ANNAMALAI UNIVERSITY
DEPARTMENT OF MANUFACTURING ENGINEERING
B.E. MECHANICAL ENGINEERING (MANUFACTURING)
(Four Year Degree Programme)
(Choice Based Credit System)
(Full-Time)
REGULATIONS AND SYLLABI
REGULATIONS

R1. Condition for Admission

Candidates for admission to the first year of the four year B.E. Degree Courses shall be required to have passed the final examination of the plus 2 Higher Secondary Course with Mathematics, Physics and Chemistry as subjects of study conducted by the Board of Secondary Education. Tamilnadu Government or an examination of any other authority accepted by the syndicate of this University as equivalent thereto. They shall satisfy the conditions regarding qualifying marks, age and physical fitness as may be prescribed by the syndicate of the Annamalai University from time to time. Candidates who have passed the Higher Secondary Examination through vocational stream under ENGINEERING AND TECHNOLOGY and candidates, who have passed the Diploma Course in Engineering of the State Board of Technical Education and Training, Tamilnadu, will also be eligible for admission to the first year of the four year degree course in B.E. provided they satisfy other conditions.

R2. Eligibility for the Degree

A candidate shall be eligible for the degree of Bachelor of Engineering if the candidate has satisfactorily undergone the prescribed courses of study for a period of not less than four academic years and has passed the prescribed examinations in all the four academic years.

R3. Branches of study in B.E.

BRANCH I - Civil Engineering
BRANCH II - Civil and Structural Engineering
BRANCH III - Mechanical Engineering
BRANCH IV - Mechanical Engineering (Manufacturing)
BRANCH V - Electrical and Electronics Engineering
BRANCH VI - Electronics and Instrumentation Engineering
BRANCH VII - Computer Science and Engineering
BRANCH VIII - Chemical Engineering
BRANCH IX - Information Technology
BRANCH X - Electronics and Communication Engineering

R4. Subjects of Study

The subjects of study and syllabus for the subjects are given separately.

R5. Scheme of Examinations

The scheme of Examinations is given separately.

R6. Choice Based Credit System

Each course is normally assigned one credit per period of lecture/tutorial per week and one credit for two periods or part thereof for laboratory or practical or drawing per week.

Each semester curriculum shall normally have a blend of theory and practical courses. In the first year the total number of credits will be 32. For semesters III to VIII the average credits per semester will be 28 and total credits for the entire degree course will be 200. For the award of the degree a student has to

1. earn a minimum of 200 credits,
2. serve in the NSS or NCC for at least one year, and
3. enroll as a student member of a recognized professional society.

R7. Duration of the Programme

A student is normally expected to complete the B.E Mechanical Engineering (Manufacturing) programme in four years but in any case not more than seven years from the time of admission.

R8. Registration for Courses

A newly admitted student will automatically be registered for all the courses prescribed for the first year without any option.

Every other student shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration with the approval of the Dean on the recommendation of the Head of the Department along with a late fee will be done up to the last working day.

Registration for the project work shall be done only for the final semester.

R9. Assessment

The break-up of assessment and examination marks for theory subjects is as follows.

First assessment	: 10 marks
Second assessment (mid-semester test)	: 10 marks
Third assessment	: 05 marks
Examination	: 75 marks

The break-up of assessment and examination marks for practical subjects is as follows.

First assessment (test)	: 15 marks
Second assessment (test)	: 15 marks
Maintenance of record book	: 10 marks
Examination	: 60 marks

The project work will be assessed for 40 marks by a committee consisting of the guide and a minimum of two members nominated by the Head of the Department. One of the committee members will be nominated as the chairman by the Head of the Department. The Head of the Department may himself be a member or the chairman. 60 marks are allotted for the project work and viva voce examination at the end of the semester.

R10. Student Counsellors

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counsellor for those students throughout their period of study. Such student counsellors shall advise the students, give preliminary approval for the courses to be taken by the students during each semester and obtain the final approval of the Head of the Department.

R11. Class Committee

For all the branches of study during the first year, a common class committee will be constituted by the Dean of the faculty.

From among the various teachers teaching the same common course to different classes during the first year, the Dean shall appoint one of them as course co-ordinator.

The composition of the first year class committee will be as follows.

Course Co-ordinators of all Common Courses. Teachers of all other individual courses

All Heads of Departments, among whom one may be nominated as Chairman by the Dean.

The Dean may opt to be a member or the chairman.

For each of the higher semesters, separate class committees will be constituted by the respective Heads of Departments.

The composition of the class committees from third to eighth semester will be as follows.

Course co-ordinators of the common courses, if any, who shall be appointed by the Head of the Department from among the staff members teaching the common course.

A project co-ordinator (in the eighth semester committee only) who shall be appointed by the Head of the Department from among the project supervisors.

Teachers of other individual courses.

One Professor or Reader, preferably not teaching the concerned class, appointed as chairman by the Head of the Department. The Head of the Department may opt to be a member or the chairman. All student counsellors of the class, and the Head of the Department (if not already a member) or any staff member nominated by the Head of the Department may opt to be special invitees.

The class committee shall meet four times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of assessment like test, assignment etc. for the first and third assessments and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The second assessment will be the mid-semester test. The third meeting will be held within a week after the second assessment is completed to review the performance and for follow-up action.

The fourth meeting will be held after all the assessments except the examinations are completed for all the courses, and at least one. week before the commencement of the examinations. During this meeting the assessment on a maximum of 40 marks will be finalized for every student and tabulated and submitted to the Head of the Department (to the Dean in the case of first year) for approval and transmission to the Controller of examinations.

R12. Withdrawal from a Course

A student can withdraw from a course at any time before a date fixed by the Head of. the Department prior to the second assessment. with the approval of the Dean of the faculty on the recommendation of the Head of the Department.

R13. Temporary Break of Study

A student can take a one-time temporary break of study covering the current year/semester and/ or the next semester with the approval of the Dean on the recommendation of

the Head of the Department. not later than seven days after the completion of the mid semester test. However, the student must complete the entire programme within the maximum period of seven years.

R14. Movement to Higher Semesters

The following minimum credits must be earned by the student to move to a higher semester.

To move to the fourth semester	: 25 credits
To move to the fifth semester	: 50 credits
To move to the sixth semester	: 75 credits
To move to the seventh semester	: 100 credits
To move to the eighth semester	: 125 credits

The result of the eighth semester will be withheld until the student passes all the previous semester examinations.

A student who has not fulfilled the NCC/NSS requirements will not be eligible to register for the fifth semester.

R15. Substitute Assessments

A student who has missed, for genuine reasons accepted by the Head of the department, one or more of the assessments of a course other than the examination, may take a substitute assessment for anyone of the missed assessments. The substitute assessment must be completed before the date of the fourth meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Head of the Department within a week from the date of the missed assessment.
The substitute assessment must be completed before the date of the fourth meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Head of the Department within a week from the date of the missed assessment.

R16. Attendance Requirements

To be eligible to appear for the examination in a particular course, a student must put in a minimum of 80% of attendance in that course. However, if the attendance is 75% or above but less than 80% in any course, the authorities can permit the student to appear for the examination in that course on payment of the prescribed condonation fee.

A student who withdraws from or does not meet the minimum attendance requirement in a course must reregister for and repeat the course.

R17. Passing and Declaration of Examination Results

All assessments of all the course on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the Controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average and cumulative grade point average, and prepare the grade cards.

90 to 100 marks	- Grade 'S'
80 to 89 marks	- Grade 'A'
70 to 79 marks	- Grade ‘B’
60 to 69 marks	- Grade ‘C’
55 to 59 marks	- Grade 'D'
50 to 54 marks	- Grade 'E'
Less than 50 marks	- Grade 'F’
Insufficient attendance	- Grade ‘T’
Withdrawn from the course	- Grade 'W'

A student who obtains less than 24 marks out of 60 in the examination or is absent for the examination will be awarded grade 'F'.

A student who earns a grade of S,A,B,C,D or E for a course is declared to have successfully completed that course. Such a course cannot be repeated by the student.

A student who obtains letter grade F in a course has to reappear for the examination in that course.

A student who obtains letter grades I or W in a course must reregister and repeat the course.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

S - 10; A - 9; B - 8; C - 7; D - 6; E - 5; F - 0

Courses with grades I and W are not considered for calculation of grade point average or cumulative grade point average. F grade will be considered for computing GPA and OGPA.

A student can apply for retotalling of one or more of his examination answer papers within a week from the date of issue of grade sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After results are declared, grade cards will be issued to the students. The grade card will contain the list of courses registered during the year/semester, the grades scored and the grade point average (GPA) for the year / semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the year/semester, divided by the sum of the number of credits for all courses taken in that year/semester. OGPA is similarly calculated considering all the courses taken from the time of admission.

The results of the final semester will be withheld until the student obtains passing grade in all the subjects of all earlier semesters.

After successful completion of the programme, the degree will be awarded with the following classifications based on OGPA.

For First class with Distinction the student must earn a minimum of 200 credits within four years from the time of admission, pass all the courses in the first attempt and obtain a OGPA of 8.25 or above for all subjects from III semester to VIII semester.

For First class the student must earn a minimum of 200 credits within five years from the time of admission and obtain a OGPA of 6.75 or above for all the subjects from III semester to VIII semester.

For Second class the student must earn a minimum of 200 credits within seven years from the time of admission.

R18. Ranking of Candidates

The candidates who are eligible to get the B.E. degree in First Class with distinction will be ranked together on the basis of the percentage of marks obtained by them in all the subjects of study from III to VIII semester.

The candidates passing with First class will be ranked next after those with distinction on the basis of the percentage of marks obtained by them in all the subjects of study from III to VIII Semester.

The ranking will be done separately for each branch of study.

R19. Electives

Apart from the various elective courses offered in the curriculum of the branch of specialization, a student can choose a maximum of two electives from any specialisation under the faculty during the entire period of study, with the approval of the Head of the Department and the Head of the Department offering the course.

R20.

The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the subjects of study and the syllabi from time to time.

R21. Transitory Regulations

Wherever there had been change of syllabi, examinations based on the existing syllabus will be conducted for three consecutive times after implementation of the new syllabus in order to enable the students to clear the arrears. Beyond that the students will have to take up their examinations in equivalent subject, as per the new syllabus, on the recommendations of the Head of the Department concerned.

FIRST YEAR

Code	Subject	Ins. Hrs./Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
101	Technical English	3	-	-	-	3	25	75	100	3
102	Engineering Mathematics –1	3	1	-	-	3	25	75	100	4
103	Engineering Physics	3	-	-	-	3	25	75	100	3
104	Engineering Chemistry	3	-	-	-	3	25	75	100	3
105	Engineering Mechanics	3	-	-	-	3	25	75	100	3
106	Basic Engineering (Civil, Mechanical & Electrical	6	-	-	-	3	25	75	100	3
107	Environmental Studies	3	-	-	-	3	25	75	100	3
108	Engineering Drawing	-	-	-	3	3	40	60	100	2
109	Physics Laboratory	-	-	-	-	3	40	60	100	2
110	Chemistry Laboratory	-	-	3	-	3	40	60	100	2
111	Computer Programming	1	-	2	-	3	40	60	100	2
112	Workshop Practice	-	-	3	-	3	40	60	100	2
	Total	25	1	8	3	-	375	825	1200	32
Cumulative Total										32

L – Lecture; T – Tutorial; P – Practical; D – Drawing

III SEMESTER

Code	Subject	Ins. Hrs./Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
MFEC301	Engineering Mathematics-II	4	1	-	-	3	25	75	100	4
MFEC302	Material Science	4	-	-	-	3	25	75	100	4
MFEC303	Thermal Engineering	4	-	-	-	3	25	75	100	4
MFEC304	Fluid Mechanics & Machinery	4	-	-	-	3	25	75	100	4
MFEC305	Mechanics of Materials	4	-	-	-	3	25	75	100	3
MFEC306	Electrical & Electronics Engineering	4	-	-	-	3	25	75	100	3
MFEP307	Electrical Laboratory	-	-	3	-	3	40	60	100	2
MFEP308	Mechanical Laboratory			4		3	40	60	100	2
Total		24	1	7	3	-	230	570	800	26
Cumulative Total										58

L – Lecture; T – Tutorial; P – Practical; D – Drawing

IV SEMESTER

Code	Subject	Ins. Hrs./Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
MFEC401	Probability & Statistics	4	1	-	-	3	25	75	100	4
MFEC402	Industrial Management	4	-	-	-	3	25	75	100	4
MFEC403	Mechanics of Metal Machining	4	-	-	-	3	25	75	100	4
MFEC404	Mechanics of Machines I	4	-	-	-	3	25	75	100	4
MFEC405	Measurements in Manufacturing Processes	4	-	-	-	3	25	75	100	4
MFEC406	Machine Tool Technology	4	-	-	-	3	25	75	100	4
MFEP407	Programming Laboratory	-	-	6	-	3	40	60	100	2
MFEP408	Machine Shop & Foundry Practice	-	-	6	-	3	40	60	100	2
Total		24	1	12	4	-	230	570	800	28
Cumulative Total										86

L – Lecture; T – Tutorial; P – Practical; D – Drawing

V SEMESTER

Code	Subject	Ins. Hrs./Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
MFEC501	Metal Joining Processes	4	-	-	-	3	25	75	100	4
MFEC502	Industrial Engineering	4	-	-	-	3	25	75	100	4
MFEC503	Casting Technology	4	-	-	-	3	25	75	100	4
MFEC504	Mechanics of Machines II	4	-	-	-	3	25	75	100	4
MFEC505	Engineering Metallurgy	4	-	-	-	3	25	75	100	4
MFEC506	Design of Machine Elements	4	-	-	-	3	25	75	100	4
MFEP507	Hydraulic Laboratory	-	-	6	-	3	40	60	100	2
MFEP508	Special Machines Laboratory	-	-	6	-	3	40	60	100	3
Total		24	-	12	-	-	230	570	800	29
Cumulative Total										115

L – Lecture; T – Tutorial; P – Practical; D – Drawing

VI SEMESTER

Code	Subject	Ins. Hrs./Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
MFEC601	Numerical Methods	4	-	-	-	3	25	75	100	4
MFEC602	Production & Operations Management	4	-	-	-	3	25	75	100	4
MFEC603	Tool Engineering	4	-	-	-	3	25	75	100	4
MFEC604	Mechatronics	4	-	-	-	3	25	75	100	4
MFEC605	Metal Forming Processes	4	-	-	-	3	25	75	100	4
MFEC606	Computer Aided Design	4	-	-	-	3	25	75	100	4
MFEP607	Modeling & Simulation laboratory	-	-	6	-	3	40	60	100	3
MFEP608	Materials Processing Laboratory	-	-	6	-	3	40	60	100	3
Total		24	-	12	-	-	230	570	800	30
Cumulative Total										145

L – Lecture; T – Tutorial; P – Practical; D – Drawing

VII SEMESTER

Code	Subject	Ins. Hrs./Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
MFEC701	Machine Tool Control & Automats	4	-	-	-	3	25	75	100	4
MFEC702	Operations Research	4	-	-	-	3	25	75	100	4
MFEC703	Non-Traditional Manufacturing Processes	4	-	-	-	3	25	75	100	4
MFEC704	CNC & Robotics	4	-	-	-	3	25	75	100	4
MFEE705	Elective I	4	-	-	-	3	25	75	100	4
MFEE706	Elective II	4	-	-	-	3	25	75	100	4
MFEP707	Metrology & Measurements laboratory.	-	-	6	-	3	40	60	100	3
	Project work	-	-	6	-	3	40	60	100	
	Seminar									
Total		24	-	12	-	-	230	570	800	27
Cumulative Total										172

L – Lecture; T – Tutorial; P – Practical; D – Drawing

VIII SEMESTER

Code	Subject	Ins. Hrs./Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
MFEC801	Machine Tool Design	4	-	-	-	3	25	75	100	4
MFEC802	Total Quality Management	4	-	-	-	3	25	75	100	4
MFEC803	Advanced Manufacturing Processes	4	-	-	-	3	25	75	100	4
MFEC804	Ethics in Engineering	4	-	-	-	3	25	75	100	2
MFEE805	Elective – III	4	-	-	-	3	25	75	100	4
MFEE806	Elective – IV	4	-	-	-	3	25	75	100	4
MFET807	Project work and Viva Voce	-	6	-	-	-	40	60	100	6
	Seminar	2	-	-	-	-				
Total		26	6	-	-	-	190	510	700	28
Cumulative Total										200

L – Lecture; T – Tutorial; P – Practical; D – Drawing

LIST OF ELECTIVES
(MFEE705/ MFEE706/ MFEE805/ MFET807)

1. Finite Element Methods in Manufacturing
2. Intelligent Manufacturing Systems
3. Surface Engineering
4. Non-Destructive Testing
5. Engineering Economics
6. Automotive Engineering
7. Modern Manufacturing Strategies

MFEC301 ENGINEERING MATHEMATICS II

AIM

The course aims to develop the skills of the students in the areas of boundary value problems and transform techniques. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

OBJECTIVES

At the end of the course the students would

- be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.
- have gained a well founded knowledge of Fourier Series, their different possible forms and the frequently needed practical Fourier analysis that an engineer may have to make from discrete data.
- have obtained capacity to formulate and identify certain boundary value problems encountered in engineering practices, decide on applicability of the Fourier series method of solution. Solve them and interpret the results.
- have grasped the concept of expression of a function, under certain conditions as a double integral leading to identification of transform pair, and specialization on Fourier transform pair, their properties, the possible special cases with attention to their applications.
- have learnt the basics of Z transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of difference equations and solve them using the Z transform technique bringing out the elegance of the procedure involved.

