FACULTY OF ENGINEERING

IASE University

Gandhi Vidya Mandir, Sardarshahr (Rajasthan) – 331403, INDIA

Teaching and Examination Scheme and Syllabus

for

BACHELOR OF ENGINEERING
(Mechanical Engineering)
(Four-Year Full Time Degree Programme)
(SEMESTER SCHEME)

Rules And Guidelines For The Students

1. The Bachelor of ENGINEERING (Mechanical Engineering) course is a four year (Eight Semester) full time integrated degree programme.

2. ELIGIBILITY for Admission

A candidate seeking admission to the first year of the Bachelor of Engineering (Mechanical Engineering) course shall be required to have passed 10+2 examination in Science with Physics, Chemistry and Mathematics from any board recognized by Rajasthan Board of Secondary Education, Rajasthan with at least 45% marks in aggregate for general category candidates, and 40% for SC/ST/OBC candidates.

3. ADMISSION procedure

Admission to the first year B.E. course shall be made on the basis of marks scored by the candidates in his/her 10+2 examination.

4. THE PROGRAMME

The Bachelor of Engineering (Mechanical Engineering) is a four year (Eight semesters) full time degree program .The course structure and program administration are as follows.

5. COURSE STRUCTURE

The four year, eight semester teaching consists of Theory (Lectures and Tutorials) and Practicals/Sessionals (Laboratory work, Engineering Graphics, Workshop Practice and Project etc.).Examination will be held at the end of the each semester. Details of these are given in the Teaching & Examination Scheme.

6. PROGRAMME ADMINISTRATION

6.1 Medium of Instruction

English shall be the medium of instruction and examination.

6.2 EVALUATION

(a) Each subject will be evaluated through a theory paper at the end of the semester carrying 100 marks along with continuous evaluation of sessional work, carrying 50 marks. The theory paper shall be of three hour duration. The sessional work will consist of continuous assessment of student's performance by teachers in tutorial classes, and class tests.

(b) Three class tests will be organized in each semester as per the scheme. The higher two out of the marks scored in the three tests will be considered for the sessional marks.

(c) Evaluation of laboratory practical work and Engineering Graphics (Drawing) will be through continuous assessment throughout the semester as well as examination at the end of the semester.

(d) At the end of the sixth semester the student will undergo practical training for a period of at least 45 working days in an industry / research organization related to his / her field of Study. At the end of the training, the student will submit its report to the Head of the Department within three weeks of the start of the seventh semester. The work of the practical training will be evaluated by a board of two teachers appointed by the Head of the Department. The later will counter sign the marks awarded by the board.

(e) Project: The project work will be carried out in the VII & VIII semester. The Head of the Department will approve the topic of the project and the entire project work will be carried out under the guidance of a teacher of the department approved as project supervisor by the Head of the Department. The nature of the project work will consist of varying proportions of designing, fabrication, testing and analysis of results. The project topic can also be taken from a live industrial problem. The report of the completed project shall be signed by the guide and submitted to the Head of the Department on or before the last working day of the eighth semester. A board consisting of two examiners will do the evaluation of the project.

7. Promotion

7.1 The maximum span period of a program is eight years from the date of registration in the program.

7.2 The minimum marks for passing the examination for each semester shall be 50% in each practical/ sessional, 40% in End Semester Examination of each theory paper, 50% in training and project, and 45% in the aggregate of all the subjects (theory, sessional and project) of the semester.

7.3 A student will be permitted to attend the classes of the second/fourth/sixth/eighth semesters immediately after the examination of the first/third/fifth/seventh semester's examination, as the case may be, provided he/she has appeared in the first/third/fifth/seventh semester examination, respectively.

7.4 To be eligible for promotion to the 3rd semester of the program a student must have successfully cleared at least 10 subjects out of the 20 subjects including practicals of the first and second semesters taken together.

7.5 To be eligible for promotion to the 5th semester of the program a student must have successfully cleared at least 12 subjects out of the 23 subjects including practicals and sessionals of the third and fourth semesters taken together.

7.6 To be eligible for promotion to the 7th semester of the program a student must have successfully cleared at least half the subjects including practicals and sessionals of the fifth and sixth semesters taken together.

7.7 A student promoted to the third/fifth/seventh semesters, without having cleared all the papers, will have to appear and pass the backlog papers of the first/third/seventh semesters along with the regular examination of the first/third/fifth semesters and backlog papers of the second/fourth/sixth semesters along with the regular examination of the second/fourth/sixth semesters.

