, ANALYSIS, MANUFACTURING AND APPLICATIONS OF ENGINEERING SMART STRUCTURES AND PRODUCTS**   **(4 HRS)**

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. 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.

REFERENCES:

1. Mein Schwartz, *"Composite Materials Handbook"*, Mc Graw Hill Book Company - 1984.

2. Autar K.Kaw, *"Mechanics of Composite Materials"*, CRC Press New York - 1st edi, 1997.

3. F.L. Matthews and R.D. Rawlings, *"Composite Materials - Engineering and Science"*, CRC, Woodhead Publi., 1994.

4. M. V. Gandhi and B. So Thompson, *"Smart Materials and Structures"*, Chapman & Hall, London; New York - 1992 (ISBN: 0412370107).

5. B. Cui shaw, *"Smart Structures and Materials"*, Artech House, Boston, - 1996 (ISBN: 0890066817).

6. V. Srinivasan, *"Smart Structures: Analysis and Design"*, Cambridge University Press, Cambridge; New York - 2001 (ISBN: 0521650267).

7. Tai Ran Hsu, *"MEMS & Microsystem: Design & Manufacture"*, Tata McGraw Hill Publisher, 2002.

8. *"The MEMS Handbook"*, CRC Press, 2001.

MMP 641-B EL-I ADVANCED FOUNDRY TECHNOLOGY

Teaching Scheme: Examination Scheme:

Lecture - 03 Hrs.   Theory Paper - 80 Marks

Tutorial - 01 Hrs.   Class Test - 20 Marks

Credit: 04

1. SOLIDIFICATION OF CASTING   (3 HRS)

Concept of solidification of metals. Homogenous and heterogeneous nucleation. Growth mechanism. Solidification of pure metals and alloys. Mechanism of columnar and dendritic growth. Coring or Segregation. Solidification time and Chvorinov's rule. Concept of progressive and directional solidifications.

2. PRINCIPLES OF GATING AND RISERING   (4 HRS)

Purpose of the gating system. Components of the gating System and its functions. Design of the gating System. Different types of gates. Gating ratio and its functions. Definition and functions of the riser. Types of risers and their application. Design of the riser - its shape. Size and location. Use of insulating material and exothermic compounds in risers.

3. DESIGN OF CASTING   (5 HRS)

Factors to be considered in casting design. Design consideration in pattern making, moulding techniques and core making and assembly. Cooling stresses and hot spots in casting and modification in casting geometry to overcome them.

4. CASTING QUALITY CONTROL   (5 HRS)

Casting defects and factors responsible for them. Different inspection and testing methods to evaluate the casting. Quality control activities in a foundry. Salvaging methods of defective casting.

5. FURNACE TECHNOLOGY   (5 HRS)

Study of various furnaces used in foundry, construction and operation of crucible and hearth furnaces. Resistance, Arc and Induction furnaces-their construction. Operation and application. Heat treatment furnaces and drying ovens used in foundry.

6. GRAY CAST - IRON FOUNDRY PRACTICE   (5 HRS)

Chemical Composition and structure of gray cast iron. Moulding, gating and risering techniques. Melting of gray cast iron in Cupola and induction furnace. Inoculation of gray cast iron. Application of gray cast iron castings.

7. MALLEABLE CAST IRON   (5 HRS)

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Chemical composition and structure of White-heart and black-heart malleable cast iron. Melting malleabilisation heat treatment and application of malleable cast iron.

8. STEEL CASTING PRACTICE (4 HRS)

Common steel casting, their composition, structure and properties. Melting and refining of steel. Gating and risering of steel castings cleaning of steel castings.

9. FOUNDRY MECHANIZATION AND MODERNIZATION (4 HRS)

Introduction to modernization. Mechanization of foundry and its advantages. Mechanization of sand plant, moulding and core.

REFERENCES:

1. Heine, "*Principle of Metal Casting*", et. al - Tata-McGraw-Hill Publication - 2003.
2. Lal, M. Khanna, "*A Test Book of Foundry Technology*", P.O. DhanpatRai & Sons Publication.
3. Beelely, P.R., "*Foundry Technology*", Butterworth.