UNIT I: Partial Differential Equations

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - solution of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second order with constant coefficients.

UNIT II: Fourier Series

Dirichlet's conditions - General Fourier Series - odd and even functions - Half range sine series - Half range cosine series - Complex form of Fourier series Parseval's identify.

UNIT III: Boundary Value Problems

Solutions of one dimensional wave equation - One dimensional beat equation (without derivation). Fourier series solutions in Cartesian co-ordinates.

UNIT IV: Fourier Transform

Fourier integral theorem (without proof) - Fourier transform pair - Sine and cosine transforms - Properties - Transforms of simple functions - convolution theorem - Parseval's identify.

UNIT V: Z-Transform And Difference Equations

Z-transform - Elementary properties - Inverse Z-transform - Convolution theorem - Solution of difference equations using Z-transform.

Text Books:

1. Kandasamy.P, Thilagavathy.K and Gunavathy.K, "Engineering Mathematics" series, S.Chand & Co. Ltd., 2004, New Delhi.
2. Venkatraman.M.K. "Engineering Mathematics" series, The National Pub. Co., Chennai, 2003.

Reference Books:

1. Veerarajan.T, "Engineering Mathematics" series, Tata Mcgraw. Hill pub. Co., Ltd., New Delhi, 2002.
2. Singaravelu.A, "Engineering Mathemetics" Series, Meenakshi Publications, Chennai, 2004.
3. Wylie. C., Ray and Barrett Louis.C., "Advanced Engineering Mathmatics", McGraw-Hill Inc., New York.

MFEC302/PMFEC102 MATERIAL SCIENCE

OBJECTIVES

The main objective of this subject is to provide wide spectrum of knowledge about various metals and materials that are widely used in engineering application.

UNIT I Engineering Alloys

Classification, chemical composition, mechanical properties and applications of Low alloy steels - Aluminium alloys – Copper alloys – Stainless steels – Cast iron – Magnesium, Titanium and Nickel alloys – Materials selection for engineering designs using metallic materials.

UNIT II Polymeric Materials

Introduction – Processing of plastic materials – Thermo plastics – Thermosetting plastics – Elastomers – applications - Materials selection for engineering designs using plastic materials.

UNIT III Ceramic Materials

Introduction – Traditional and engineering ceramics – Electrical properties of ceramics – Mechanical properties of ceramics – Thermal properties of ceramics – Glasses – applications.

UNIT IV Composite Materials

Introduction –Fiber reinforced plastic composite materials - Fibers and matrix materials – Concrete – Asphalt and asphalt mixes – Wood – Sandwich structures – Metal matrix and ceramic matrix composites-applications

UNIT V Conducting and Magnetic Materials

Types of magnetism – Magnetization and Demagnetization of ferromagnetic metal – Soft magnetic materials – Hard magnetic material – Ferrites – applications.
Semiconductor materials – Conductor and resistor materials – Super conducting materials - Die electric materials – applications.

Text Book

1. Principles of Materials Science and Engineering, William F.Smith, Third Edition, McGraw-Hill, Inc., 1996.

Reference Books:

1. Engineering Materials Properties and Solution, Kenneth. G. Budinski, Michael K. Budinski, Prentice Hall International, 1999, 6th Edition.
2. Properties of Engineering Materials R.A. Higgins, Viva low priced student edition, 2nd Edition, 1998.
3. Materials Science and Engineering, V. Raghavan, Prentice Hall of India, 1991.

MFEC303/PMFEC103 THERMAL ENGINEERING

OBJECTIVES

To give an idea regarding the basic concepts and laws of thermodynamics and an in-depth knowledge of topics in thermal engineering like internal combustion engines, air compressors, steam turbines, refrigeration and air conditioning, and modes of air heat transfer.

UNIT I

Thermodynamics - Definition - heat and work - open system and closed system - state, property and change of state of a system - properties of vapor - internal energy - entropy, dryness fraction - Calorimeter for determination of dryness fraction.

UNIT II: Internal Combustion Engines

Cycles of operation - Otto, Diesel and Semi-diesel - calculation of air standard efficiency and relative efficiency - Indicator diagram - Power and Mechanical efficiency - performance curves - heat balance - problems.

UNIT III: Air compressors

Reciprocating air compressor - single and multistage compression - inter cooling - calculation of main dimensions - Effect of clearance volume - Volumetric efficiency.

UNIT IV: Steam Cycles

Rankine cycle with reheating and regenerating, feed heating, steam turbines - details - compounding of turbine - velocity diagram - blade efficiency - reaction turbine - height of blade and diameter of drum.

UNIT V: Heat transfer

Primary modes of heat transfer - basic laws of conduction, convection and radiation - simple problems - refrigeration and air-conditioning - General principles of refrigeration - C.O.P calculations of psychometric chart - air conditioning methods.

Text Books:

1. Thermal Engineering, Khurmi R.S., S.Chand & Co., New Delhi.
2. Thermal Engineering, Ballaney P.L., Khanna Pub., New Delhi. 1997.

Reference Books:

1. Engineering Thermodynamics,Gupta C.P and Rajendra Prasad,
2. Engineering Thermodynamics, Spalding and Cole, ELBS.

MFEC304/PMFEC105 FLUID MECHANICS & MACHINERY

OBJECTIVES

To make the student understand the basic topics in fluid mechanics and hydraulic machinery like properties of fluids, pressure measurement techniques, types of flows, dimensional analysis, hydraulic turbines and pumps and their working characteristics

UNIT I

Introduction to fluid mechanics – Properties of fluid – Pressure in a fluid – Manometers – Real and ideal fluids – compressible and incompressible fluids – Pressure measurements – total pressure – Centre or pressure – total force on a plane submered area – forces on irregular surfaces – Buoyancy and static stability – Metacentre.

UNIT II

Path lines and stream lines – Types of flows – one dimensional flow analysis – General continuity equation – steady flow equation of continuity – Euler's equation, Bernoulli's equation – Orifice meter, Venturimeter and pitot tube. Application.

UNIT III

Boundary layer – laminar and turbulent flow separation – Transition – flow through pipes – Buckingham ∏ theorem – non – dimensional numbers – Reynolds number – Froude numbers, Weber number, Euler's number and Mach number.

UNIT IV

Pressure of a jet a stationary and moving curved blades – impulse and reaction turbines – Pelton wheel – velocity diagram for impulse turnine – hydraulic, mechanical and overall efficiency – reaction turbines – types – Francis and Kaplan turbine – velocity diagrams – draft tubes – specific speed – cavitation.

UNIT V

Centrifugal pump – casing – velocity diagrams – manometric and hydraulic efficiency – minimum speed for starting a pump – specific speed. Reciprocating pump – slip and co-efficient of discharge – velocity diagrams – effect of friction and velocity & acceleration on pipes – air vessels – hydraulic appliances.

Text Books:

1. A Text Book of Fluid Mechanics and Hydraulic Machinery, Bansal R. K., Lakshmi Publications, Madras.

Reference Books:

1. Hydraulics and Fluid Mechanics, Modi P.N., Standard Book House, NewDelhi,1992.
2. Fluid Mechanics and Hydraulics Machinery, Khurmi R. S., S. Chand and Co. New Delhi,1991
3. Fluid Mechanics and Hydraulics Machines, Jagdish Lal, Metropolitan Book Co. Pvt.Ltd., New Delhi, 1991.

MFEC305/PMFEC104 MECHANICS OF MATERIALS

OBJECTIVES

It is an allied discipline to prepare a theoretical laws for designs and tooling in general and to understand their application in manufacturing engineering.

UNIT I

Elementary ideas about Stress and Strain - Mechanical Properties of Engineering materials - Classification of loads - Stress - Strain diagrams for brittle and ductile materials - Luder's lines - Hook's law - Shear stress - Shear strain - Poisson's ratio - Elastic constants - Deformation of axially loaded Straight bars and bars of varying Sections - Composite bars - Thermal stresses.

UNIT II

Strain energy and Impact loading - Definitions - Strain energy stored in a body due to a load applied gradually, suddenly and with impact - Strain energy stored in a body due to Shear stress. Principal planes - Principal stresses and strains - Maximum Shear stress - Mohr's Circle for stresses and strains.

UNIT III

Bending moment and Shear force - cantilever, simply supported and overhanging beams with different types of loading - Bending moment and Shear force diagrams - Point of Contraflexure. Bending stresses in beams - Neutral axis and Moment of Resistance - Bending stress distribution for symmetrical, unsymmetrical and composite beams. Shearing stresses in beams of different sections. Deflection of determinate beams - Double integration and Macaulay's methods.

UNIT IV

Torsion - Theory of pure torsion of circular shafts - Maximum torque transmitted by solid and hollow circular shafts - Horse power transmitted - Polar moment of inertia - Polar modulus - Torsional rigidity - Composite shafts - Combined bending and torsion - Strain energy stored due to torsion.

Springs - Definitions - Laminated springs - Close and open coiled helical springs - Axial deflection - Angle of twist - Strength and Stiffness - Strain energy stored due to torsion.

UNIT V

Simple machines - Definitions - Ideal machine and Frictional losses - Reversibility of machines - Law of the machine - Maximum mechanical advantage and efficiency of a machine - Levers - Pulleys - Screw jack - Simple Wheel and Axle - Differential Wheel and Axle - Differential Pulley block - Worm and Worm Wheel - Handle Winch.

Text Books:

1. Strength of Materials, Bansal R.K., Lakshmi Pub., 1988.
2. Strength of Materials, Sadhu Singh P., Khanna Pub, New Delhi, 1990.
3. Strength of Materials, Rajput R.K., S.Chand & Co., New Delhi, 1999.

Reference Books:

1. Strength of Materials, Ramamrutham S., Dhanpat Rai & Sons, New Delhi, 1995.
2. Strength of Materials, Timoshenko S.& Young D.H., East West Press, New Delhi 1968.
3. Strength of Materials, Khurmi R.S., S.Chand & Co., New Delhi, 1995.

MFEC306/PMFEC301 ELECTRICAL & ELECTRONICS ENGINEERING

OBJECTIVES

To impart a sound understanding of the principles of electrical and electronics engineering with an emphasis on concepts and quantitative approach.

UNIT I

D.C Motors – Principles of operation – back emf – lap and wave windings – commutator – speed and torque equations – methods of speed control – speed torque characteristics of series, shunt and compound motors – efficiency – swinburne's test – applications of d.c. motors – starters – necessity and use - types of starters and connections.

UNIT II

Transformer – working principle – phasor diagram for no load and loaded conditions – equivalent circuit – O.C and S.C tests – efficiency and voltage regulation – Auto transformer – Three phase transformers – constructional features – connections – line voltage and current relations.

UNIT III

Three – Phase induction motors – types – principle of operation – rotating magnetic field – Synchronous speed and slip - equivalent circuit – torque slip characteristics – starters – single phase induction motors – principle of operation – types – starting methods – applications.

Alternators – principle of operation and constructional features – salient and non-salient pole machines – voltage regulation – emf method – synchronous motors – phasor diagram – power factor control – applications.

UNIT IV

P-N Junction – characteristics and uses of semi conductor devices: diode, photo diodes, zener diodes, BJT, FET, UJT & SCR, rectifier circuits – Half wave, full wave and bridge – filters – zener voltage regulators

UINT V

Transistorised amplifiers and oscillators: Classification and characteristics – Voltage, current and power gain – frequency response – Audio amplifier – principle of negative feedback – emitter follower – power amplifier – class A,B,C – applications – oscillators – R C phase shift – Hartley and UJT oscillators.

Text Books:

A Text Book of Electrical Technology, Theraja B.L., S. Chand & Co., New Delhi 1993.

Reference Books:

1. A Text Book of Electrical Machines, Rajput R.K., Lakshmi Publications., 1988
2. Principles of Electronics, Metha V. K., S. Chand & Co., New Delhi, 2000

MFEP307 ELECTRICAL LABORATORY

OBJECTIVES

- To understand the theoretical and practical aspects of electrical equipments through a variety of experiments.

- The syllabus is to cover experiments in the theory syllabus under FT436. The experiments will include D.C and A.C machines & Transformers and will be decided by the Heads of the Departments of Manufacturing Engineering and Electrical Engineering.

MFEP308 MECHANICAL LABORATORY

OBJECTIVES

- This course includes the experiments on study and performance tests on IC engines, Journal bearing, cam and followers and governors. The learner is also made to understand the principles of balancing, vibration and moment of inertia with the help of simple experiments.

Performance of Governors, Balancing of rotating parts, Vibration Experiments – free, forced, transverse and torsion. Moment of Inertia determinations for flywheel and connecting rod. Study of gear trains, cams, followers. Cam analysis experiment. Journal bearing pressure distribution.

Study and valve timing/ port timing of four stroke and two stroke I. C. Engines – Performance tests on I. C. Engines.

MFEC401 PROBABILITY AND STATISTICS

Objectives

- At the end of the course. the students would acquire skills in handling situations involving more than one random variable and functions of random variables.
- Be introduced to the notion of sampling distributions and have acquired knowledge of statistical techniques useful in making rational decision in management problems.
- Be exposed to statistical methods designed to contribute to the process of making scientific judgments in the face of uncertainty and variation.

Unit-I

Measures of central tendency, dispersion, moments, skewness and kurtosis.

Theory of probability - Laws of addition and Multiplication of probabilities - Independent events Baye's theorem and its applications.

Unit-II

Random variable - Distribution function - Probability mass function - Probability density function - Joint and Marginal probability density function - Conditional distribution function - Mathematical Expectation Moment Generating function - Characteristic function and its properties - Chebycheffs Lemma.

Regression and Correlation Analysis.

Unit-III

Discrete distribution - Binomial, Poisson, Geometric and Hyper Geometric distributions.

Continuous distributions - Uniform. Normal. Gamma. Exponential. Cauchy and Beta distributions.

Unit-IV

Testing of hypothesis - Level of significance - Large sample tests - small sample tests based on Z, t, F and Chi - square distributions, interval estimates of mean, S.D. and proportion.

Unit-V

Definition of Reliability - Hazard rate and mean time to failure - Exponential and Weibull failure models system reliability - series system, parallel system.

Text Books

1. Gupta. S.C. and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and sons, Delhi 1996.
2. Irwin Mille, John E. Freund - Probability & Statistics for Engineers, EEE(PHI) 1990.

Reference Books

1. Govil, A.K., Reliability Engineering, Tata McGraw Hill, New Delhi, 1983.
2. Helston. C.W. - Probability and Stochastic Processes for Engineers, MacMillan Publishing Company, New York 1991.
3. Srinath, L.S. – Reliability, East West Press Ltd.1991.

MFEC402/PMFEC401 INDUSTRIAL MANAGEMENT

OBJECTIVES

- To introduce the students to different functional areas in industrial management including engineering economics and industrial psychology.

UNIT I

Engineering economics - nature and scope of managerial economics - basic economic tools in managerial economics - decision and efficiency analysis. Consumer behaviour - law of demand and supply - elasticity - determinants - uses. Pricing under different market conditions: Monopoly - monopolistic competition - oligopoly, pricing policies - Porter's five forces - model of competition. Financial markets: Primary and secondary markets - money market instruments - capital market instruments. National income - concepts. Trade and development: Free trade versus protection - balance of payments - globalisation - W.T.O.

UNIT II Industrial psychology

The significance of individual differences in industry.

Personnel selection

Selection process - preliminary interviews - application blanks - interview - reference check. The general principles of personnel testing - aptitude - personality - interest - intelligence. Training of industrial employees - determining training needs - training objectives - methods - types - measurement of training. Industrial accidents - factors - prevention - safety measures. Industrial fatigue - nature - methods of reduction.

UNIT III Elements of management:

Principles of management - Functions of management - Scientific management - Contributions of Taylor, Gilberth, Gantt- Forms of business organisation - line, functional, line and staff organisations - Industrial ownership - single, partnership, joint stock company, co-operative organisations, state and central government owned.

Costing

Objectives of cost accounting and cost estimation - Elements of costs - factory cost - estimation of selling price - apportionment of overheads - Allocation of overheads - Introduction to activity based costing.

UNIT IV

Breakeven analysis - concept and applications - Profit - volume chart. Depreciation - straight line and declining balance method. - Basic concepts of value engineering and value analysis - Applications.