7.8 A candidate who has secured minimum marks to pass in each paper but has not secured the minimum marks required to pass in the aggregate for the semester concerned may take re-examination in not more than two papers to obtain the aggregate percentage required to pass the semester. The candidate will have to pay the requisite examination fee in order to be eligible for re- examination. In this case the marks secured by the candidate in the earlier examination in the paper concerned will be cancelled.

7.9 (a) Award of Division:

Securing 60% marks and above – Ist division

Securing 50% and above but below 60% - IInd division

Securing 45% and above but below 50% - pass

For first B.E. to 3rd B.E. the division will be decided based on the marks obtained in the respective class/ year.

(b) For the declaration of Final B.E. result, marks will be totalled up as follows:

First B.E.:	50% of the marks secured
Second B.E.:	75% of the marks secured
Third B.E.:	100% of the marks secured
Final B.E.:	100% of the marks secured

- A student who has secured 75% marks and above shall be declared to have passed in first division with honors. However, for this the student must have cleared successfully all the subjects in single attempt in the final year period of his/her study.
- Similarly, to be eligible for a gold medal on account of having secured first position, the student must have cleared all subjects in single attempt and passed them with first division.

7.10 For determining merit position of the candidates at the final year level the marks obtained by them in the second, third and final year as described above shall only be considered.

7.11 If a student (who has successfully completed the programme) wishes to reappear in one or more theory papers of the first, second, third, fourth, fifth, sixth, seventh or eighth semesters for the purpose of improving his/her marks, he/she will be permitted to do so on payment of requisite examination fee along with the regular examinations of that semester; however, the total number of such attempts shall not exceed four theory papers during the span period of the programme. For this his/her previous performance in the paper/papers concerned shall be treated as cancelled. The application for such reappearing/re-examination must be submitted before the next examination of the corresponding semester. However, such candidates shall not be considered for award of gold medal.

7.12 A student to be eligible for award of degree has to clear all papers offered during four-year programme within the span period of eight years.

8. LATERAL ENTRY

Students who have passed 3 year diploma examination from the Board of Technical Education, Rajasthan, or its equivalent with a minimum of 60% marks can be admitted to the Third Semester of the B. E. programme. However, they will be required to pass a course on Special Mathematics (BE300) for Diploma pass students. Students will have to pass this course before they are admitted to the seventh semester. However, the marks obtained in this course will not be counted for deciding the division of the student.

9. Attendance: All students are required to have 75% attendance in each subject and there must be 75% attendance of the student before he/she could be permitted to appear in the examination.

10. RULES FOR CHANGE OF BRANCH FOR THE STUDENTS OF III SEM. B.TECH/ B.E.:

I The faculty, on the basis of applications received from desirous students up to the date and time notified by the Director, will prepare a merit list of the students. The list will be prepared on the basis of overall merit of the I (Semester) result only and the applications for change of branch will be processed as per the merit list.

II Request for change from B.E. to B. Tech. programme or vice versa by any student will be considered only if, the candidate fulfills basic admission criteria for the desired programme and using the guidelines below:

If the candidate is eligible for change from B. Tech. to B.E. & vice-versa is found deficit in the course coverage of first and second semester, he will have to pass the deficit courses before the candidate is admitted to the seventh semester. However, the marks obtained in the deficit courses will not be added for deciding the division of the student.

ELIGIBILITY CRITERIA:

(a) The students must have passed the I Semester B.Tech./B.E Examination in all components in one attempt with at least 60% marks in aggregate. The student with back papers or whose result has not

been declared will not be considered for change of branch.

(b) In case any student has applied for re-valuation/ re-totaling of his/her marks of I Semester B.Tech/B.E and the result has not been received till the time of change of branch, such a student will not be entitled for change of branch on the basis of his/her subsequently revised result.

PROCEDURE:

1) Applications in a specified format (developed by the faculty) for change of branch will be invited by the Director/Principal of the faculty on the basis of the result of I (Semester) B. Tech./ B.E in duplicate, upto the date notified by IASE University. One copy of each such application be sent to IASE University by that date.

2) The students would submit a photo copy of I (Semester) Examination mark sheet of that year along with the application. The student may give as many preferences as possible against the vacant seats in respective college.

3) A seat matrix shall be prepared by the faculty, as per the details of the vacant seats (admitted through direct admission) in the previous year.

4) Due to change of branch, the strength of student in any branch should not fall short of 75% of the enrolled students in that branch in that year. And under no circumstances, due to change of branch, the number of seats in a particular branch in a college shall exceed the sanctioned strength approved by the AICTE, for that batch.