MMP 641-C EL-I SIMULATION & MODELING OF MANUFACTURING SYSTEMS

Teaching Scheme: Examination Scheme:

Lecture - 03 Hrs.   Theory Paper - 80 Marks

Tutorial - 01 Hrs.   Class Test - 20 Marks

Credit: 04

1. **PRINCIPLES OF COMPUTER MODELING AND SIMULATION**   (3 HRS)

   Monte Carlo simulation. Nature of computer- modeling and simulation. Limitations of simulation, areas of applications.

2. **SYSTEM AND ENVIRONMENT**   (4 HRS)

   Components of a system -discrete and continuous systems, Models of a system -a variety of modeling approaches.

3. **DISCRETE EVENT SIMULATION**   (4 HRS)

   Concepts in discrete event simulation, manual simulation using event scheduling, single channel queue, two server queue, simulation of inventory problem.

4. **STATISTICAL MODELS IN SIMULATION**   (4 HRS)

   Discrete distributions, continuous distributions

5. **RANDOM NUMBER GENERATION**   (6 HRS)

   Techniques for generating random numbers- Mid square method -the mod product method -Constant multiplier technique -Additive congruential method -Linear congruential method -Tests for random numbers -The Kolmogorov-Smirnov test -the Chi-square test.

6. **RANDOM VARIABLE GENERATION**   (4 HRS)

   Inversion transforms technique-exponential distribution. uniform distribution, weibul distribution, continuous distribution, generating approximate normal variates-Erlang distribution.

7. **EMPIRICAL DISCRETE DISTRIBUTION**   (5 HRS)

   Discrete uniform -distribution Poisson distribution -geometric distribution -acceptance -rejection technique for Poisson distribution gamma distribution.

8. **DESIGN AND EVALUATION OF SIMULATION EXPERIMENTS**   (5 HRS)

   Variance reduction techniques -antithetic variables, variables-verification and validation of simulation models.

9. **SIMULATION SOFTWARE**   (5 HRS)

   Selection of simulation software, simulation packages.

REFERENCES:

1. Jerry Banks & .John S., "*Discrete Event System Simulation*", Carson II - Prentice Hall Inc.-1984.

2. Gordan. G., "*Systems Simulation*", Prentice Hall India Ltd - 1991.

3. Nusing Deo, "*System Simulation with Digital Computer*", Prentice Hall of India - 1979.

4. Francis Neelamkovil - John Wilely & Sons, "*Computer Simulation and Modeling*", 1987.

5. Rath M. Davis & Robert M. O. Keefe, "*Simulation Modeling with Pascal*", Prentice Hall Inc. - 1989.

MMP 621 – QTDM&NM LAB.

Teaching Scheme: Examination Scheme:

Practical - 4 Hrs/Week   Termwork - 50 Marks

Credit: 02

It shall consist of a minimum of 8 experiments based on the syllabus of Quantitative Techniques in Decision Making & Numerical Methods.

MMP 622 – CIM & A LAB.

Teaching Scheme: Examination Scheme:

Practical - 2 Hrs/Week   Practical - 50 Marks

Credit: 01

It shall consist of a minimum of 8 experiments based on the syllabus of Computer Integrated Manufacturing and Automation.

MMP 623 - SEMINAR

Teaching Scheme:

Practical - 2 Hrs/Week

Credit: 01

Examination Scheme:

Practical - 50 Marks

The Seminar will consist of a typewritten report covering the topic selected for the seminar. The candidate shall deliver the seminar on the topic which will be judged by two examiners and the marks will be given accordingly.

SEMESTER - II

MMP 651 - ADVANCED JOINING PROCESSES

Teaching Scheme: Examination Scheme:

Lecture - 03 Hrs.   Theory Paper - 80 Marks

Tutorial - 01 Hrs.   Class Test - 20 Marks

Credit: 04

1. DISTORTION   (4 HRS)

Methods to avoid distortion, Stresses in Joint Design.

2. WELDING AND CLADDING OF DISSIMILAR MATERIALS   (6 HRS)

Overlaying and surfacing.