UNIT V

Job evaluation - objectives, procedure - methods of job evaluation - Ranking, classification, factor comparison, point method - Merit rating - objectives - methods - Rating scale, check list, employee comparison method.

Wages

Methods of payment of wages - wage incentives - wage incentive plans - Straight piece rate system, Taylor's differential piece rate system, Merrick differential piece rate system, Halsey's premium plan, Rowan's plan - Incentives for indirect workers - Profit sharing.

Text Books:

1. Industrial Engineering, Kumar. B, Khanna Publications, 1995.
2. Industrial Psychology, Joseph Tiffin and Ernest J. McCormick E.J., Prentice Hall India, sixth edition, 1979.
3. Applied Economics for Managers and Engineers, Jain. S. K, Vikas Publishers, 1997.

Reference Books:

1. Mechanical Estimating and Costing, TTTI Madras, Tata McGraw Hill.
2. Industrial Engineering and Management Science, Sharma S.C.,Banga T.R., and Agarwal N.K., Khanna Pub., New Delhi, 1998.
3. Industrial Organisation and Psychology, Von Maller Cilmer B.,
4. Managerial Economics, Mehta P.L., Sultan Chand & Sons, 1995.
5. Money, Banking, Trade and Public Finance, Vaish M.C., New Age International (P) Ltd., 1996.

MFEC403/PMFEC403 MECHANICS OF METAL MACHINING

OBJECTIVES

- The objective is to provide an understanding of the mechanics of metal machining which includes a study on tool geometry, mechanics of chip formation, tool materials and tool failure analysis.

UNIT I

Tool geometry - Cutting tool geometry for turning, drilling and milling tools - Tool signature - Tool designation: ASM, DIN, British - their relationships.

UNIT II

Mechanism of chip formation – Continuous and discontinuous chips - Built up edge formation - Deformation of chips - single shear plane theory - Chip formation in drilling and milling - Chip breakers.

UNIT III

Introduction to oblique and orthogonal machining. Mechanics of metal cutting : The force system - Velocity relationship - Forces in turning, drilling and milling - Relationship between forces, cutting speed, feed and depth of cut-Theoretical and experimental determination of cutting forces - Working principles of tool dynamometers for turning, drilling and milling operations

UNIT IV

Tool materials : HSS, Carbide and coated tools - Advances in tool Materials: CBN, ceramic, PCD - Cutting fluids : Characteristics, types, methods of application

UNIT V

Tool failure : Mechanisms of tool wear – machinability Index – Taylor's tool life equation – Effect of cutting parameters on tool life – measurement techniques for tool wear – tool economics – basic concepts – simple problems.

Text Books:

1. Metal Cutting - Theory and Practice, Bhattacharya A., 1989, Central Book Publishers.

Reference Books:

1. Principles of Metal Cutting, Kuppusamy. G, University Press - 1996.
2. Metal Cutting Principles, Shaw.M.C, I.B.H Publishers 1992.
3. The Machining of Metals, Armarego E.I.A and Brown R.H, Prentice Hall, 1969
4. Fundamentals of Metal Machining, Boothryd G., Tata McGraw Hill, 1982.

MFEC404/PMFEC202 MECHANICS OF MACHINES I

OBJECTIVES:

- To introduce as a tool for static analysis of mechanisms for use in design and engineering.

UNIT I

Kinematics of a particle - Rectilinear motion - uniform motion, uniformly accelerated motion, motion of several particles - Plane curvilinear motion - rectangular coordinates, motion of projectiles, normal and tangential coordinates, polar coordinates.

UNIT II

Kinetics of particles: Force, mass and acceleration - Newton's second law - Dynamic equilibrium - system of particles - D'Alembert's principle Work energy method: Principle of work and energy - conservation of energy. Impulse momentum method: System of particles - Conservation of linear momentum - Impact - direct central impact, oblique central impact.

UNIT III & IV

Kinematics - links, pairs and mechanisms. Constrained motion - Completely constrained - quadratic cycle chain - single, double and cross slider crank chain - Inversion - mechanisms obtained by inversion - Oldhams coupling - quick return motions

.

Determination of velocity - Relative velocity method, velocity diagrams for different mechanisms. Instantaneous centre - types - Kennedy's theorem - velocity analysis by instantaneous centre method. Determination of acceleration - Acceleration diagram for different mechanisms - concept of Corioli's component - Klein's construction for reciprocating engine mechanism - Analytical method for reciprocating engine mechanism.

UNIT V

Cams - Layout of cam profile for uniform velocity, simple harmonic, cycloidal and uniform acceleration and retardation with reciprocating and oscillating motions - followers of different types - knife edged, roller and flat - Calculation of maximum velocity and acceleration of follower.

Text Books:

1. Engineering Mechanics, Meriam J.L., and Kraige L.G., Vol.II - Dynamics (SI version), John Wiley & Sons, New York, 1996.
2. Engineering Mechanics, Kumar K.L., TMH, New Delhi, 1998.
3. Theory of Machines, Rattan S.S., Tata McGraw Hill, 1993.
4. Mechanics of Machines, Ramamurthi. V, Narosa Publishers, New Delhi, 2002

Reference Books

1. Engineering Mechanics, Dynamics, Hibbeler M., Macmillan Publishing Co. Inc, 1983.
2. Vector Mechanics for Engineers, Dynamics, Beer F.P., and Johnson E.R., TataMcGraw Hill, 1997.
3. Theory of Machines, Ballaney P.L., Khanna Publishers, 1998.
4. Theory of Machines, Khurmi R.S., Eurasia, 1998
5. Theory of Machines, Thomas Bevan, CBS Publishers, 1998.
6. Mechanisms and Machines, Amitabha Gosh and Ashok Kumar Malik., EWP, 1998.
7. The Theory of Machine through Solved Problems, Rao J.S., New Age International Pvt. Ltd., 1996.

MFEC405/PMFEC204 MEASUREMENTS IN MANUFACTURING PROCESSES

OBJECTIVES:

- To make the beginners understand the basics and needs of measuring instruments used in the field of engineering to measure temperature, pressure, displacement, force, torque, vibration, acceleration, noise and the procedure adopted during the calibration of some of the above instruments and to introduce the basic concepts of automation in measurements.

UNIT I

Need for measurement system - Generalised measurement system - Basic standards of measurement - Errors - classification.

Measurements of displacement, force and torque - Dynamometers - mechanical, hydraulic, pneumatic, absorption and electrical current dynamometers. Measurement of strain - bonded and unbonded strain gauges - Requirements of materials. mechanical, electrical, optomechanical strain gauges.

UNIT II

Objectives of Metrology - Standards for linear measurement - Line standard - End standard - Wave length standard - Methods of comparing standards, Slip gauges – manufacture, calibration and uses. Optical flats.

Characteristics of precision measuring instruments - Vernier instruments - various types of vernier calipers - vernier height gauge - Micrometer - inside micrometer - Stick micrometer - dial micrometer - optical levers - Toolmaker's microscope - Length bar measuring machine - Newall measuring machine. Different types of comparators – mechanical, electrical & electronic. - Pneumatic and mechanical & optical comparators - Solex pneumatic gauge - Differential comparators

UNIT III

Measurement of angles - angular slip gauges - Use of angle gauges - Calibration of angle gauges - Rotary dividing heads - Auto Collimators - Angle dekkor. Measurement of surface finish - Terminology as per Indian standards - methods of measuring & surface finish - Measuring means-Stylus probe instruments - Tomilson surface meter – Talysurf - measurement of roundness.

UNIT IV

Screw threads Terminology - Errors in threads - Measurement of various elements of thread - Methods of measuring effective diameter - measurement by micrometer - two and three wire methods - Measurement of effective diameter of internal threads - Checking the thread form and angle by optical projection method - Terminology of Gear tooth - Measurement of tooth thickness by constant chord method - Base tangent method-Base pitch measuring instrument - plug method for checking pitch diameter and tooth spacing -Gear checking by Parkinson gear tester.

UNIT V

Measurement in production - In process gauging and control - Mechanical, electrical and pneumatic devices - Machine vision system - fundamentals and applications - Alignments tests on Lathe, milling machine, drilling machine, shapers and surface grinder.

Text Books:

1. Engineering Metrology, Jain R.K., Khanna Publications, New Delhi, 1994.
2. Engineering Precision Metrology, Gupta Khanna R.C., Khanna Publications, New Delhi.
3. Mechanical Measurements, Hollman., Tata-McGraw Hill, New Delhi.
4. Automotive Control Systems, Kuo B.C., PHI, New Delhi, 1991.

Reference Books:

1. Hand Book of Industrial Metrology - ASTME Publications. 1988
2. A Text Book of Metrology, Mahajan M., Dhanpat Rai & Co(Pvt) Ltd.
3. Metrology and Gauging, Parson S.A.J., Macdonald & Evans Ltd, London.
4. Engineering Metrology, HUME
5. Precision Measuring Instruments, JUDGE.
6. Metrology for Engineers, Galyer J.F.W - Shotbolt C.R, Cassell Publications, London, 1993.
7. Mechanical Measurements, Beckwith T.G., Buck N.L., and Marangoni R.D., Narosa Publications, New Delhi, 1995.
8. Mechanical and Industrial Measurements, Jain R.K., Khanna Pub., 1976

MFEC406/PMFEC303 MACHINE TOOL TECHNOLOGY

OBJECTIVES

- To provide an understanding of the types, functional features and uses of metal cutting machine tools.

UNIT I Lathe

Engine lathe parts, Lathe Accessories, Cutting speed, feed, and depth of cut, Lathe safety, Mounting, removing, and aligning lathe centers, Grinding cutting tools, Machining between centers - knurling, grooving, and form turning - Tapers and taper turning - Threads and thread cutting - Steady rest, follower rest, and mandrels - Machining in a chuck - Drilling, Boring, Reaming, and Tapping.

UNIT II Shaper, Planer and Slotter

Working principle - principal parts - specifications - classifications - different drive mechanisms - methods of working - work holding devices.

Gear manufacturing - Generating process, hobbing, shaping - bevel gear generators - gear finishing process

Turret and Capstan lathes - types - operating principles - principal parts, attachments and accessories

UNIT III Milling Machines

Specifications - classification of milling machines, principle of operation and functions - attachments and accessories - Types of milling cutters - methods of milling - dividing heads - common methods of indexing - various operations performed on milling machines

Broaching

Broaching - advantages and limitations of broaching - broaching tool - classification of broaching machines and their principles - machine size - finish and accuracy - broaching characteristics - broaching length and machine time

Sawing

Classification and their working principle

UNIT IV Drilling Machines

Specifications of drilling machines - operations performed - classification - cutting speed and feed - machine time in drilling

Boring machines: classification - machine size - machine time. Jig boring: description - types - hole location, procedure - locating, cutting and checking

UNIT V Grinding

Abrasives - types - manufacture of artificial abrasives - efficiency of abrasive particles - manufacture of grinding wheel - bonding process - moulding process - wheel selection - wheel truing and dressing - grinding machines - types and classifications - operating principles - roll grinders - Jig grinding – micro finish - honing, lapping – super finishing - buffing and polishing

Text Books

1. Technology of Machine Tools, Krar S.F and, Check A.F, TMH, New Delhi, 1998.
2. Manufacturing Science & Technology, Suresh Dalela., Vol.I & II, Umesh Publications, 1997.

Reference Books

1. Production Technology, Jain R.K., Khanna Publications,New Delhi, 1995
2. Elements of Workshop Technology Hajra Choudhry, Media Promoters & Publications Pvt. Ltd,1994
3. Production Technology, HMT, TMH Publication Co. Ltd, 1996
4. Manufacturing Engineering & Technology (3 rd Edition), Kalpakjian. S, Addition Wesley Inc. 1997.

MFEP407 PROGRAMMING LABORATORY

OBJECTIVES

- To make the students understand the concept of local area network and its management. Hands-on experience in programming with C and C++ programming is provided

LAN – Introduction – File server – Nodes – Sharing the Resources – System configuration – Some important Netware commands – Login and logout.
Exercise to compile, Link and run C and C++ programs invoking Turbo C++ - Details of the IDE screen – Main menu editor window, message – status line – Explanations – creating source file – Compiling, linking and running – Managing errors – short cuts using function keys – simple programs.

MFEP408 MACHINE SHOP & FOUNDRY PRACTICE

OBJECTIVES

- To develop procedural and manual skills in machining, and also to provide training in making greensand moulds.

Lathe exercises: Study of cutting tools and speeds - Practice in cylindrical turning, taper turning, facing, knurling, external thread cutting, drilling, boring, internal taper turning, internal thread cutting, eccentric turning.
Foundry exercises: Preparation of moulds for simple objects with or with out cores – demonstration of machine moulding.
Wood turning: Simple exercises in wood turning.

MFEC501/PMFEC404 METAL JOINING PROCESSES

OBJECTIVES

- To introduce the different welding power sources and to provide an understanding of the various welding processes and their applications

UNIT I

Basics of arc welding processes - Classification of welding and allied Processes - Welding arc: physics involved in arc, structure and characteristics, arc efficiency calculation, methods of arc initiation and maintenance, arc stability, arc blow - Arc Welding Power Sources: V-I characteristics, constant current and constant voltage characteristics, duty cycle, simple problems, welding transformers, generators, rectifiers, inverters; Classsification of electrodes - Metal Transfer: forces affecting metals transfer - modes of metal transfer.

UNIT II

Arc welding processes-Basic principles, Process variables, Chief characteristics and applications of the following processes: Shielded(Manual) Metal Arc Welding (SMAW/MMAW) - Submerged Arc Welding (SAW), Gas Tungsten Arc Welding (GTAW), Gas Metal Arc Welding (GMAW), CO_2 welding, Flux cored Arc Welding (FCAW), Electro Slag and Electro Gas Welding - Atomic Hydrogen Welding.

UNIT III

Resistance welding processes Basic principle, Process variables, Welding Sequence, Process characteristics and applications of the following processes: Spot welding, simple problems - Seam welding - Projection welding - Percussion welding - Resistance Butt welding - Flash Butt welding - High Frequency Resistance Welding (HFRW) and High Frequency Induction Welding (HFIW)

UNIT IV

Solid state welding processes, Basic principles, Process parameters, Process characteristics and applications of the following Processes: Forge welding - Cold welding - Cold pressure welding - Friction welding -Explosive welding - Ultrasonic welding - Diffusion Bonding.

UNIT V

Allied processes: Basic principles, Process variables, Chief characteristics and applications of the following processes: Electron Beam Welding (EBW) - Laser Beam Welding (LBW) - Thermit welding and Pressure Thermit welding and Pressure welding - Gas welding - Soldering - Brazing - Adhesive Bonding - Welding of plastics.

Text Books

1. Welding Processes and Technology, Parmar R.S., Khanna Publishers, New Delhi. 2007.
2. Welding and Welding Technology, Little R.L., Tata McGraw Hill Publishing Company Limited, New Delhi. 1990.

Reference Books

1. Modern Arc Welding Technology , Nadkarni S.V., Oxford & IBH Publishing Co.Pvt.Ltd., NewDelhi. 1996.
2. Welding Technology, Khanna. O.P Dhanpat Rai & Sons Publishers, New Delhi. 1993.
3. Welding Hand Book, Welding Process, Vol.II,8th Edition, American Welding Society,1991.

MFEC502/PMFEC501 INDUSTRIAL ENGINEEING

OBJECTIVES

- To impart knowledge to the students on the applications of Industrial Engineering, to provide an understanding of the traditional approaches for managing operations, and to introduce both qualitative and quantitative techniques used in management decision making process.

UNIT I Plant Location

Locational objectives - Factors influencing locational choice - Locational models - Dimensional analysis, breakeven model, qualitative factor rating method, Brown - Gibson model.

UNIT II Plant Layout

Need for layout planning - Layout objectives and determinants - Types of layout - Process, product, fixed position, group layout - Comparison - Layout selection for process layouts - Simple graphic approach, travel chart, operations sequence analysis, load - distance analysis, Muthur - grid technique - computer based layout planning - CRAFT (Description only of algorithm and flowchart) - Line layouts for product layouts - Line balancing methods - Largest candidate rule, Kilbridge and Wester method - COMSOAL (Description only of the algorithm).

UNIT III Work Study

Structure and objectives of work study - method study - Basic procedure for method study - recording methods - process charts, multiple activity charts, - flow diagrams, String diagram, SIMO chart, memo motion, cycle graph, chrono cycle graph - Recording procedures - Principles of motion economy. Work measurement : Basic procedure of work measurement - Time study - types of elements, rating, systems of rating, allowances, estimation of standard time - Work sampling – PMTS.

UNIT IV

Purchasing functions - Single versus multiple sourcing - Vendor performance rating - Methods - catagorical plans, cost - ratio plan, weight point plan - Make - or - buy decisions - Learning curve - concepts and applications - Stores management - functions - Methods of pricing - (FIFO, LIFO, weighted average, HIFO) - Stores layout and location system - Classification and codification of materials in stores.