5) All students who have applied for the change of branch in-time will be called for counseling by the admission council of the faculty and considered for change of branch as per merit, preference and availability of seat. However, at the time of the counseling, if any student wishes to withdraw his/her application he/she can do so by a written request. In case any student does not present himself/herself for counseling, his/her branch will be changed as per the preference mentioned in the application form, merit and availability of seat.

11. RULES FOR THE AWARD OF GRACE MARKS

A. UNDER GRADUATE/ POST GRADUATE (MAIN/SUPPLYMENTARY EXAMINATIONS UNDER THE FACULTIES OF ENGINEERING & TECHNOLOGY.

Grace marks to the extent of 1% of the aggregate marks prescribed for an examination will be awarded to a candidate failing in not more than 25% of the total number of theory papers, practicals, sessionals, dissertation, viva-voce and the aggregate, as the case may be in which minimum pass marks have been prescribed; provided the candidate passes the examination by the award of such Grace marks. For the purpose of determining the number of 25% of the papers, only such theory papers practicals, dissertation, viva-voce etc. would be considered, of which, the examination is conducted by the University.

N.B.:- If 1% of the aggregate marks or 25% of the papers works out in fraction, the same will be raised to the next whole number. For example, if the aggregate marks prescribed for the examination are 450, grace marks to the extent of 5 will be awarded to the candidate, similarly, if 25% of the total papers is 3.2, the same will be raised to 4 papers which grace marks can be given.

GENERAL:-

- A candidate passes in a paper/ practical or the aggregate by the award of grace marks will be deemed to have obtained the necessary minimum for a pass in that paper/ practical or in the aggregate and shown in the marks sheet to have passed by grace. Grace marks will not be added to the marks obtained by a candidate from the examiners nor will the marks obtained by the candidate be subject to any deduction due to award of grace marks in any other paper/ practical or aggregate.
- If a candidate passes the examination but misses First or Second Division by one mark, his aggregate will be raised by one mark so as to entitle him for the first or second division, as the case may be. This one mark will be added to the paper in which he gets the least marks and also in the aggregate by showing +1 in the tabulation register below the marks actually obtained by the candidate. The marks entered in the marks-sheet will be inclusive of one grace mark and it will not be shown separately.
- Non appearance of a candidate in any paper will make him ineligible for grace marks. The place of a passed candidate in the examination list will, however be determined by the aggregate marks he secures from the examiners, and he will not, by the award of grace marks, become entitled to a higher division.
- Distinction won in any subject at the examination is not to be forfeited on the score that a candidate has secured grace to pass the examination.

Note: - The Grace marks will be awarded only, if candidate appears in all the papers prescribed for the examination.

TEACHING & EXAMINATION SCHEME
for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – First Year

Semester - I

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	BE101	English	3	1	-	30	20	50	100	150
2	BE102	Engineering Mathematics-I	3	1	-	30	20	50	100	150
3	*BE103/203	Engg. Physics/Engg. Chemistry	3	1	-	30	20	50	100	150
4	BE104	Computer Systems & Programming	3	1	-	30	20	50	100	150
5	BE105	Electrical & Electronics Engg.	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
6	*BE106/208	Engg. Physics/ Engg. Chemistry Lab	-	-	3	50	-	50	50	100
7	BE107	Computer Programming Lab	-	-	3	50	-	50	50	100
8	BE108	Practical Geometry	-	-	3	50	-	50	50	100
9	BE109	Workshop Practice	-	-	3	50	-	50	50	100
10	BE110	Electrical & Electronics Lab	-	-	2	50	-	50	50	100
		Total Hours	15	5	14					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 34
Total Marks – 1250

*Half of the intake of the student of the faculty shall study Physics and rest of the students shall study Engineering Chemistry in First Semester. In Second Semester, the students shall interchange the subjects.

TEACHING & EXAMINATION SCHEME

for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – First Year

Semester - II

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	BE201	Communication Techniques	3	1	-	30	20	50	100	150
2	BE202	Engineering Mathematics –II	3	1	-	30	20	50	100	150
3	*BE203/103	Engg. Chemistry /Engg. Physics	3	1	-	30	20	50	100	150
4	BE204	Engineering Mechanics	3	1	-	30	20	50	100	150
5	BE205	Mechanical Engineering	3	1	-	30	20	50	100	150
6	BE206	Environmental Studies& Disaster Management	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	BE207	Language Lab	-	-	2	45	-	45	30	75
8	*BE208/106	Engg. Chemistry /Engg. Physics	-	-	3	50	-	50	50	100
9	BE209	Environmental Engg. Lab	-	-	2	45	-	45	30	75
10	BE210	Machine Drawing	-	-	3	50	-	50	50	100
11	BE211	Discipline & Extracurricular Activities	-	-	-	-	-	100	-	100
		Total Hours	18	6	10					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 34
Total Marks – 1350

*Half of the intake of the student of the faculty shall study Physics and rest of the students shall study Engineering Chemistry in First Semester. In Second Semester, the students shall interchange the subjects.