3. ELECTRO SLAG   (4 HRS)

Welding Electron Beam Welding, Plasma arc Welding, Laser Beam Welding, Explosion Welding, Diffusion Welding, Ultrasonic Welding, Friction welding and Thermit welding.

4. INSPECTION OF WELDS   (4 HRS)

Destructive techniques like Tensile, Bend, Nick break, Impact & Hardness. Non-Destructive techniques like 'X' rays, Ultrasonic, Magnetic particle, Dye Penetrant, Gamma ray inspection.

5. WELDING SYMBOLS   (4 HRS)

Need for, Representing the welds, Basic weld symbols, Location of Weld, Supplementary symbols, Dimensions of welds, Examples.

6. WELDING DESIGN   (6 HRS)

Introduction, Principles of sound welding design, welding joint design. Welding positions, Allowable strengths of welds, under steady loads.

7. QUALITY CONTROL IN WELDING   (6 HRS)

Introduction, Quality assurance v/s Quality control, Weld quality, Discontinuities in welds, their causes and remedies and Quality conflicts.

8. COMPUTER-AIDED WELDING DESIGN   (6 HRS)

Introduction, Principles of sound welding design, Wilding joint design. Welding positions. Allowable strengths: of welds. 1D1der steady loads. Weld throat thickness. Solved and um solved examples.

REFERENCES:

1. A.W.S., *"Welding Engineering Handbook"*.

2. Rossi, *"Welding Engineering"*, McGraw Hill.

3. Nikodaco & Shansky, *"Advanced Welding Processes"*, MIR Publications.

4. O.P. Khanna, *"Welding Technology"*.

5. Udin, Funk & Wulf, *"Welding for Engineers"*.

MMP 652 - PRODUCT DATA MANAGEMENT

Teaching Scheme: Examination Scheme:

Lecture - 03 Hrs.   Theory Paper - 80 Marks

Tutorial - 01 Hrs.   Class Test - 20 Marks

Credit: 04

1. **INTRODUCTION**   **(8 HRS)**

   Introduction to PDM-present market constraints need for collaboration- Internet and developments in server-client computing.

2. **COMPONENTS OF PDM**   **(8 HRS)**

   Components of a typical PDM set-up hardware and software- document management creation and viewing of documents -creating parts-version control of parts and documents – case studies.

3. **PROJECTS AND ROLES**   **(8 HRS)**

   Creation of projects and roles -life cycle of a product- life cycle management -automating information flow -work flows-Creation of work flow templates -life cycle -work flow integration -case studies.

4. **CHANGE MANAGEMENT**   **(8 HRS)**

   Change issue -change request-change investigation- change proposal-change activity- case studies.

5. **GENERIC PRODUCTS AND VARIANTS**   **(8 HRS)**

   Products configuration comparison between sales configuration mild products generic-generic product modeling in configuration mode1er-use of order generator for variant creation -registering ofvarian1s in product register-case studies.

REFERENCES:

1. David Bed worth. Mark Henderson & Philips Wolfe, "*Computer Integrated Design and Manufacturing*", McGraw Hill Inc. - 1991.

2. Terry Quatrain, "*Visual Modeling with Rational Rose and UML*", Addison Wesley - 1998.

3. Wind-chill, "*R.S.O. Reference Manuals*", 2000.

MMP 653 - SURFACE ENGINEERING

Teaching Scheme:

Lecture - 03 Hrs.

Tutorial - 01 Hrs.

Credit: 04

Examination Scheme:

Theory Paper - 80 Marks

Class Test - 20 Marks

1. FUNDAMENTALS OF ELECTRO PLATING (6 HRS)

Galvanizing, Hot dip metal coating, thin coating, thin coating, chromium plating, Nickel plating.

2. VACUUM COATING (10 HRS)

FVD & CVD metal spraying - Methods, surface preparation, mechanical Properties of sprayed metals, plasma coating.

3. PLASTIC COATING OF METAL (8 HRS)

PVC coating Spherodising process details, phosphate coating - mechanism of formation. Testing of surface coating methods.