UNIT V Maintenance

Objectives - Forms of maintenance - Preventive, breakdown and corrective - Preventive and breakdown maintenance costs - Expected value model for estimating breakdown cost - Probability model for selecting preventive maintenance policy - guides to preventive maintenance policy - spare parts planning - maintenance, insurance and capital spares - Introduction to TPM.

Text Books:

1. Operations Management, Monks G.J., McGraw Hill, 1987.
2. Theory and Problems in Operations and Production Management, Chary S.N., Tata McGraw Hill, 1994.

Reference Books:

1. Modern Production/Operations Management, Buffa E.S., and Sarin R.K., - John Wiley, 1994.
2. Production and Operations Management - Principles and Techniques , Ray Wild, - ELBS.
3. Introduction to Work Study, ILO, Oxford & IBH Pub. Co. New Delhi, 1991.
4. Maynard's Industrial Engineering Hand Book, Hadson W. K. et al, McGraw Hill, 1992.
5. Industrial Engineering and Management, Hicks P.E., McGraw Hill,1992.
6. Production and Operations Management, Adam E.E. and Ebert R., PHI, 1992.

Work study, Shan H.S., Dhanpat Rai & Sons, 1992.

MFEC503/PMFEC304 CASTING TEHNOLOGY

OBJECTIVES

- To impart an understanding about the different traditional and modern casting techniques.

Unit I Sand

Moulding sands - properties - additives used, Control of moulding sands. Moulding Types of moulding - moulding processes, instruments used for different methods. Moulding materials - quality moulds - dressing of moulds.
Moulding machine.

Pattern

Types of pattern - pattern materials - pattern allowances - pattern making machinery. Core: Purpose of cores - preparation of cores - core materials and additions - core dressing, effect on castings - location and fixing.

Unit II Melting

Melting furnaces - Ferrous and non-ferrous metals - Charging operation in cupola - Dissolved gases in molten metal, degassing methods - Analysis and composition of the metal ladle - Fluxes, Effect of inoculation

Unit III

Pouring and feeding - Solidification of metals - Equilibrium diagram - Feeding systems - Design of runners and risers - Cooling rates of different sections, casting defects and remedies - Stresses in casting and relieving operations.

Unit IV Foundry Mechanisation

Moulding - Core making Sand conditioning - Removal of moulds - Pouring methods - Shaking out - Core cleaning, fettling, and handling Testing: Sand testing, moulding testing - Testing of casting – Instrument sand equipments used for testing and inspection.

Unit V Centrifugal Casting

Semi centrifugal and centrifuging processes - Die casting - Die casting alloys and metals - Dies, hot and cold chambers processes - Die casting machines - Investment casting, Shell moulding.

Text Books:

1. Casting and Forming Process, Campbell, McGraw Hill - 1997.
2. Principles of Metal Casting, Heine R.W., Rosenthal P.C., & Loper C.R.,Tata McGraw Hill - 1997.

Reference Books:

1. Principles of Foundry Technology, Jain P.L, Tata McGraw Hill- 1997
2. Fundamentals in the Design and Production of Casting. Merck, McGraw Hill
3. Foundry Engineering, Banga T.R, Agarwal R.E, Tahil Manghrani, Khanna Publishers,New Delhi, 1992.

MFEC504 / PMFEC302 MECHANICS OF MACHINES II

OBJECTIVES

To introduce as a tool for dynamic analysis of mechanisms for use in design and engineering.

UNIT I : Friction

Frictional loss of power in journal, pivot and collar bearings, Clutches single plate, multiple plate and cone clutches - Belt and rope drives - Brakes - Band and block, pin anchored type - Principle of internal expanding shoe brake and disc brakes.

UNIT II : Turning Moment

D'Alembert's Principle - Inertia force, calculation of turning moment in reciprocating engines, coefficient of fluctuation of energy, coefficient of fluctuation of speed - Flywheel for punch press.

UNIT III : Balancing

Static and dynamic balancing of rotating masses - balancing of reciprocating masses - partial balancing of multi cylinder in line, V and radial engines.

UNIT IV : Vibrations

Linear and angular vibration of single degree of freedom system, free, damped and forced vibrations - Torsional vibration of two rotor system and equivalent shaft - Whirling of shafts - critical speed of rotating shaft with a single rotor.

UNIT V : Governors

Governors – function of governors – Porter, Proell and spring loaded governors – stability and isochronism-calculation of equilibrium speeds and range of speed of governors.

Text Books:

1. Theory of Machines, Rattan S.S., Tata McGraw Hill, 1993.
2. Mechanics of Machines, Ramamurthi. V, Narosa Publishers, New Delhi, 2002

Reference Books:

1. Theory of Machines, Ballaney P.L., Khanna Publishers, 1998.
2. Theory of Machines, Khurmi R.S., Eurasia, 1998
3. Theory of Machines, Thomas Bevan, CBS Publishers, 1998.
4. Mechanisms and Machines, Amitabha Gosh and Ashok Kumar Malik., EWP,1998.
5. The Theory of Machine through Solved Problems, Rao J.S., New Age International Pvt., Ltd., 1996.

MFEC505/PMFEC402 ENGINEERING METALLURGY

OBJECTIVES

To impart fundamental knowledge on metals engineering with an introduction to the structures, properties and various processes relevant to this topic.

UNIT I

Unit cell, Crystal systems, BCC,FCC & HCP structures, Crystallographic planes & direction, Miller indices, Crystal imperfections - point, line & area defects. Grain size ASTM grain size number, grain size measurement. Constitution of alloys, compounds & solid solutions, Gibbs phase rule, lever rule, isomorphous, eutectic, eutectoid, and peritectic systems. Metallography - metallurgical microscope - preparation of specimen, micro & macro examination.

UNIT II

Iron - Carbon equilibrium diagram, Plain carbon steels - effect of C, Mn, Si, P & S. Purpose of alloying, effect of important alloying elements. - Important low alloy steels, stainless steel, tool steels - types, compositions and applications ; Cast iron - types, composition and applications.

UNIT III

Heat treatment of steel: Isothermal transformation diagram - Continuous cooling transformation diagrams, full annealing, stress relief annealing, spheroidzing, normalizing, Hardenability and Jominy end quench test- Austempering and martempering - case hardening, carburising, nitriding, cyaniding, and carbon nitriding, flame hardening, induction hardening, vacuum hardening and cryogenic treatment.

UNIT IV

Non ferrous metals: Aluminum alloys, Copper alloys, Nickel alloys, Titanium alloys – Properties and applications.

Powder metallurgy : Process fundamentals, production of metal powders, characteristics, powder blending, compacting, Sintering, applications

Corrosion - Factors influencing corrosion, pitting corrosion, cavitation corrosion, cervice corrosion, fretting corrosion, inter - granular corrosion - corrosion prevention.

UNIT V

Mechanical behaviour of materials: Tensile behaviour: engineering stress, engineering strain, true stress, true strain, Stress – strain curve, Yield point phenomenon, strain aging. Impact behaviour: Charpy and Izod impact testing, DBT curve. Hardness: Brinell hardness, Rockwell hardness, micro hardness testing; Fatigue beaviour: Stress cycles, S-N curves, fatigue crack initiation, fatigue crack propagation; Creep behaviour: creep curve, creep mechanisms, deformation mechanism maps, Simple problems.

Text Books:

1.Introduction to Physical Metallurgy, Sydney H. Avner S.H, Mc Graw Hill Book Co., 1998.
2.Engineering Metallurgy - Part I, Applied Physical Metallurgy, Higgins R. A., ELBS. 1983.

Reference Books:

1. Metallurgy for Engineers, Rollason, E.C., ELBS.
2. Engineering Metalllurgy, Nayak S.P., Charotar Book Stall
3. Powder Metallurgy, Sinha A. K., Dhanpat Rai & Son,New Delhi,1995
4. An Introduction to Metallic Corrosion & its Prevention, Raj Narayan, Oxford & IBH, NewDelhi, 1983.

MFEC506/PMFEC203 DESIGN OF MACHINE ELEMENTS

(Use of approved Design Data Book is permitted in the examination)

OBJECTIVES

To impart knowledge of the fundamentals of mechanical engineering design like standardization, properties of materials, economics of design and introduces the learner to the design procedure of machine elements, like shafts, couplings, springs, gears, bearings and belts, subjected to both static and variable loads.

UNIT I

Introduction - Fundamentals of mechanical design – Selection of materials – Factor of safety- Failure theories - Limits, Fits, Tolerance and Surface Finish -Limits - fits and tolerance - hole basis system - shaft basis system - types of fits - selection of fits and applications - types of tolerance of form and position - indication of tolerances and fits on the drawing - roughness, waviness and lay - production methods and surface quality- Symbols for lay.

UNIT II

Static and variable stress analysis: Static strengths – Stress Concentration – Fatigue strength – S/N diagram – Low cycle –High cycle fatigue – Endurance limit – Modifying factors – Fluctuation stresses – Soderberg and Goodman approach – Stresses due to combined loading.

UNIT III

Design of mechanical elements: Shafts – Design for static load – bending and torsion – Equivalent twisting moment – Design of couplings – flange, bushed pin types – Design of close coiled helical Springs.

UNIT IV

Design of gears: Design of gears – Gear nomenclature – Design procedure based upon surface compressive strength – Design of spur, helical, bevel and worm gear.

UNIT V

Bearing and belts: belt drives – flat belts and V belts – Chain – selection and specification – Design of journal bearings – selection and specification of rolling contact bearing.

UNIT VI

(Drawing Practice for Internal Assessment only)

Assembly Drawings (with indication of fit designations wherever necessary)

1. Sleeve and cotter joint
2. Gib and cotter joint
3. Knuckle joint
4. Flange coupling
5. Universal coupling
6. Protected type flange coupling
7. Plummer block

Text Books:

1. Machine Design, Sundrarajamoorthy T. V., Shanmugam N., Anuradha Agencies, 2000
2. Mechanical Engineering Design, Joseph Edward Shigley, McGraw-Hill, 1996
3. Machine Drawing by N.D.Butt

Reference Books:

1. Design of Machine Elements, Spotts, Prentice Hall.
2. Machine Design; An Integrated Approach, Robert L Norton, Prentice Hall, 1997.
3. Computer Integrated Machine Design, Wilson, Prentice Hall
4. Machine Elements, Dobrovolsky et al, Foreign Language Publishers.
5. Machine Design, Black Paul H., McGraw-Hill.
6. PSG Tech. Design Data Book, DPV Printers, Coimbatore, 1995.
7. Production Drawing by K.L. Narayana.

MFEP507 HYDRAULIC LABORATORY

OBJECTIVES

This course include the experiments on study and performance tests on centrifugal pumps and reciprocating pumps, Pelton pumps and Francis turbine. The learner is also made to understand the principles of venturimeter, orificementer, etc., with the help of simple experiments.

Determination of co-efficient of discharge, velocity and contraction for different types of orifices and mouth pieces.
Determination of co-efficient of discharge, equations for triangular and rectangular notches, venturimeter.
Determination of friction factor of pipes, determination of losses in pipe lines due to change in section and direction.
Determination of co-efficient of orifice meter and its discharge equations.
Determination of the co-efficient for different types of vanes
Determination of the meta centric height of the model of a ship
Characteristic curves for different types of centrifugal and reciprocating pumps, Pelton and Francis Turbines.

MFEP508 SPECIAL MACHINES LABORATORY

OBJECTIVES

To provide practical experience on working special machines like shaper, slotter, milling and grinding machines, by a special machine like making different exercises appropriately.

Shaper: Practice in surface shaping, groove cutting

Slotter: Practice in profile cutting, external and internal keyway cutting

Milling machine: Practice in surface milling, end milling, cutting keyways, T- Slot, splines, and helix, making of spur gear and helical gear – pantograph milling – demonstration of gear hobbing machine.

Simple exercises on turret, Capstan, single spindle automatic lathe,

Cylindrical grinding and surface grinding

MFEC601 NUMERICAL METHODS
(Common to Civil, Structural, Mechanical & Manufacturing Engineering.)

OBJECTIVES

To develop the skills of the students in Numerical mathematics. They will be trained on the basics of chosen topics of Numerical mathematics namely method of finite difference, interpolation, numerical solution of algebric and transcendental Equations, numerical solution of ordinary and partial differential equations. At the end of the course the students would have a well –founded knowledge to solve applied problems in all branches of engineering.

UNIT I

Method of finite difference: Finite difference operators E1 - Solution of first and second order linear difference equation with constant coefficients, non- homogeneous linear difference equations with constant coefficients.

UNIT II

Interpolation - Newton - Gregory forward and backward Interpolation - Newton's divided difference formula - Lagranges interpolation formula for unequal intervals - Gauss interpolation formula - Stirling interpolation formula - Numerical differentiation - Numerical Integration - Trapezoidal rule - Simpson's 1/3 and 3/8 rule.

UNIT III

Numerical solution of algebric and transcendental equations - Bolzono's bisection method - successive approximation method - Regular - falsi method, Newton - Raphson Method, Graffi's Root Squaring Method. Numerical Solution of simulation linear algebraic equations - Gauss elimination method - Gauss Jordon elimination Method - Gauss - Seidel iteration method - Crout's method.

UNIT IV

Numerical solution of ordinary differential equations of first and second order and simulations equations - Taylor series method - Euler's method - improved Euler's. method - modified Euler's method - Runge - Kutta method of second and fourth order, Milne's - Predictor corrector method - Picard's method.

UNIT V

Numerical Solution of partial differential equations - Elliptic equation - Poisson's equation - Laplace equation - Elliptic - equation - Liebermans' iterative method - Relaxation method - Hyperbolic equations - one dimensional heat equation - Bender - Schmidt recurrence relation - Crank - Nicholson's implict method.

Text Books:

1. Numerical Methods in Science and Engineering, Venkatraman M.K., National Publishing Co., Madras, 1995.
2. Numerical Methods, Kandasamy, Thilagavathy P & Gunavathy K., S.Chand & Co., 1997.

Reference Books:

1. Applied Numerical Analysis, Gerald C.F and Wheatley P.O., Addission Wesley Publishing Company, 1994.

MFEC602/ PMFEC601 PRODUCTION & OPERATIONS MANAGEMENT

OBJECTIVES

To provide an understanding of the modern approaches to manage the operations, and to present a broad conceptual framework for the management of the operations function in an organization

UNIT I

Types of Production systems - Elements of Production planning and control - Process planning - Routing - Route sheets - Machine loading and scheduling - Scheduling charts and graphs - Forward Scheduling and backward scheduling, Methods of Scheduling - perpetual, periodic and order scheduling - Dispatching - Expediting. Aggregate planning: Costs, Strategies - Graphical and charting methods, Transportation method - Simple problems.

UNIT II

Forecasting - Uses of sales and demand forecasting in planning - components of demand, Qualitative Vs Quantitative methods of forecasting - Single and double moving average method - single exponential smoothing method - Simple linear regression model - measures of accuracy.

UNIT III

Inventory planning and control : Need, inventory costs, Determination of EOQ, EPQ/ELS (without shortages) - Effect of quantity discounts. Determination of ROL, Safety Stocks - Methods of calculating safety stock using Normal and Poisson distribution - single period inventory model, Inventory control systems - P, Q, and S- s System - Selective inventory control techniques.

UNIT IV

Materials Requirements Planning (MRP) - master production schedule, Bill of materials, MRP concepts, lot sizing - lot-for-lot technique, EOQ approach, silver - meal approach, period order quantity approach, least unit cost approach, least total cost approach, part period balancing.

UNIT V

Operations scheduling : Notations and definitions - criteria and objective functions for scheduling - Job shop scheduling - sequencing of n job through one machine - Priority decision rules, n jobs through 2 machines - Jackson's rule. Flow shop scheduling - sequencing of n jobs through 2,3 machines, Johnson's rule. n jobs through m machines - CDS algorithm, Palmer's rule, Dannenbring algorithm, - Multiproduct sequencing – Indicator method.

Text Books:

1. Operations Management, Monks G.J., McGraw Hill, 1987.
2. Theory and Problems in Production and Operations Management, Chary S.N, Tata McGraw Hill, 1995.

Reference Books:

1. Fundamentals of Operations Managements, Aquileno et al. Irwin, 1995.
2. Industrial Engineering and Management, Hicks P.E., McGraw Hill, 1994.
3. Production and Operations Management, Adam E.E. and Ebert R.J., PHI, 1992.
4. Production Operation Management, Paneerselvam R, PHI, 1999.
5. Production and Operations Management, Jay Heizer & Barry Render, Prenctice Hall Inc., 4th Edition, 1996.

MFEC603/ PMFEC503 TOOL ENGINEERING

OBJECTIVES

To introduce different production tools, including press tools, their design, and to provide an understanding of design and use of jigs and fixtures.

UNIT I

Tool engineering organisation, tool planning function, tools Control - Inspection and maintenance of cutting tools - Design of single point turning tools - Design of parting-off tool - Empirical determination of force component - Optimum values of single point tool angles.