TEACHING & EXAMINATION SCHEME

for B.E.(Mechanical Engineering)– Four Year (8 Semester) Full Time Degree Programme

B.E. (M.E.) Second Year **Semester - III**

S.No.	Course No.	Subject	Period			Examination Scheme				
			L	T	P	Sessional Exam			ESE	TOTAL
(THEORY)						TA	CT	TOTAL		
1	ME301	Mechanics of Solids	3	1	-	30	20	50	100	150
2	ME302	Materials Science & Engineering	3	1	-	30	20	50	100	150
3	ME303	Engineering Thermodynamics	3	1	-	30	20	50	100	150
4	ME304	Manufacturing Processes	3	1	-	30	20	50	100	150
5	ME305	Object Oriented Programming in c++	2	1	-	30	20	50	100	150
6	ME306	Advanced Engineering Mathematics	2	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	ME307	Mechanies of Solids Lab.	-	-	2/2	30	-	30	20	50
8	ME308	Materials science and Heat Treatment Lab.	-	-	2/2	30	-	30	20	50
9	ME309	Thermal Engg. .Lab-I	-	-	2	45	-	45	30	75
10	ME310	Production Engg. Lab.	-	-	3	50	-	50	50	100
11	ME311	Computer Programming lab	-	-	2	45	-	45	30	75
12	ME312	Machine Drawing	-	-	3	50	-	50	50	100

TA- Teacher's Assessment
CT- Class Test
ESE- End Semester Examination

Total Contact Hours-34
Total Marks-1350

	BE 300*	Special Mathematics	3	1	-	30	20	50	100	150

*This Course of Special Mathematics (BE300) is compulsory for student's having been admitted in B.E second year after passing Engineering Diploma. Students have to pass this course, before they are admitted to the third semester. However, the marks obtained in this course will not be counted for deciding the division of the student.

TEACHING & EXAMINATION SCHEME

for B.E.(Mechanical Engineering)– Four Year (8 Semester) Full Time Degree Programme

B.E.(M.E)Second Year **Semester - IV**

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	ME401	Design of Machine Elements-I	3	-	-	-	-	-	150	150
2	ME402	Thermal Engineering - I	3	1	-	30	20	50	100	150
3	ME403	Fluid Mechanics	3	1	-	30	20	50	100	150
4	ME404	Machining & Machine Tools	3	1	-	30	20	50	100	150
5	ME405	Kinematics of Machines	3	1	-	30	20	50	100	150
6	ME406	Mechanical Measurements & Control	2	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	ME407	Dynamics of Machines Lab.	-	-	3	50	-	50	50	100
8	ME408	Fluid Mechanics Lab	-	-	2	45	-	45	30	75
9	ME409	Thermal Engg. Lab-II	-	-	3	50	-	50	50	100
10	ME410	Mechanical Measurements & control Lab.	-	-	2	45	-	45	30	75
11	ME411	Design of Machine Elements	-	-	3	30	20	50	50	100
12	ME412	Discipline and Cocurricular activities	-	-	-	-	-	-	-	100

TA- Teacher's Assessment
CT- Class Test
ESE- End Semester Examination

Total Contact Hours-35
Total Marks-1450

TEACHING & EXAMINATION SCHEME

for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – Third Year **Semester - V**

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	ME501	Advanced Mechanics of Solids	3	1	-	30	20	50	100	150
2	ME502	Heat Transfer	3	1	-	30	20	50	100	150
3	ME503	Fundamentals of Aerodynamics	3	1	-	30	20	50	100	150
4	ME504	Industrial Engg.-I	3	1	-	30	20	50	100	150
5	ME505	Dynamics of Machines	3	1	-	30	20	50	100	150
6	ME506	Principles of Turbomachines	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	ME507	P.E. Lab.-I	-	-	2	50	-	50	50	100
8	ME508	Automobile Engg. Lab.	-	-	2	50	-	50	50	100
9	ME509	DOM Lab - II	-	-	2	50	-	50	50	100
10	ME510	Matlab & Computer Graphics	-	-	2	45	-	45	30	75
11	ME511	Entrepreneurship Development	-	-	2	45	-	45	30	75
		Total Hours	18	6	10					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 34
Total Marks – 1350