4. HEAT TREATMENT METHODS (8 HRS)

Annealing, Normalizing, Tempering, Case hardening methods, flame hardening sub zero treatment. Heat treatment methods for gears, spindles, cutting tools.

5. ADVANCED COATING TECHNOLOGIES (8 HRS)

Hard facing, electro deposition technique, nanocoatings, coating characterization.

REFERENCES:

1. James A. Murphy, *"Surface Preparations & Finishes for Metals"*, McGraw Hill.
2. Pergamon Press Gabe, David Russell, *"Principles of Metal Surface Treatment and Protection"*, Description, Oxford ; New York – 2nd ed., 1978.
3. John wiley & sons , *"Handbook of Metal Treatment and Testing"*.
4. Zakrov, *"Heat Treatment of Metals"*, MIR Publications.
5. ASM, *"Metals Hand Book"*.

MMP 654 - INDUSTRIAL DESIGN AND ERGONOMICS

Teaching Scheme: Examination Scheme:

Lecture - 03 Hrs.   Theory Paper - 80 Marks

Tutorial - 01 Hrs.   Class Test - 20 Marks

Credit: 04

1. **INTRODUCTION**   **(4 HRS)**

   An approach to industrial design - elements of design structure for industrial design in engineering application in modem manufacturing systems.

2. **ERGONOMICS AND INDUSTRIAL DESIGN**   **(6 HRS)**

   Introduction - general approach to the man-machine relationship-workstation design-working position.

3. **CONTROL AND DISPLAYS**   **(6 HRS)**

   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.

4. **ERGONOMICS AND PRODUCTION**   **(6 HRS)**

   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.

5. **COLOUR**   **(6 HRS)**

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

6. **AESTHETIC CONCEPTS**   **(6 HRS)**

   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.

7. **INDUSTRIAL DESIGN IN PRACTICE**   **(6 HRS)**

   General design - specifying design equipments - rating the importance of industrial design — industrial design in the design process.

REFERENCES:

1. Mayall W. H., "Industrial *Design for Engineers*", London Cliffee Books Ltd. - 1988.

2. Brien Shakel (Edited), "*Applied Ergonomics Hand Book*" ,Butterworth Scientific, London, 1988.

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MMP 691-A EL-II RESEARCH METHODOLOGIES

Teaching Scheme:

Lecture - 03 Hrs.

Tutorial - 01 Hrs.

Credit: 04

Examination Scheme:

Theory Paper - 80 Marks

Class Test - 20 Marks

1. INTRODUCTION   (6 HRS)

Nature and objectives of research. Methods of Research: historical, descriptive and experimental, research process, research approaches, criteria for good research.

2. RESEARCH DESIGN   (6 HRS)

Meaning of research design, need of research design, features of good design, different research designs, and basic principles of experimental designs, design of experiments.

3. DATA COLLECTION   (6 HRS)

Types of data, methods and techniques of data collection, primary and secondary data, meta analysis, historical methods, content analysis, devices used in data collection, pilot study and pretest of tools, choice of data collection methods.

4. PROCESSING AND ANALYSIS OF DATA   (8 HRS)

Use of statistics for data analysis, measures of central tendency, dispersion, skewness and relationship. Sampling distributions, sampling theory, determination of sample size, chisquare test, analysis of variance, multiple regression analysis.

5. DECISION MAKING TECHNIQUES   (8 HRS)

Application of various decision making techniques such as Analytical Hierarchy Process (AHP), TOPSIS, neural networks, graph theory, simulated annealing, genetic algorithms, data envelope analysis (DEA).

6. INTERPRETATION AND REPORT WRITING   (6 HRS)

Techniques of interpretation, precautions in interpretation, significance of report writing, different steps in report writing, layout of research report, mechanics of writing research report.