Design principles of cutting tools - form tools - form relieved milling cutters - design of hobs - design of twist drills - design of broaches. CNC Tooling - VDI Tooling systems - modular tooling concepts - tool monitoring, Tool pre-setting.

UNIT II

Presses – Classification, drives and characteristics - Design of press tools, progressive die design for typical components involving blanking and piercing. Design procedure- strip layout analysis, Load calculation for selection of press, design of strippers.

UNIT III

General design approach to press tools for drawing of cylindrical vessels - Bending dies, Forging dies and plastic dies – Concepts and applications of quick change tooling and SMED.

UNIT IV

Principle of jigs and fixtures – design concepts, methods – different types of locating devices – clamps – drill bushes and bush retainers – Elements of fixtures.

UNIT V

Design concepts – turn over, built up, box, latch, indexing, and solid types of jigs, Fixtures for difference operations like milling, grinding, turning, welding – Modular Fixtures.

Text Books:

1. Typical Examples and Problems in Metal Cutting, Nefedov V., and Osinov K., MIR Publishers, Moscow, 1967.
2. Tool Design, Donaldson G.H, Lecain, Goold V.V, TMH Edition, 1976

Reference Books:

1. Cutting Tool Design, Rodin P., MIR Publisher, Moscow,1968.
2. Metal Cutting Theory and Cutting Tool Design, Archinov, MIR Publishers, 1976
3. Die design Hand book, Wilson F.W., McGraw Hill.
4. Fundamentals of Tool Design, ASTME, Prentice Hall, 1974.
5. Introduction to Jigs and Tool Design, Kempstar M.H.A, ELBS, 1976

MFEC604 MECHATRONICS

OBJECTIVES

To provide an understanding of the actuation systems, performance and sensors and transducers, various controllers, real time interfacing and data acquisition and control systems.

UNIT-I

Introduction to Mechatronics: Introduction to control system - Open loop and closed loop - working principle - state equations - procedure for writing state equations - nook equation - loop equations - laws governing nook and loop equations

Analog Control system: Transfer function, procedure for writing transfer function - signal flow graph - procedure derivation of transfer function of electrical, mechanical, thermal and hydraulic systems block diagram algebra - Need for control system.

UNIT -II

Stability Conditions - Absolute, relative and conditional stability of a closed loop system, Routh Huaritz criterion - Frequency response analysis - Polar plot. Boop, plot, Nyquist criterion, Nichols plot, Root locus method (plots, general rules for constructing root locur method)

System models - Basics, mathematical, mechanical. electrical, thermal, fluid models - Engineering. rotational, translational, hydro-mechanical system and performance.

UNIT -III

Electronic Components - switches, types, contact, magnetic, electromagnetic type - Transducers - introduction and principle - sound, light, pressure transducers - Sensors - introduction and principle, Types: pressure, temperature, slip and other sensors - proximity pick ups and applications.

Signal conditioning - Operational amplifiers, protection, filtering and digital signal.

UNIT-IV

Electrical components - motors principle; construction and working of D.C and A.C motors - Stepper motors - Introduction, principle, construction and working Servo motors - Introduction. principle, construction and application.

Advanced digital control system - Introduction. Study of microprocessor based control, problems, design. remote control applications.

UNIT -V

Electro mechanical systems - Basics, mechanical systems involved control of the above mechanical systems, mechanical operations, Controls of these operations in various modes - Basics of CD-ROM players, PLC Applications. .

Advanced electro mechanical systems - Robotics system, integration of various systems, vision, speech, collision avoidance and other controls, CNC machines, control of CNC machines - Applications.

Text Books:

1. Cooper W.O., and HelfricK A.D.. Electronic Instrumentation and Measurement Techniques. 1979.
2. Benjamin C. Kuo, Automatic Control Systems, Prentice Hall, New Delhi. 1992.
3. John D Lenk, Complete Guide to Video Cassette "Recording - Operation and Servicing, Prentice Hall of India.
4. Philippe Coiffet and Michael Chirouze, An Introduction to Robot Technology, McGraw Hill, 1983.

Reference Books:

1. 1. John J. D'azzo and Constantine H. Houpis, Linear Control system Analysis and Design, Conventional and Modern, 1985.
2. A Text Book of Electrical Technology, Theraja B.L., S. Chand & Co., New Delhi 1993.
3. Anthony C., Robot Technology: Theory. Design and Application, McDonald, 1985.
4. Bolton W, Mechatronics, Thomas Press(lndia) Ltd.. 1999.

MFEC605/PMFEC502 METAL FORMING PROCESSES

OBJECTIVES

To impart knowledge on the fundamentals of metal working processes and the analysis of the processes through stress evaluation and work formula approaches.

UNIT I

State of Stress in two dimension and three dimensions stress tensor, Principal stresses Stress deviator Vonmises Criteria, yield criteria, Comparison of yield criteria Forming load calculation -Fundamentals of Metal working: Flow curve, Relationship between true stress and true strain, Temperature in metal forming, hot cold and warm working strain rate effects metallurgical structures, friction and lubrication, hydrostatic pressure workability residual stress.

UNIT II

Forging: Types of Process & hammers defects & remedies. Forging classification, open die forging, forging disks closed die forging calculations of forging loads, defects causes remedies.

Rolling: Rolling of blooms billet, Slab & Sheet types of rolling mills defects, forces & geometrical relationship in rolling, Analysis of rolling load torque & power, forward slip & Position of neutral pt, maximum possible reduction Factors which determine rolling load minimum thickness & spread, defects causes remedies.

UNIT III

Extrusion: Direct and indirect Extrusion equipments port late extrusion die hydrostatic extrusion- defects causes remedies. Analysis of extrusion- tube extrusion, production of seamless pipe & tube hydrostatic extrusion defects causes and remedies.

Drawing of rods, wires & tubes : Simple analysis of wire tube drawing . residual stress is rod, wire & tubes .

UNIT IV

Sheet Metal Forming: Forming methods – shearing and blanking – bending – types of bending – spring back – Deep drawing – Mechanism of Deep drawing – Limiting draw ratio – Concept of Forming Limit Diagram. Description only: Stretch forming – Rubber pad forming – Tube hydro forming – defects in sheet metal forming.

UNIT V

High Speed Forming: Basic principle, process variables, Characteristics and application of the following processes: Dynapak, electro hydraulic forming, electromagnetic forming, explosive forming, fuel combustion process, water hammer forming. Comparison between conventional forming and high speed forming, metallurgical aspects.

Text Books:

1. An Introduction to the Principles of Metal Working, Rowe G.W, Edward Arnold Publication.
2. Mechanical Metallurgy, George E. Dieter, Mc Graw-Hill International Edition, Newyork, 1998

Reference Books:

1. Fundamentals of Metal Forming, Robert H. Wagoner and Jean Loup Chenot., John Wiley & Sons Inc., New York, 1992.
2. Plasticity for Engineers, Calladine C. R., John Wiley & Sons, 1991.
3. Metals Handbook, Material Information Society, ASM, Vol.4, 1979.
4. Manufacturing Technology – Foundry, Forming & Welding, Rao P. N., TMH, 1998.
5. Developments in High Speed Metal forming, Davies. R and Austin E.R., The Machinery Publishing Co. Ltd., London, 1970.
6. Manufacturing Technology, Haslehurst, ELBS, 1973.

MFEC606/PMFEC305 COMPUTER AIDED DESIGN

OBJECTIVES

To provide fundamental knowledge to the CAD technology that includes fundamentals of CAD hardware and software, modeling, drafting, and the elements of FEM.

UNIT I: Computer Aided Design

Overview of CAD – Conventional and CAD processes – benefits – application.

CAD Hardware: Input devices: keyboards, light pens, digitizing tablets, mouse systems, joysticks, track balls, thumb wheels and other input devices.

Output Devices: graphic display, hard-copy printer and plotters – Hardware integration and networking

UNIT II: Introduction to computer graphics

2-D display control facilities – 2-D transformations – 3-D display control facilities – 3-D transformations – shading and coloring concepts

Unit III: Geometric modeling techniques

Wire frame modeling – concepts – surface modeling – solid modeling: methods – b-rep, c-rep, sweep representation, primitive instancing – Boolean operations – Extraction of entities from a solid, filleting of edges – Constructive Solid Geometry

UNIT IV

Computer Aided Drafting: Introduction – Automated 2D drafting – Basics – functions, attributes, layers, dimensioning, text styles – dragging and rubber banding – clipping – mechanical assembly – bill of materials generation – mass property calculations

UNIT V: Finite Element Analysis

Introduction – procedures – element types – nodal approximation – element matrices, vectors and equations – global connectivity – assembly – boundary conditions – solution techniques – interface to CAD – Introduction to packages

UNIT VI (Laboratory Practice – For internal assessment only)

CAD: Modeling of engineering components like Lathe tail stock, Plummer block, Flange coupling, etc.

Text Books:

1. CAD/CAM, Computer Aided Design and Manufacturing, Sadhu Singh, Khanna Publishers – New Delhi, 2000
2. CAD/CAM: Computer Aided Design and Manufacturing, Groover, M.P., and Zimmers, E.W., Prentice Hall International – New Delhi, 1996

Reference Books:

1. CAD/CAM: Theory and Practice, Ibrahim Zeid, McGraw-Hill Inc., 1998
2. CAD/CAM/CIM, Radhakrishnan, P, and Subramanyan, S., New Age International Pvt. Ltd. – Chennai, 1995
3. Principles of Interactive Computer Graphics, Newman, W. M., and Sproull, R. F., Mc-Graw Hill Inc.

MFEP 607 MODELING & SIMULATION LABORATORY

OBJECTIVES

To provide hands-on experience in using modelling, analysis and simulation software such as AutoCAD, ProEng, & Ansys, in product design and development.

Simple exercise involving development of a product using modeling, analysis and simulation software.

MFEP608 MATERIALS PROCESSING LABORATORY

OBJECTIVES

To make the linear syllabus is so designed to understand the metallographic procedures, hardness and hardenability evaluation, stress calculations in metal forming processes, temperature distribution in metal joining processes, characteristics of moulding sand and the concept of numerical control machines.

Metallurgy: Preparation of specimen-micro examination-effect of quenching media, section size and hardness, hardenability test, Study of phase diagrams, Creep test.

Metal forming: Water hammer forming, Rolling of strips, Compression testing.

Welding: Simple exercises in Arc & Gas welding, Weld bead geometry, Demonstration of Plasma & MIG welding.

Metal Casting: Study on Ring casting, Moulding sand characteristics

Study of NC trainers – Part programming.
Study of Hydraulic Tracer

MFEC701/ PMFEC504 MACHINE TOOL CONTROL AND AUTOMATS

OBJECTIVES

To make the learner to know the use of Hydraulic and Pneumatic systems and mechanical systems for the control of various parts of machine tools, and to provide an introduction to automatic machine tool components and their working.

UNIT I

General principles - Application - Advantages of hydraulic, pneumatic - control. Generation of oil hydraulic power - types of pumps - gear, vane, and piston pumps - Motors - Construction, principle - Characteristic curves.

UNIT II

Valves - relief, pressure reducing, flow control, direction control, unloading - sequence valves, counter balance valves - Accumulators-Intensifiers - construction - principle - fluid power symbols - Reservoirs - Filters.

UNIT III

Hydraulic circuits - speed control circuits - Accumulator circuits - Regenerative circuits.

UNIT IV

Pneumatic control - Principles - Pneumatic valves - compressors - sequencing circuits - Pneumatic logic circuits - cascading system of circuit design. Fluidic control - General principles - Logic Elements - Amplifiers - Logic circuits - Amplifications - Fundamentals of numerical control.

UNIT V

Automats – transfer lines – automatic assembly – transfer devices and feeders – Classification and applications – job orienting and picking devices.

Text Books:

1. Industrial Hydraulics, John Pipinger and Hicks T.G., McGraw Hill, 1997.
2. Numerical control of Machine tools, Martin S.J., ELBS, 1984.
3. Machine Tool Design and Numerical Control, Metha N.K., TMH, New Delhi, 1998.

Reference Books:

1. Ernst W., Oil Hydraulic Power and its Industrial Applications, McGraw Hill, 1978.
2. Machine Tool Design, Acherkan, Vol. II, MIR Publishers, Moscow, 1978.
3. Hydraulic System Analysis, Stringers, MacMillan Press Publications, 1992.
4. Computer Numerical Control of Machines, Radhakrishnan P., New Central Book agency, Calcutta, 1992.
5. Automatic and Semiautomatic lathe, Bogulaysky, MIR Publishers, Moscow.

MFEC702/PMFEC701 OPERATIONS RESEARCH

OBJECTIVES

To provide an understanding of the systematic approach to solve decision making problems and to enhance the decision-making skills through the application of appropriate models.

UNIT I

Linear programming - graphical method - Simplex method - Duality, Dual simplex method - Applications.

UNIT II

Transportation problems - optimal solutions. Assignment problems - Hungarian algorithm - Traveling salesman problem - applications

UNIT III

Waiting line Problems - cost of waiting and cost of providing service - single channel - single stage type of problems - Monte Carlo simulation for queue problems.

Competitive strategy - Games theory – two-persons zero-sum game problem with and without saddle point - method of oddments - graphical method - method of determinants - concept of dominance - algebric method - iterative approximate method

UNIT IV

Network models - Minimal spanning tree problem, shortest route problem. PERT and CPM - basic steps - rules for constructing the network - Fulkerson's rule - time estimates - PERT calculations - probability of meeting the time schedule - time - cost trade off (crashing) - difference between PERT and CPM - applications - Introduction to resource leveling.

UNIT V

Decision Theory - Decision making under risk condition - expected value criteria - Decision trees - Decision making under uncertain conditions - Minimax, maximin, maximax, Laplace, Hurwicz regret criteria.

Text Books

1. Operations Research, Gupta & Hira, S.Chand & Co., 1998.
2. Quantitative Techniques in Management, Vohra N.D., TMH, 1990.

Reference Books

1. Operations Research, Sharma S.D., Kedarnath Ramnath and Co., Meerut, 1998.
2. Operations Research, Dharani Venkatakrishnan, Keerthi Pub. House, Coimbatore, 1990.
3. Operations Research, Principles and Practice, Ravindran A., Phillips D.T., and Solberg J.J., John Wiley and Sons, Singapore, 1987.
4. Operations Research, Taha., Tata McGraw Hill, 1998.
5. Theory and Problems of Operations Research, Bronson R., Schaum's outline series, 1997.

MFEC703/PMFEC602 NON-TRADITIONAL MANUFACTURING PROCESSES

OBJECTIVES

To impart basic knowledge on the various techniques and the process characteristics of different Non-Traditional Machining techniques and to introduce the basic concepts of rapid prototyping.

UNIT I

Overview of non-traditional manufacturing – classification of processes under source of energy, transfer media and mechanism

Electric Discharge Machining (EDM): Principles – equipment – power supply, dielectric system, electrodes – process parameters – applications

Wire Electric Discharge Machining (WEDM): Principles – equipment – power supply, dielectric system, electrodes – process parameters – applications

UNIT II

Abrasive Jet Machining (AJM): Principles – equipment – abrasives – nozzles– process parameters – applications

Abrasive Flow Machining (AFM): Principles – equipment – tooling – media – process parameters – applications

Water Jet Machining (WJM): Principles – equipment – nozzles – process parameters – applications

Abrasive Water Jet Machining (AWJM): Principles – equipment – nozzles – Abrasive feed system – process parameters – applications

UNIT III

Ultrasonic machining (USM): Principles – equipment – transducers – tool horns – abrasives, abrasive slurry – process parameters – applications

Electro chemical machining (ECM): Principles – equipment – electrolytes – tools – process parameters – applications

Chemical machining (CHM): Principles – equipment – masks, etchants – process parameters – applications

UNIT IV

Electron Beam Machining (EBM): Principles – equipment – EB gun – power supply – process parameters – applications

Laser Beam Machining (LBM): Principles – equipment – power supply – process parameters – applications

Plasma Arc Machining (PAM): Principles – equipment – plasma torches – process parameters – applications

Hot machining – Neutral particle technique – High speed machining.

UNIT V

Basic Principle of Nano technology - Rapid prototyping: basic concepts, techniques: Stereolithography, Selective Laser Sintering, Selective Powder Binding, Fused Deposition Modeling, Laminated Object Manufacturing – applications

Text Books

1. Modern manufacturing processes, Pandey, P. C., and Shan, S. H., Tata McGraw Hill Pub. Co. Ltd. – New Delhi
2. Rapid prototyping – A Brief Introduction, Amitabha Ghosh, East-West Press Ltd.

Reference Books

1. Non-Traditional Manufacturing Processes, Gary F. Benedict, Marcel Dekker, Inc., New York
2. Manufacturing Science, Amitabha Ghosh and Ashok Kumar Mallik, Affiliated East-West Press Pvt. Ltd.
3. Modern Machining Methods, Adithan, M., S. Chand and Co. Ltd. – New Delhi, 1990
4. New Technology, Abrol, R. K., and Subramanian, R., The Institution of Engineers (India) edition, A continuing education monograph

MFEC704/ PMFEC405 CNC & ROBOTICS

OBJECTIVES

To address the need for automation using computers, and to provide a knowledge on the fundamentals of NC, CNC and DNC machines, their programming methods along with the fundamentals of robotic technology.

UNIT I

Introduction and basic concepts of Numerical Control (NC), Computer Numerical Control (CNC), Direct Numerical Control (DNC), Distributed Numerical Control (DNC) – Adaptive control – Machining centre: types – components: Automatic Tool Changers (ATC), Automatic Pallet Changers (APC) – Introduction to Co-ordinate Measuring Machines (CMM)

UNIT II

Part programming: Manual and Computer assisted part programming – comparison – APT language: Geometric, Motion, Post-processor and Auxiliary statements – simple exercises in drilling and milling using APT

UNIT III

Industrial Robots: Definition – History – Robot anatomy – Joint motions – End-effectors: Grippers: Types – Mechanical, Magnetic, Vacuum - Tools – Robot programming methods.

UNIT IV

Robotic sensors: Characteristics – Types: Tactile sensors, Proximity and Range sensors – Fundamentals of Machine vision – Work cell: Robot centered cell, In-line robot cell and Mobile robot cell – design factors – Interlocks

UNIT V

Robot applications: Material Transfer, Machine loading & unloading, Machining, Welding, Spray coating, Assembly – Recent developments

Text Books:

1. Computer Numerical Control Machines, Radhakrishnan, P., New Book Agency – Calcutta, 1992
2. Industrial Robotics: Technology, Programming and Applications, Groover, M. P., Weiss, M., Nagel, R. N., and Odrey, N.G., McGraw-Hill,

Reference Books:

1. Automation, Production systems and Computer Integrated Manufacturing, Groover, M. P., Prentice Hall of India Pvt. Ltd. – New Delhi, 1989
2. CNC and Computer Aided Manufacturing, Kundra, T. K., Rao, P. N., and Tiwari, N. K., Tata Mc-Graw Hill – New Delhi
3. Robotics for Engineers, Yorem Koren, Mc-Graw Hill
4. Robotics Technology and Flexible Automation, Deb S. R., Tata McGraw-Hill – New Delhi, 1996

MFEP707 METROLOGY & MEASUREMENTS LABORATORY

OBJECTIVES

- To provide a hands on experience in handling precisions metrology instruments, their calibration and to have practical exposure in conducting and analyzing metal cutting experiments.

- Metrology: Checking plug gauges – Calibration of instruments – Measurements of taper – Checking the straightness, flatness – Inspection of gears, screw thread – Process capability studies

- Metal cutting: Study of cutting tools – tool signature – measurements of tool angles – Estimation of cutting force – Lathe tool dynamometer, Power measurement, Estimation of tool life.

- Machine Tool: Study of spindle speeds – Alignment test on lathe.

MFEC801 / PMFEC603 MACHINE TOOL DESIGN

OBJECTIVE

- To introduce the various drive systems used in machine tools and also the basic design aspects of various of machine tool components and structures

UNITS - I & II

Various driving systems for machine tools - Stepper motors - Use of preferred numbers in machine tools - Stepped drives - Graphical representation of speed - structural and ray diagrams - Optimum ray diagram - Ruppert drive - Feed gear boxes - Norton ssdrive - Meander drive. Various stepless regulation systems - principles of self aligning - methods of increasing the range of regulation in modern machine tools

UNIT - III

Machine tool guides - types - Design of guide ways - wear adjustment - Anti friction ways - Hydrodynamic and hydro-static slide ways.

UNIT - IV

Machine tool beds - types - constructional and design features - Design of column of drilling and milling Machine - Stiffeners and ribs arrangement.

UNIT - V

Design of power screws - compensation for backlash - Re circulating ball screw - Spindles - Materials - Construction, spindle supports - Preloading of Bearing Design of spindles - Air bearing and Hydrostatic bearings.

Text Books:

1. Design of Machine Tools, Basu S.K., and Pal D.K., Oxford and IBH, New Delhi, 1997
2. Machine tool Design and Numerical Control, Metha N.K., Tata McGraw Hill, New Delhi, 1999.

Reference Books:

1. Principles of Machine tools, Volume II, Sen and Bhattacharya, New Central Book Agency, Calcutta, 1990.
2. Machine Tool Design, Volume I to IV, Acherkan, MIR Publishers, Moscow, 1978.

MFEC802 TOTAL QUALITY MANAGEMENT

OBJECTIVE

- To provide the statistical foundation on modern methods of quality control and management, which are used in manufacturing and service industries.

UNIT - I

Concepts of TQM – Deming, Crosby and Juran's Philosophies – Quality system – ISO 9000 Quality system standards - Quality costs, Seven tools for Quality Control, Seven tools for Quality management, Quality Function Deployment (QFD).

UNIT - II

Objectives of statistical quality control - inspection and its importance - differences between inspection and quality control - Causes and types of variations - concept of zero defect - Theory of control charts, Control charts for attributes - p, np, c and u charts.

UNIT - III

Control charts for variables, $\bar{X}$ and R charts, standard deviation charts, median chart and midrange chart - Moving range chart. Relationship between statistical control limits and specification limits - modified control chart, process capability studies (Cp and Cpk).

UNIT - IV

Acceptance sampling : Fundamental concepts and terms, OC curves. sampling plans - single, double, multiple and sequential sampling plans. Acceptance Rectification plan (AOQL) - ATI and ASN concepts - AQL and LTPD sampling plan, switching rules for normal, tightened and reduced inspection, Dodge - Roming sampling plans - uses of IS 2500 Part I.

UNIT - V

Acceptance sampling plans for variables: Variability known and unknown standard deviation method - single and double specification limit - Variability known and unknown range method - single and double specification limit - Introduction to continuous sampling plan (csp) - uses of IS 2500 Part II.

Text Books:

1. Introduction to Statistical Quality Control, Montgomery D.C., John Wiley, 1994.
2. Statistical Quality Control, Gupta R.C., Khanna Pub., 1998.

Reference Books:

1. Statistical Quality Control, Grant E.L., TMH., 1996
2. The Assurence Science, Siegmund Halpern, PHI,1978.
3. I.S 2500 - 1973 Part I and II
4. I.S 397 - 1970 Part I and II
5. Reliability Engineering, Srinath L.S., Affiliated East West Press, 1991.

MFEC803/ PMFEC505 ADVANCED MANUFACTURING PROCESSES

OBJECTIVE

- To introduce the recent developments in casting processes, welding processes and metal forming processes and also to provide a basic knowledge on processing of plastics composite and ceramic materials

UNIT - I

Modern Casting Processes: Basic principle, Process variables, Characteristics and application of the following processes, squeeze casting, Rheo casting, Thixo casting, CO_2 process, Shaw process, Slush casting, continuous casting, H-process, electro slag casting, CLA process, Full mould process.

UNIT - II

Advanced Welding Processes: Basic principle, Process variables, Chief characteristics and applications of the following processes: Laser beam welding, Electron beam welding, Plasma arc welding, Friction stir welding, Explosive welding, Pulsed current welding, Narrow Gap welding, vacuum brazing.

UNIT - III

Processing of Plastics: Extrusion – Injection Moulding – Blow Moulding – Compression and Transfer Moulding – Casting – Thermo Forming
General Machining properties of Plastics – Machining Parameters and their effect – Joining of Plastics – Mechanical Fasteners – Thermal bonding – Press Fitting.

UNIT - IV

Processing of Polymer Matrix and ceramic matrix composites. Open Mould Processes, Bag Moulding, Compression Moulding with BMC and SMC – Filament winding – Pultrusion – Centrifugal Casting – injection Moulding – Application of PMC's. Processing of ceramic matrix composites – Applications characteristics – CVD – Pressure infiltration – Hot Processing – Isostatic pressing.

UNIT - V

Solid State Fabrication Techniques – Diffusion Bonding – Powder Metallurgy Techniques – Plasma Spray, Chemical and Physical Vapour Deposition of Matrix on Fibres – Liquid State Fabrication Methods – Infiltration – Squeeze Casting – Rheo Casting – Compocasting – Application of MMCS.

Reference Books:

1. Plastics: Product Design and Process Engineering, Harold Belo sky, Hanser Publishers,1995.
2. High performance Polymers, Bera ,E and A, Hanser publishers, 1991.
3. Plastics Extrusion Technology,Hensen , Hanser Publishers 1998.
4. Injection Moulding Machines, Johannber F., Hanser Publishers 1983.
5. Olymer extrusion, Rauwendal , C, Hanser Publishers 1990.
6. Blow Moulding Hand Book, Rosatao. D.V., Hanser Publisher, 1998.
7. Moden Plastics Moulding, Seamour , E.B, John Willey.
8. Plastics Moulding, John Dalmonte , John wiley.
9. Machining of Plastics, Akira Kobyashi, Mc –Graw Hill.
10. Composite Materials science and Engineering, Kishan K.Chawla . Springer –Verlag . 1987
11. Analysis and Performance of Fiber composites, Agarwal . D. and Broutman L.J Wiley, 1990.
12. Composite Materials Technology, Mallick, P.K and Newman, S Hanser Publishers, 1990.
13. Metals Handbook on Casting, ASM.
14. Welding Processes and Technology, Parmar R. S, Khanna Publishers, New Delhi, 1996.
15. Manufacturing Technology, Haslehurst, ELBS, 1973.
16. Modern Composite Materials, Broutman, L.J and Krock, R.H, Addison Wesley, 1967.

MFEC804 ETHICS IN ENGINEERING

OBJECTIVE

- To understand the Ethical Implications of Engineers work, to understand the moral problems engineers face in the corporate setting, and to provide the conceptual tools necessary for performing moral issues surrounding engineering practice.

UNIT - I

Introduction to Engineering Ethics – Senses of "Engineering Ethics" – Variety of Moral Issues – Three Types of Inquiry – Engineering Ethics and Philosophy. Need for Engineering Ethics – Moral Dilemmas – Moral Autonomy – Kohlber's Theory – Gilligan's Theory – Consensus and Controversy. Professions and Professionalism – Professions – Membership Criteria – Persuasive Definitions – Multiple Motives. Model Reasoning and Ethical Theories – Theories about Virtues – Professional Responsibility – Integrity – Self-Respect – Senses of "responsibility". Theories about Right Action – Utilitarianism – Duty Ethics – Rights Ethics – Testing Ethical Theories. Self-Interest, Customs, and Religion-Self-Interest and Ethical Egosim – customs and Ethical Relativism – Religion and Divine command Ethics. Uses of Ethical theories – Resolving Moral dilemmans – justifying Moral Obligations – Relating Professional and Ordinary Morality.

UNIT - II

Engineering as Social Experimentation – Engineering as Experimentation – Similarities to Standard Experiments – Learning from the past – Contracts with Standard Experiments – Knowledge Gained. Engineering as Responsible Experiments – Conscientiousness – Relevant Information – Moral Autonomy – Accountability. The challenger Case – Safety issues. Codes of Ethics – Roles of Codes – Codes and the Experimental Nature of Engineering – Limitations on codes. A balanced outlook on law – A regulated Society – The trend toward Greater Detail – Industrial Standards – problems with the Law in Engineering – The proper Role of Law in Engineering. Safety and Risk – The concept of Safety – Risks – Acceptability of Risk – Lessons for the Engineers. Assessment of Safety and Risk – Knowledge of Risk – Uncertainties in Design – Testing for Safety – When Testing is inappropriate.

Risk – Benefit analyses and reducing risk – Personal risk – Public risk and public acceptance – accounting publicly for benefits and risks – incentives to reduce risk – some examples of improved safety – liability. Three Mile island Chernobyl and safe exits – Three Mile Island – Prior warnings – Chernobyl – Three Mile Island, Chernobyl, and a Forerunner – Safe Exit.

UNIT - III

Responsibilities to Employers – Collegiality and Loyalty – Collegiality – Two Senses of Loyalty – Obligations of Loyalty – Misguided Loyalty – Professionalism and Loyalty. Respect for Authority – Institutional Authority – Morally justified authority – Accepting Authority – Paramount Obligations. Collective Bargaining – Historical Note – Faithful Agent Argument – Public Service Argument – Conclusion. Confidentiality – Definition – Justification and Limits – Changing jobs – Management Policies. Conflicts of Interest – Impairment of Judgment and Service – Gifts and Bribes – Interests in Other Companies – Insider information – Moral Status. Occupational Crime – Industrial Espionage – Price Fixing – Endangering Lives.

UNIT - IV

Issues – Professional Rights – Basic Right of Professional Conscience – Institutional Recognition of Rights – Specific Rights : Recognition and Conscientious Refusal – Foundation of Professional Rights. Whistle-Blowing – Definition – Three cases – Moral Guidelines – Protecting Whistle-Blowers-Commonsense Procedures – The right to Whistle-Blow – Beyond Whistle-Blowing. The Bart Case – background – Responsibility and Experimentation –

Controversy – Aftermath-Comments. Employee Rights –Employee Bill of Rights – Choice of outside Activities- Privacy-Drug testing – Due process. Discrimination-Examples-Definitions-Antidiscrimination laws- Moral Justification of Nondiscrimination laws- preferntial Treatment-Sexual Harassment. Multinational Corporations-Three Senses of "Relative"Values –"When in Rome"- International Rights- Promoting Morally Just Measures- Technology Transfer and Appropriate Technology – Bhopal.

Environmental Ethics – Case Studies –The Commons and a Livable Environment-Guilty until Proven Innocent? - Internalizing costs of Environmental Degradation-Technology Assessment – Philosophical view of Nature. Computer Ethics- Power Relationships-Property – Privacy- Professional Issues. Weapons Development- The Weapons Seesaw- the Engineer's Involvement in Weapons Work- Defense Industry Problems-Decommissioning Weapons and lasting Effects.

UNIT - V

Engineering as Managers, Consultants and Leaders – Engineers as Managers-Managers as Professional – Promoting and Ethical Climate –Managing Conflict. Consulting Engineers – Advertising – Competitive Bidding – Contingency Fees- Safety and Client needs –Provision for Resolutions of Disputes. Engineers as Expert witness and Advisers – Experts Witnesses in the courts-Abuses-Advisers in Planning in Planning and policy –making – Normative Models of Advisers. Moral leadership- Morally –Creative Leaders –Participation in Professional Societies Leadership in Communities – Ideals of Voluntary Service. Concluding Remarks .Integrity and Ingenuity – Citicorp Skyscraper.

Reference Books:

1. Mike W.Martin Roland Schinzinger, "Ethics in Engineering – Third Edition" Tata McGraw –Hill Publishing Company Ltd ., New Delhi,2003.

MFEE705/ 706/ 805/ 806/PMFEE604/702/703
FINITE ELEMENT METHODS IN MANUFACTURING

OBJECTIVES

- To introduce the basic concepts and methodology of Finite Element Methods in Engineering, and to provide an understanding of problem modeling and Finite element formulation of 1D, 2D, 3D and axi-symmetry problems.

Unit - I

Introduction - Variational Formulation - General field problems in Engineering - Modelling - Discrete and Continuous models Characteristics - Difficulties involved in solution - The relevance and place of finite element method - Historical comments - Basic concept of FEM. Boundary and initial value problems - Gradient and divergence theorems - Functionals - Variational calculus - Variational formulation of VBPS. The method of weighted residuals - The Ritz method.

Unit - II

Finite Element Analysis of One Dimensional Problems -One dimensional second order equations - discretisation of domain into elements Generalised coordinates approach - derivation of elements equations - assembly of element equations - imposition of boundary conditions - solution of equations Cholesky method - Post processing - Extension of the method to fourth order equations and their solutions - time dependant problems and their solutions example from heat transfer, fluid flow and solid mechanics.

Unit - III

Finite Element Analysis of Two Dimensional Problems - Second order equations involving a scalar-valued function - model equation Variational formulation - Finite elernent formulation through generalised coordinates approach - Triangular elements and quadrilateral elements - convergence criteria for chosen models - Interpolation functions - Elements matrices and vectors - Assembly of element matrices - boundary conditions - solution techniques.

Unit - IV

Isoparametric Elements and Formulation - Natural coordinates in 1,2 and 3 dimensions - use of area coordinates for triangular elements in - 2 dimensional problems - Isoparametric elements in 1,2 and 3 dimensions - Largrangean and serendipity elements - Formulation of element equations in one and two dimensions - Numerical integration.

Unit - V

Applications to Field Problems in Two Dimensions - Equations of elasticity- plane elasticity problems - axisymmetric problems in elasticity - Bending of elastic plates - Time dependent problems in elasticity - Heat transfer in two dimensions - incompressible fluid flow.

Text Book

1. An Introduction to Finite Element Method, J.N.Reddy, McGraw Hill, IntI. Student Edition, 1985.

Reference Book

1. The finite element method, Basic formulation and linear problems, Rienkiewics, Vol.l, 4/e, McGraw Hill, Book Co.
2. The Finite Element Method in Engineering, S.S.Rao, pergaman Press, 1989

MFEE705/ 706/ 805/ 806/PMFEE604/702/703
INTELLIGENT MANUFACTURING SYSTEMS

OBJECTIVES

To provide an understanding of the concepts of automation, Group Technology, FMS and the applications of Artificial Intelligence and Expert Systems.