REFERENCES:

1. C.R Kothari, *"Research Methodology"*, Wishwa Prakashan.

2. P.G Triphati, *"Research Methodology"*, Sultan Chand & Sons, New Delhi.

3. Fisher, *"Design of Experiments"*, Hafner.

4. Stoufferetal, *"Measurement and Prediction"*, Wiley, N. York

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5. J.W. Bames, "*Statistical Analysis for Engineers and Scientists*", McGraw Hill, N.York

6. Donald Cooper, "*Business Research Methods*", Tata McGraw Hill, N.Delhi

7. Bhanwar Lal Garg, Renu Kavdia, Sulochana Agrawal and Umesh Kumar Agrawal, "*An Introduction to Research Methodology*". RBSA Publications,

8. Rao S. S., "*Optimization*", Wiley Eastern, New Delhi, 1995.

9. Montgomery D.C., "*Design and Analysis of Experiments*", Wiley publications.

10. Trochim, William M.K. (2003), "*Research Methods*" 2/e, New Delhi, Biztantra, Dreamtech.

MMP 691-B EL-II FINITE ELEMENT METHODS

Teaching Scheme:

Lecture - 03 Hrs.

Tutorial - 01 Hrs.

Credit: 04

Examination Scheme:

Theory Paper - 80 Marks

Class Test - 20 Marks

1. INTRODUCTION   (6 HRS)

Equations of equilibrium, stress-strain relations for 2-D and 3-D, Potential energy and equilibrium, Boundary conditions, Von Misses Stresses.

2. FEM FOR 1-D PROBLEMS   (8 HRS)

General procedure for FEA, Raleigh Ritz method, Galerkin Approach, shape functions, stiffness matrix, load vectors, temperature effects, Applications of boundary conditions using elimination, penalty and multi-constraint approaches, Application problems – 1-D bar element. Trusses and beams.

3. FEM FOR 2-D PROBLEMS   (10 HRS)

Shape functions, stiffness matrix, strain matrix, load vectors for CST Elements and application problems.

4. FEM FOR AXI-SYMMETRIC PROBLEMS   (8 HRS)

Axisymmetric formulation, triangular elements, PE approach, Body force term, application problems.

5. FEM FOR SCALAR FIELD PROBLEMS   (8 HRS)

1-D Steady state heat transfer, torsion, potential flow and fluid flow in ducts and application problems.

Laboratory Exercises

1. Static (Structural) Analysis of 1-D problems.

2. Static (Structural) Analysis of plane stress and Plane Strain problems.

3. Structural Analysis of Trusses.

4. Static Analysis of Axisymmetric problems.

5. Transient Heat Transfer Analysis of 1D problems.

6. Transient Heat Transfer Analysis of 2D problems.

7. Heat Transfer Analysis of Axisymmetric Problems.

8. Dynamic Analysis of 1D problems – Free vibration Analysis.

9. Non-linear Static Analysis – Typical problems in geometric and material non-linear Analysis.

10. Buckling Analysis of Shell Structures.

REFERENCES:

1. Tirupathi R. Chandrupatla, Ashok D. Belegundu, "*Introduction to Finite Elements in Engineering*", Prentice Hall India Pvt. Ltd., New Delhi – Third Edition, 2003.

2. Cook R.D, Malkus D.S & Plesha, "*Concepts and Applications of finite Element Analysis*", M.E- John Wiley & Sons - 1989.

3. Segerlind L .J., "*Applied Finite Element Analysis*", John Wiley & Sons Edition - 1984.

4. Rao S. S., "*The Finite Element Method in Engineering*", Pergomon Press, Oxford - 2nd Edition, 1984.

5. Bathe K. J., "*Finite Element Procedures in Engineering Analysis*", Prentice Hall, New Jersey – 1982.

6. Shames & Dym C. L., "*Energy and Finite Element Methods in Structural Mechanics*", Wiley eastern ltd – 1995.

MMP 691-C EL-II QUALITY AND RELIABILITY ENGINEERING

Teaching Scheme:

Lecture - 03 Hrs.

Tutorial - 01 Hrs.

Credit: 04

Examination Scheme:

Theory Paper - 80 Marks

Class Test - 20 Marks

1. BASIC CONCEPTS (4 HRS)

Definitions of quality and Reliability, Parameters and Characteristics, Quality control, statistical Quality Control, Reliability concepts.