UNIT - I Automation

Introduction – Definition – Reasons for automation – Production automation and Automation strategies

Detroit type automation

Automated flow lines – methods of work part transport – transfer mechanism – buffer storage – control functions – automation for machining operations. Automated assembly systems: Assembly process – assembly systems – types of automated assembly systems

UNIT - II Group Technology and Cellular manufacturing

Part Family – Parts Classification and Coding – Production Flow Analysis – Benefits of Group Technology – Cellular Manufacturing

Flexible Manufacturing Systems:

Definition – Components – Material Handling and Storage Systems: Conveyors, Automatic Guided Vehicles, Automatic Storage and Retrieval System - FMS Layouts – Applications – Benefits of FMS

UNIT - III Computer Aided Process Planning (CAPP)

Generative and Variant type of Process Planning – Concurrent Engineering and Design for Manufacture

Fundamentals of Materials Requirement Planning (MRP), Capacity Requirement Planning (CRP), Manufacturing Resource Planning (MRP II)

UNIT - IV

Introduction to Business Process Re-engineering (BPR), Enterprise Resource Planning (ERP)

Fundamental concepts of Lean Production and Agile Manufacturing – Comparison

UNIT - V

Artificial Intelligence (AI) and Expert systems (ES): Introduction – Basics of AI – ES: Basic elements, working, using an ES – Software for AI systems – computer hardware for AI systems – AI applications in manufacturing – Trends in AI

Text Book:

1. Automation, Production Systems and Computer-Integrated Manufacturing, Mikell P. Groover, Second Edition, Prentice-Hall of India Private Limited, New Delhi, 2002

Reference Books:

1. CAD/CAM/CIM, Radhakrishnan. P., and Subramanyan. S., New Age International Pvt. Ltd., Madras, 1995
2. Manufacturing strategy, John Miltenburg, Productivity Press, Portland, 1995
3. Operation Management-Theory and Problems, Joseph G. Monks, McGraw-Hill Inc., 1987
4. Reengineering the Organization, Jeffrey N. Lowenthal, Tata Mc-Graw-Hill Publishing Company Limited-New Delhi, 1995
5. Business Process Reengineering, Jayaraman, M. S., Ganesh Natarajan and Rangaramanujan, A. V., Tata Mc-Graw-Hill Publishing Company Limited-New Delhi, 1994
6. Processes and Design for Manufacturing, Sherif D. El Wakil, PWS Publishing Company, 1998
7. Computer Automated Manufacturing Systems, John H. Powers Jr, McGraw-Hill Book Co., 1987

MFEE705/ 706/ 805/ 806/PMFEE604/702/703
SURFACE ENGINEERING

OBJECTIVES

- To impart knowledge on the characterization, surface morphology, Tribology, Surface coating and surface protection with inspection.

UNIT - I

Mechanisms of wear and metal cleaning: Basic mechanisms of wear - abrasive, adhesive wear, contact fatigue – fretting corrosion – Testing of wear resistance – Practical diagnosis of wear – General cleaning process for ferrous and non ferrous alloys – Selection of cleaning processes – alkaline cleaning, emulsion cleaning abrasive bath cleaning – polishing, buffing and hot peering.

UNIT - II

Thermal spraying processes and Electro deposited coatings: Thermal spraying-materials, characteristics of thermal spray process – Designing for thermally sprayed coatings – coating production – spray fused coatings – Principles of electroplating – technology and control – electroplating – Technology and control – electroplating systems – properties and applications of electro deposits - non - aqueous and electroless deposition.

UNIT - III

Hot dip coating and diffusion coatings: Principles – surface preparation-batch coating and continuous coating – properties and applications principle of cementation – cladding, vacuum deposition – sprayed metal coating – structure of diffusion coatings – chemical vapor deposition – physical vapor deposition

UNIT - IV

Non metallic coatings and conversion coatings: Plating coating – lacquers – rubbers and elastomers – Vitreous enamels – anodizing, Chromating, Phosphating

UNIT - V

Weld surfacing: Hard facing, overlaying – Laser cladding – Explosive cladding – Roll bonding
Testing and inspection of coatings: Thickness and porosity measurement – selection of coatings

Text Books:

1. Engineering Coatings – Design and Applications, Stan Grainger, Jaico, 1994.
2. Electroplating Hand Book, Parthasarathy. N.V. Prentice Hall, 1992.
3. Principles of Metal Surface Treatment & Protection, Gale D. R. Pergamon, 1990
4. Advances in Surface Treatments, Niku-Lavi, Pergamon, 1990.
5. Metals Handbook on Surface Engineering, 8th Edition, ASM, 1994.

MFEE705/ 706/ 805/ 806/PMFEE604/702/703
NON DESTRUCTIVE TESTING

OBJECTIVES

- To provide an exposure to the different non destructive testing methods.

UNIT - I Liquid Penetrant and Magnetic Particle Inspection

Liquid penetrant system – Processing cycles – Inspection of surface defects – Generation of Magnetic fields – Magnetic particle inspection equipments – Demagnetization – Applications and limitations.

UNIT - II Radiography

Production of X-rays – Characteristics rays and white ray – Tube current and voltage – Source of γ rays – Half life period – Penetrating power – Absorption of x and γ rays – Radiation contrast and film contrast – Exposure charts – Penetrameters and sensitivity – Safety.

UNIT - III Eddy Current Inspection

Eddy current production – Impedance concepts – Inspection of magnetic materials – Inspection of non magnetic materials – Influences of various parameters – Advantages and limitations.

UNIT -IV Ultrasonic Testing

Production of ultrasonic waves – Different types of waves – Normal beam inspection – Angle beam inspection – Thickness measurements – Applications.

UNIT - V Recent Techniques

Principle of acoustic emission – Instrumentation for non destructive testing – Principles of holography – Applications of holographic techniques non destructive inspection – Advantages and limitations – Other techniques.

Text Book:

Non Destructive Testing, Barry Hull & Vernon John, Mac Millan, 1988.

Reference Books:

1. Metals Hand Book, Americal Society of Metals, 9th Edition, Volume 11, 1980.
2. Non Destructive Testing, Birchand. D., Oxford University Press, 1977.
3. Proceedings of the 10th International Acoustic Emission Symposium, Japanese Society for Non Destructive Inspection, Sendai, 1990.
4. New Procedures in Non Destructive Testing, Holler. P., Springer Verlag, 1983.

MFEE705/ 706/ 805/ 806/PMFEE604/702/703
ENGINEERING ECONOMICS

OBJECTIVES

- To introduce the student to the cost implications of the various decisions that may have to be made in a manufacturing environment.

UNIT - I

Basic concepts, terms, demand – supply relationship, Role of engineering economics in decision making Interest calculation (simple & compound), cash flows, Minimum attractive rate of return.

UNIT - II

Principle of money – time relationships – Factors and their uses – single payment factors, uniform series present worth factor - capital recovery factor, sinking fund factor present worth, future worth and equivalent uniform annual worth calculation.

UNIT - III

Application of money – time relationships: present worth, capitalized cost evaluation, equivalent uniform annual worth calculation, rate of return components for single projects, rate of return evaluation for multiple alternatives.

UNIT - IV

Replacement strategies and Policies: Basic concepts of replacement analysis, economic service life, opportunity costs - cash flow approaches to replacement analysis - Replacement analysis using specified study period - probabilistic replacement models.

UNIT - V

Cost-benefit ratio evaluation, alternative selection by cost-benefit break-even analysis and its application, payback period.
Depreciation methods: straight line, declining balance, sinking fund - Depletion models – cost depletion, percentage depletion methods.

Text Books:

1. Engineering Economy, Leland Blank. T and Anthony .J Tarquin, McGraw Hill, Singapore, 4th Edition 1998.
2. Engineering Economics, Riggs J.L, Bedworth J.A and Randhava S.U., McGarw Hill,1998.

Reference Books:

1. Engineering Economics, Degarmo E.P, Sullaivan W.G and Bontadelli J.A Macmillan Pub. Co., New York, 1993.
2. Engineering Economics Principle, Stenier H.M., McGraw Hill, New York, 1992.
3. Engineering Economics, Thuesen G.J. and Fabrycky W.J, Prentice Hall International, New Jersey, 1993.

MFEE705/ 706/ 805/ 806/PMFEE604/702/703
AUTOMOTIVE ENGINEERING

OBJECTIVES

- To impart knowledge of the various parts involved in automobile and their mechanisms in automobile.

UNIT - I

The Clutch – Function – Single plate – multi plate – clutches – Torque converters – Gear boxes – Function – Sliding mesh – Constant mesh and synchromesh gear boxes – Selector Mechanism – Automatic operation of gear boxes – over drive – Front wheel drive – Propeller shaft and universal joints – Constant velocity Universal joints.

UNIT - II

Front axle and steering geometry – Principle of power steering – steering mechanism – Re circulating ball mechanism – cam & Double pin steering gear boxes – Chamber angle, Caster angle, King pin inclination – Types of frames and suspension systems. Independent suspension – Rear suspension – Pneumatic suspension.

UNIT - III

Rear axle – final drive – Single and double reduction axle, torque and thrust members – arrangements. Differential – function of differential – differential locks – rear axle – housing construction – Rear axle arrangements.
Brakes – Mechanical, disc, hydraulic and pneumatic brakes – servo brakes.

UNIT - IV

Electrical system of the automobile storage battery – starters – Dynamo, Self motors – regulators and alternators – Ignition system – coil ignition system, and transistor ignition system –Gasoline injection. Alternate fuels – LPG, CNG, Methanol, Ethanol.

UNIT - V

Source of automotive pollution – Petrol engine pollution and Diesel engine pollution – formation of oxides of nitrogen, carbon monoxide, hydrocarbon, and smoke, particulate emission – control, crankcase emission, Air fuel mixture, ERG, air injection, thermal reactors in cylinder control of pollution, catalytic converters. Use of driving cycles for emission measurements. National and International standards. Non dispersive infrared gas analyser, Smoke measurements and smoke meters.

Text Books:

1.Automobile Engineering GUPTA R.B., Sathya Prakasam New market, New Rohtaroad, New Delhi.
2. Diesel Mechanics Mangal M.K., Tata McGraw Hill
3. Crouse William automotive Emission control, Gregg Division, McGraw-Hill, 1971.

Reference Books:

1. Internal Combustion Engines, John Keywood. B., Mc-Graw-Hill
2. Motor Vehicles, Newton & Steeds
3. Fundamentals of Motor Vehicle technology, Hillier V.M.
4. Automobile Engines Heitner.

MFEE705/ 706/ 805/ 806/PMFEE604/702/703
MODERN MANUFACTURING STRATEGIES

OBJECTIVES

- To provide knowledge and understanding of the modern manufacturing strategies and to present a broad conceptual framework for the management of the operations function across the supply chain.

UNIT - I

Total Productive Maintenance (TPM) - Six big losses – TPM implementation – TPM and TQC.

UNIT - II

Supply Chain Management (SCM)-Basic concepts – Supplier selection – Analytic Hierarchy Process (AHP) – Customer-supplier relationship – JIT and SCM - ERP Vs SCM-Logistics management.

UNIT - III

Just-in-time (JIT)- JIT philosophy – Objectives – Sources of waste – Waste reduction – Value added focus – push system-pull system – push vs pull system – kanban – JIT implementation

UNIT - IV

Business Process Re-engineering (BPR)- Basic concepts – TQM and BPR – Traditional IE and BPR- Benchmarking-Types of benchmarking-overview and approaches to Concurrent Engineering - Agile and Lean Manufacturing- Small lot Production – Setup time reduction – SMED methodology.

UNIT - V

Other Management Techniques - Technology Management – Strategic Management - Decision Support Systems (DSS) – Manufacturing flexibility - Enterprise wide information system (EWIS) – Enterprise resource planning (ERP) – selection of ERP - Product development – SWOT analysis – Value stream mapping – Customer relationship management – Re-Manufacturing.

Text Book:

1. Industrial Engineering and Management, Ravishankar, Galgotia Publications pvt. Ltd., New Delhi. 2002

References:

1. Advanced Operations Management, Mohanty R.P., and Deshmukh S.G., Pearson Education (Singapore) Pvt. Ltd., New Delhi, India.2003.
2. Competitive Manufacturing Management, Nicholas J.M., TMH, New Delhi. 2001.
3. Introduction to Total Productive Maintenance, Seiichi Nakeiima, Productivity Press (India) Pvt Ltd., Madras, 1988.

ANNAMALAI UNIVERSITY
DEPARTMENT OF MANUFACTURING ENGINEERING
B.E. MECHANICAL ENGINEERING (MANUFACTURING)
(Choice Based Credit System)
(PART-TIME)
REGULATIONS AND SYLLABI
REGULATIONS

1. Condition for Admission

Candidates for admission to First year of the 3½ years B.E. Degree Programme by Part-time shall be required to have passed the Diploma Examination in the appropriate branch conducted by the State Board of Technical Education of Tamil Nadu of its equivalent examination accepted by the Syndicate of this University. They shall satisfy the conditions regarding eligibility norms as may be prescribed by the Syndicate of the Annamalai University from time to time.

2. Eligibility for the Degree

A pass in a Diploma Course in any of the appropriate branch Civil / Mechanical / Electrical / Electronics / Instrumentation / Chemical branches of Engineering conducted by the State Board of Technical Education of Tamilnadu or its equivalent examination with 3 years professional experience in a recognized industry or organization after passing the Diploma examination.

The admission is restricted to those working or residing within a radius of 75 km from Annamalainagar. The application should be sent through their employers.

However the advance copy with all documents complete in all respects should be received before the prescribed last date. The application through proper channel to be received before entrance test.

3. Branches of Study in B.E.

Branch-I	: Civil Engineering
Branch-II	: Civil and Structural Engineering
Branch-III	: Mechanical Engineering
Branch-IV	: Mechanical Engineering (Manufacturing)
Branch-V	: Electrical and Electronics Engineering
Branch-VI	: Electronics and Instrumentation Engineering
Branch-VII	: Chemical Engineering

4. Subject of Study

The subjects of study and syllabus for the subjects are given separately.

5. Scheme of Examinations

The scheme of Examinations is given separately.

6. Choice Based Credit System

Each course is normally assigned one credit per period of lecture/tutorial per week and one credit for two periods or part thereof for laboratory or practical or drawing per week.

Each semester curriculum shall normally have a blend of theory and practical courses. The total credits for the entire degree programme will be 135. For the award of the degree a student has to earn a minimum of 135 credits.

7. Duration of the Programme

A student is normally expected to complete the B.E. Programme in 3½ years but in any case not more than eight years from the time of admission.

8. Registration for Courses

A newly admitted student will automatically be registered for all the courses prescribed for the first semester without any option.

Every other student shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration with the approval of the Dean on the recommendation of the Head of the Department along with a late fee will be done up to the last working day.

Registration for the project work shall be done only for the final semester.

9. Assessment

The break-up of assessment and examination marks for theory subjects is as follows.

First assessment	: 10 marks
Second assessment (mid-semester test)	: 10 marks
Third assessment	: 05 marks
Examination	: 75 marks

The break-up of assessment and examination marks for practical subjects is as follows.

First assessment (test)	: 15 marks
Second assessment (test)	: 15 marks
Maintenance of record book	: 10 marks
Examination	: 60 marks

The project work will be assessed for 40 marks by a committee consisting of the guide and a minimum of two members nominated by the Head of the Department. One of the committee members will be nominated as the chairman by the Head of the Department. The Head of the Department may himself be a member or the chairman. 60 marks are allotted for the project work and viva voce examination at the end of the seventh semester.

10. Student Counsellors

To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counsellor for those students throughout their period of study. Such student counsellors shall advise the students, give preliminary approval for the courses to be taken by the students during each semester and obtain the final approval of the Head of the Department.

11. Class Committee

For each of the semesters, separate class committees will be constituted by the respective Heads of Departments.

The composition of the class committees from first to seventh semester will be as follows.

Course co-ordinators of the common courses, if any, who shall be appointed by the Head of the Department from among the staff members teaching the common course.

A project co-ordinator (in the seventh semester committee only) who shall be appointed by the Head of the Department from among the project supervisors.

Teachers of other individual courses.

One Professor or Reader, preferably not teaching the concerned class, appointed as chairman by the Head of the Department. The Head of the Department may opt to be a member or the chairman.

The class committee shall meet four times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of assessment like test, assignment etc. for the first and third assessments and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The second assessment will be the mid-semester test. The third meeting will be held within a week after the second assessment is completed to review the performance and for follow-up action.

The fourth meeting will be held after all the assessments except the examinations are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 40 marks will be finalised for every student and tabulated and submitted to the Head of the Department for approval and transmission to the Controller of examinations.

12. Withdrawal from a Course

A student can withdraw from a course at any time before a date fixed by the Head of the Department prior to the second assessment, with the approval of the Dean of the faculty on the recommendation of the Head of the Department.

13. Temporary Break of Study

A student can take a one-time temporary break of study covering the current year/semester and/or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid semester test. However, the student must complete the entire programme within the maximum period of eight years.

14. Substitute Assessments

A student, who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the examination, may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the date of the fourth meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Head of the Department within a week from the date of the missed assessment.

15. Attendance Requirements

To be eligible to appear for the examination in a particular course, a student must put in a minimum of 80% of attendance in that course. However, if the attendance is 75% or above but less than 80% in any course, the authorities can permit the student to appear for the examination in that course on payment of the prescribed condonation fee.

A student who withdraws from or does not meet the minimum attendance requirement in a course must reregister for and repeat the course.

16. Passing and Declaration of Examination Results

All assessments of all the course on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the Controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average and cumulative grade point average, and prepare the grade cards.

90 to 100 marks	: Grade 'S'
80 to 89 marks	: Grade 'A'
70 to 79 marks	: Grade 'B'
60 to 69 marks	: Grade 'C'
55 to 59 marks	: Grade 'D'
50 to 54 marks	: Grade 'E'
Less than 50 marks	: Grade 'F'
Insufficient attendance	: Grade 'I'
Withdrawn from the course	: Grade 'W'

A student who obtains less than 24 marks out of 60 in the examination or is absent for the examination will be awarded grade 'F'.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course. Such a course cannot be repeated by the student.

A student who obtains letter grade F in a course has to reappear for the examination in that course.

A student who obtains letter grades I or W in a course must reregister and repeat the course.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

S - 10; A - 9; B - 8; C - 7; D - 6; E - 5; F - 0

Courses with grades I and W are not considered for calculation of grade point average or cumulative grade point average. F grade will be considered for computing GPA and OGPA.

A student can apply for retotalling of one or more of his examination answer papers within a week from the date of issue of grade sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of examinations with the recommendation of the Head of the Department.

After results are declared, grade cards will be issued to the students. The grade card will contain the list of course registered during the year/semester, the grades scored and the grade point average (GPA) for the year/semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the year/semester, divided by the sum of the number of credits for all courses taken in that year/semester. OGPA is similarly calculated considering all the courses taken from the time of admission.

The results of the final semester will be withheld until the student obtains passing grade in all the subjects of all earlier semesters.

After successful completion of the programme, the degree will be awarded with the following classifications based on OGPA.

For First class with Distinction the student must earn a minimum of 135 credits within 3½ years from the time of admission, pass all the courses in the first attempt and obtain a OGPA

of 8.25 or above.

For First class the student must earn a minimum of 135 credits within four years from the time of admission and obtain a OGPA of 6.75 or above.

For Second class the student must earn a minimum of 135 credits within eight years from the time of admission.

17. Ranking of Candidates

The candidates who are eligible to get the B.E. degree in First Class with distinction will be ranked together on the basis of the percentage of marks obtained by them in all the subjects of study from III to VIII semester.

The candidates passing with First class will be ranked next after those with distinction on the basis of the percentage of marks obtained by them in all the subjects of study from III to VIII Semester.

The ranking will be done separately for each branch of study.

18. Electives

Apart from the various elective courses offered in the curriculum of the branch of specialization, a student can choose a maximum of two electives from any specialisation under the faculty during the entire period of study, with the approval of the Head of the Department and the Head of the Department offering the course.

19.

The University shall have powers to revise or change or amend the regulations. the scheme of examinations, the subjects of study and the syllabi from time to time.

20. Transitory Regulations

Wherever there had been change of syllabi, examinations based on the existing syllabus will be conducted for three consecutive times after implementation of the new syllabus in order to enable the students to clear the arrears. Beyond that the students will have to take up their examinations in equivalent subjects, as per the new syllabus, on the recommendations of the Head of the Department concerned.

I Semester

Code	Subject	Ins. Hours/Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
PMFEC101	Mathematics-I	4	-	-	-	3	25	75	100	4
PMFEC102/ MFEC302	Material Science	4	-	-	-	3	25	75	100	4
PMFEC103/ MFEC303	Thermal Engineering	4	-	-	-	3	25	75	100	4
PMFEC104/ MFEC305	Mechanics of Materials	4	-	-	-	3	25	75	100	3
PMFEC105/ MFEC304	Fluid Mechanics & Machinery	4	-	-	-	3	25	75	100	4
Total		20	-	-	-	-	125	375	500	19
Cumulative Total										19

II Semester

Code	Subject	Ins. Hours/Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
PMFEC201	Mathematics-II	4	-	-	-	3	25	75	100	4
PMFEC202/ MFEC404	Mechanics of Machines-I	4	-	-	-	3	25	75	100	4
PMFEC203/ MFEC506	Design of Machines Elements	4	-	-	-	3	25	75	100	4
PMFEC204/ MFEC405	Measurements in Manufacturing	4	-	-	-	3	25	75	100	4
PMFEC205	Computer Programming	4	-	-	-	3	25	75	100	3
Total		20	-	-	-	-	125	375	500	19
Cumulative Total										38

L – Lecture; T – Tutorial; P – Practical; D – Drawing

III Semester

Code	Subject	Ins. Hours/Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
PMFEC301/ MFEC306	Electrical Electronics Engineering	4	-	-	-	3	25	75	100	3
PMFEC302/ MFEC504	Mechanics of Machines-II	4	-	-	-	3	25	75	100	4
PMFEC303/ MFEC406	Machine Tool Technology	4	-	-	-	3	25	75	100	4
PMFEC304/ MFEC503	Casting Technology	4	-	-	-	3	25	75	100	4
PMFEC305/ MFEC606	Computer Aided Design	4	-	-	-	3	25	75	100	4
Total		20	-	-	-	-	125	375	500	19
Cumulative Total										57

IV Semester

Code	Subject	Ins. Hours/Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
PMFEC401/ MFEC402	Industrial Management	4	-	-	-	3	25	75	100	4
PMFEC402/ MFEC505	Engineering Metallurgy	4	-	-	-	3	25	75	100	4
PMFEC403/ MFEC403	Mechanics of Metal Machining	4	-	-	-	3	25	75	100	4
PMFEC404/ MFEC501	Metal Joining Process	4	-	-	-	3	25	75	100	4
PMFEC405/ MFEC704	CNC & Robotics	4	-	-	-	3	25	75	100	4
Total		20	-	-	-	-	125	375	500	20
Cumulative Total										77

L – Lecture; T – Tutorial; P – Practical; D – Drawing

V Semester

Code	Subject	Ins. Hours/Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
PMFEC501/ MFEC502	Industrial Engineering	4	-	-	-	3	25	75	100	4
PMFEC502/ MFEC605	Metal Forming Processes	4	-	-	-	3	25	75	100	4
PMFEC503/ MFEC603	Tool Engineering	4	-	-	-	3	25	75	100	4
PMFEC504/ MFEC701	Machine Tool Control & Automats	4	-	-	-	3	25	75	100	4
PMFEC505/ MFEC803	Advanced Manufacturing Processes	4	-	-	-	3	25	75	100	4
Total		20	-	-	-	-	125	375	500	20
Cumulative Total										97

VI Semester

Code	Subject	Ins. Hours/Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
PMFEC601/ MFEC602	Production & Operations Management	4	-	-	-	3	25	75	100	4
PMFEC602/ MFEC703	Non Traditional Manufacturing Processes	4	-	-	-	3	25	75	100	4
PMFEC603/ MFEC801	Machine Tool Design	4	-	-	-	3	25	75	100	4
PMFEE604	Elective – I	4	-	-	-	3	25	75	100	4
PMFEP605	Production Engineering Laboratory-I	-	-	6	-	3	40	60	100	2
Total		16	-	6	-	-	140	360	500	18
Cumulative Total										115

L – Lecture; T – Tutorial; P – Practical; D – Drawing

VII Semester

Code	Subject	Ins. Hours/Week				Exam Duration in hours	Internal assessment marks	End exam marks	Total Marks	Credit Points
		L	T	P	D					
PMFEC701/ MFEC702	Operations Research	4	-	-	-	3	25	75	100	4
PMFEE702	Elective - II	4	-	-	-	3	25	75	100	4
PMFEE703	Elective – III	4	-	-	-	3	25	75	100	4
PMFEP704	Production Engineering Laboratory-II	-	-	6	-	3	40	60	100	2
PMFEV705/ MFET807	Project & Viva-voce	-	6	-	-	-	40	60	100	6
Total		12	6	6	-	-	155	345	500	20
Cumulative Total										135

L – Lecture; T – Tutorial; P – Practical; D – Drawing

LIST OF ELECTIVES (PMFEE604/702/703)

1. Finite Element Methods in Manufacturing
2. Intelligent Manufacturing Systems
3. Surface Engineering
4. Non-Destructive Testing
5. Engineering Economics
6. Automotive Engineering
7. Mechatronics (MFEC604)
8. Total Quality Management (MFEC802)
9 Modern Manufacturing Strategies

For the all the subjects expect PMFEC101, PMFEC201 & PMFEC205. The syllabi are same as that of regular stream.

PMFEC101 MATHEMATICS-I

Aim

The course is aimed at developing the skills of engineering students in the basics of chosen topics of Mathematics that are imperative for effective understanding - of engineering subjects. It also lays the foundation for leaving further topics of Mathematics in higher semesters in a graded manner. The learns will be enabled to appreciate the important role of mathematical concepts in engineering application.

Objectives

- On completion of course the students are expected to
- Be capable of identifying algebric eigen value problems from practical areas and obtain the eigen solutions in certain cares and to have acquired the technique of diagerally a matrix which would render the eigen solution procedure very simple.
- Understand effectively the geometrical aspects of curvature, involutes and evolutes of plane curves, essential concepts for an enquirer as elegant application of differential calculation.
- Have learnt the method of double and triple integration, which are needed in their studies in other areas and gained confidence to handle integrals of higher order
- Have studied the basics of vector calculation comprising of gradient, divergence and cure and line, surface and volume integrals and the classical theorem involving them which would be encountered by them in their engineering subjects I the same or higher semesters

Unit-I: Matrices

Inverse of a matrix by elementary transformation - Eigen value problem-Eigenvalues and eigenvectors of a real matrix-properties of eigen values and eigenvectors - cayley - Hamiltion theorem (without proof) - Orthogonal transformation of a symmetric matrix to diagonal form - Reduction of quadratic form to canonical form by orthogonal transformation - Nature of quadratic form.

Unit-II: Differential Calculus

Curvature - Cartesian and parametric co-ordinates - centre and radius of curvature - circle of curvature - Evolutes - Envelops - Tayler series and Maclourin's series expansion of function of two variables - Jacobians - Haxima and minima of functions of two variables - Contrained maxima and minima Lagrange's method of multipliers.

Unit-III: Multiple Integrals and Curve Fitting

Evaluation of double and triple integrals - Change of order of integration Beta and Gamma functions. Fitting of straight lines, parabolas and exponential curve by method of least squares.

Unit-IV: Vector Differentiation

Scalar and vector point function - differentiation of vector-gradient of a scalar function - simple applications - Divergence and curl of vector functions Solenoidal and irrotational fields - Expansion formulae of first and second order differential operators.

Unit-V: Vector Integration

Line integral - surface integral - Volume integral - Gauss Divergence theorem - Stoke's theorem - Green's theorem in a plane (without proof) - verification of the above theorem and evolution of integrals using them.

Text Books

1. Kandasamy.P., Thilagavathy.K and Gunavathy,K "Engineering Mathematics" series, S.Chand & Co, Ltd(2004) New Delhi.
2. Venkataraman,M.K; "Engineering Mathematics" series, The National Pub Co., Chennai,2003.

References .

1. Veerarajan,T., "Engineering Mathematics" Series, Tata McGraw-Hill Pup Co, Ltd, New Delhi, 2002
2. Vairamanickam,K; Nirmala.P Ratchogan, Thilligovindan.N.,"Engineering Mathematics" Vol-I, Prentice Hall Pvt Ltd, New Delhi, 2005.
3. Kreyszig.E., "Advance Engineering Mathematics", John wiley and sons (Asia) Ltd, Singapore, 2001

PMFEC201 MATHEMATICS -II

Aim

An aim of the course is to train the students in additional areas of Engineering Mathematics, necessary for grooming them into successful engineers. The topics introduced will serve as basic tools for specialized studies in many engineering fields, significantly in fluid mechanics, field theory and communication engineering.

Objective

On completion of the course the students are expected to

- Have learnt the method of solving differential equations of certain types, including systems of differential equations that they might encounter in their studies of other subjects in the same or higher studies.
- Have a sound knowledge of lap lace transform and its properties and sufficient exposure to solution of certain linear differential equations using the laplace transform technique.
- Have a good grasp of analytic functions and their interesting properties which could be exploited in a few engineering areas, and be introduced to the host of conformal mappings with a few standard examples that have direct applications,
- Have grasped the basics of complex integration and the concept of contour integration which is an important tool for evaluation of certain integrals encountered in practice.

Unit-I: Ordinary Differential Equations

Second order differential equations with constant coefficients - simultaneous first order constant differential equations - Application of second order differential equations to deflection of beams and electrical circuits.

Unit-II: Differential Equations with Variable Coefficients and Special Methods

Linear differential equations of second order with variable coefficients: Euler's homogeneous differential equations - Legender's differential equations - Complete solution in terms of an integral of the corresponding homogeneous equation by inspection - Reduction to normal form by removing the first derivative - Change of independent variable - method of variation of parameters.

Unit-III:Laplace Transform

Laplace transform - Transforms of elementary functions - Basic properties Inverse laplace transform - Laplace transform of derivatives and integrals Transform of periodic functions - Application to solution of linear ordinary differential equations Second order with constant coefficients.

Unit-IV: Complex Variables

Function of a equation variable - Analytic function - Cauchy-Riemann equation in Cartesian coordinates - Properties of analytic function - Determination of harmonic conjugate by Milne Thomson method - Conformal mapping. $W = 2^2$, $W = 1/2$, $W = e^2$, $W = \sin 2$, $W = \text{Cosz}$ - Bilinear Transformation

Unit-V: Complex Integration

Complex integration - Cauchy's integral theorem - Cauchy's integral formula Taylor and Laurent expansion - Residues - Cauchy's residue theorem - Counter integration- Evaluation of simple standard integrals around unit circle -Semi- circular contours(excluding poles on real axis).

Text Books

1. Kandasamy.P., Thilagavathy.k and Gunavathy.K., "Engineering Mathematics Series". S. Chand & company Ltd., New Delhi. 2004.
2. Venkataraman. M.K., " Engineering Mathematics Series". The national Pub. Co. Chennai. 2003.

References

1. Veerarajan.T." Engineering Mathematics Series". Tata McGraw Hill Pub.Co. Ltd. New Dellii- 2002.
2. Vairamanickam. K., Ninnala.P., Ratchagar., ThillaiGovindan.N., Engineering Mathematics VoLl . Printice Hall Pvt. Ltd. New Dellii. 2005.
3. Kreyzig. E., "Advanced Engineering Mathematics" John Wiley & Son's (Asia)Pvt. Ltd. Singapore. 2001.

PMFEC205 COMPUTER PROGRAMMING

UNIT I

Object Oriented Programming (C++): Objects and classes – Methods – Messages – Encapsulation – Abstraction – Polymorphism – Dynamic binding. Traditional approach Vs object orientation: The benefits of object orientation – Flexibility in software development – Reusability – Extensibility and Maintainability

UNIT II

Member Functions – Reference Variables – Constructor & Destructor Functions – Overloaded Functions and Operators – Inheritance and Derived Classes – Streamed I/O operators – Creating Data types in C++ - Classes in Action – Data Hiding – Introducing friend function – Techniques for Creating and Initializing Objects and Cleaning Objects – Deriving Classes

UNIT III

Components of C++ functions: Function Prototypes – Calling C++ functions – Passing Arguments – Reference Arguments – Default Arguments – Inline Functions – Iterative Functions and Objects – Virtual Functions and Polymorphism

UNIT IV

Functions and Operator Overloading: Operator Overloading using friend functions – Example of Operator overloading – Calling Constructors – Creating static, Dynamic and Automatic objects – Different Types of Constructors

UNIT V

Inheritance: Types of Inheritance – Class Hierarchies using Constructors and Destructors in Derived Classes – C++ Stream I/O Systems – Using the Stream Operators – Initializing Istream, Ostream Objects - Record Oriented File I/O

TEXT BOOK:

1. The C++ Programming Language, Bjarne Stroustrup, Addition Wesley Publications, Second Edition, 1991

REFERENCE BOOKS:

1. Objected Oriented Programming in C++, Balagurusamy, E., Tata-McGraw Hill, Delhi, 1997
2. Learning C++, Neil Graham, McGraw Hill, 1991
3. The Complete C++, Primer, Keith Wleiskamp and Byran Flaming, Academic Press Inc. 1990