2. CONTROL CHARTS (6 HRS)

Variable charts-bar chart, R chart and □ chart, Attribute charts – P chart, nP chart, C chart and U Chart.

3. ACCEPTANCE SAMPLING (6 HRS)

Fundamentals of acceptance sampling, types of acceptance sampling, O.C Curve, AQL, LTPD, AOQL.

4. FAILURE DATA ANALYSIS (6 HRS)

Introduction, Failure Data, Quantitative measures, MTTF, MTBF, Bathtub Curve, Mean Life, Life Testing, Problems, Introduction to Failure Mode and Effect Analysis.

5. SYSTEM RELIABILITY (6 HRS)

Series, parallel and mixed configuration, Block diagram concept, r- out-of-n structure solving problems using mathematical models.

6. RELIABILITY IMPROVEMENT AND ALLOCATION (6 HRS)

Difficulty in achieving reliability, Methods for improving reliability during design, Different techniques available to improve reliability, Optimization, Reliability-Cost trade off, Prediction and Analysis, Problems.

7. MAINTAINABILITY AND AVAILABILITY (6 HRS)

Introduction, Formulas, Techniques available to improve maintainability and availability trade-off among reliability, maintainability and availability, Simple problems.

REFERENCES:

1. Seigmund, Halpern, "The *Assurances Sciences*", Prentice Hall International, New Jersey, U.S.A – 1978.

2. Juran, J.M and Gryna, F.M., "*Quality Planning and Analysis*", Tata McGraw Hill publishing company Ltd., New Delhi, India. -1982.

3. Kraus, John W Editors – Ireson. W.G. and Cooms, C.F, *"Maintainability and Reliability"*, Handbook of Reliability Engineering and Management - McGraw Hill Book Company Inc. U.S.A – 1988.

4. Srinath L. S., *"Concepts in Reliability Engineering"*, Affiliated East-West Press Private Limited, New Delhi, India – 1985.

5. Charles Ebeling, *"An Introduction to Reliability and Maintainability Engineering"*, TMH

6. Tata Mcgraw Hill - ISBN: 0070421382.

7. K. Govil, *"Reliability Engineering"*, Tata McGrawHill, New Delhi 1983.

MMP 671 – AJP LAB.

Teaching Scheme:

Practical - 4 Hrs/Week

Credit: 02

Examination Scheme:

Term Work - 50 Marks

It shall consist of a minimum of 8 experiments based on the syllabus of Advanced Joining Processes.

MMP 672 – SE LAB.

Teaching Scheme:

Practical - 2 Hrs/Week

Credit: 01

Examination Scheme:

Practical - 50 Marks

It shall consist of a minimum of 8 experiments based on the syllabus of Surface Engineering.

MMP 673 - MINI PROJECT

Teaching Scheme: Examination Scheme:

Practical - 2 Hrs/Week   Practical - 50 Marks

Credit: 01

The student will have to make a literature survey and should select a small project (as suggested by faculty adviser) relevant to Manufacturing Processing Engineering. The candidate should submit a comprehensive report on the work done and should deliver a seminar at the end of the semester which will be judged by two examiners and the marks will be given accordingly.

SEMESTER-III

MMP 731 - DISSERTATION (PART - I)

Teaching Scheme   Examination Scheme:

Practical - 12 Hrs/Week.   Term Work: 50 Marks

Credit: 12   Practical - 50 Marks

The dissertation Seminar will consist of a type written report covering the topic selected for Dissertation report. This should include the literature survey, technical details and related data required for the dissertation. The candidate shall deliver the dissertation seminar on the topic which will be judged by two examiners (one external and one internal guide) and the marks will be given accordingly.

SEMESTER-IV

MMP 781 - DISSERTATION (PART - II)

Teaching Scheme   Examination Scheme:

Practical - 20 Hrs/Week.   Term Work - 100 Marks

Credit: 20   Practical - 200 Marks

The practical Examination will consist of a presentation along with the demonstration of the dissertation work. The said examination will be conducted by a panel of two examiners (one internal guide and one external examiner).