TEACHING & EXAMINATION SCHEME

for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – Third Year **Semester - VI**

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	ME601	Design of M/c Elements - II	3	1	-	30	20	50	100	150
2	ME602	I.C. Engines & Diesel Power Plan	3	1	-	30	20	50	100	150
3	ME603	Manufacturing Science & Technology	3	1	-	30	20	50	100	150
4	ME604	Noise, Vibration and Harshness	3	1	-	30	20	50	100	150
5	ME605	Hydraulic Machines & Hydroelectric Power Plant	3	1	-	30	20	50	100	150
6	ME606	Numerical Methods and Applied Statistics	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	ME607	Heat Transfer Lab.	-	-	2	50	-	50	50	100
8	ME608	Turbomachinery Lab.	-	-	2	50	-	50	50	100
9	ME609	Computer Oriented Numerical Methods	-	-	2	50	-	50	50	100
10	ME610	Machine Design Sessional -II	-	-	2	45	-	45	30	75
11	ME611	CAD Lab (Pro E/Unigraphics/Autocad inventor)	-	-	3	45	-	45	30	75
12	ME611	Discipline & Cocurricular Activities	-	-	-	-	-	100	-	100
		Total Hours	18	6	10					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 34
Total Marks – 1450

TEACHING & EXAMINATION SCHEME

for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – Third Year **Semester - VII**

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	ME701	Computer Aided Design	3	1	-	30	20	50	100	150
2	ME702	Refrigeration & Air-conditioning	3	1	-	30	20	50	100	150
3	ME703	Operations Research	3	1	-	30	20	50	100	150
4	ME704	Steam Turbines & Steam Power Plant	3	1	-	30	20	50	100	150
5	ME705	Product Development and Launching	3	1	-	30	20	50	100	150
6	ME706	Robotics	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
7	ME707	P.E.Lab.- II	-	-	2	50	-	50	50	100
8	ME708	Mechanical Vibrations Lab.	-	-	2	50	-	50	50	100
9	ME709	I.C. Engine Lab.	-	-	2	50	-	50	50	100
10	ME710	Practical Training and Industrial Visit	-	-	2	30	-	30	20	50
11	ME711	Project stage-I	-	-	2	50	-	50	50	100
		Total Hours	18	6	10					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 34
Total Marks – 1350

TEACHING & EXAMINATION SCHEME

for B.E.– Four Year (8 Semester) Full Time Degree Programme

B.E. – Fourth Year **Semester - VIII**

S.No.	Course No.	Subject	Period			Examination Scheme				
(THEORY)			L	T	P	Sessional Exam			ESE	TOTAL
						TA	CT	TOTAL		
1	ME801	Renewable Energy Technology	3	1	-	30	20	50	100	150
2	ME802	Operations Management	3	1	-	30	20	50	100	150
3	ME803	Gas Turbines & Gas Power Plant	3	1	-	30	20	50	100	150
4	ME804	Computational Fluid flow & Heat Transfer	3	1	-	30	20	50	100	150
(PRACTICALS/SESSIONALS)										
5	ME806	CAM and Robotics Lab.	-	-	3	50	-	50	50	100
6	ME807	Industrial Engg. Lab	-	-	4	100	-	100	50	150
7	ME808	Seminar	-	-	4	100	-	100	50	150
8	ME809	Project stage-II	-	-	4	200	-	200	150	350
9	ME810	Discipline & Cocurricular Activities	-	-	-	-	-	100	-	100
		Total Hours	12	4	17					

TA – Teacher's Assessment
CT – Class Test
ESE – End Semester Examination

Total Contact Hours – 33
Total Marks – 1450

BE 101-ENGLISH

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT – I
Short Stories

- . "The Gift of the Magi" by O. Henry
- . "The Fortune-Teller" by Karl Capek
- . "The Nightingale and the Rose" Oscar Wilde

UNIT – II
Short Stories

- . "Dr. Heidegger's Experiment" by Nathaniel Hawthorne
- . "The Three Dancing Goats" by Anonymous
- . "The Accompanist" by Anita Desai

UNIT – III
Poems

- . "Mending Wall" by Robert Frost
- . "This is Going to Hurt Just a Little Bit" by Odgen Nash
- . "Death and Leveler" by James Shirley
- "Last Lesson of the Afternoon" by D. H. Lawrence
- . "Night of the Scorpion" by Nissim Ezekiel

UNIT – IV
Short Plays

- . "The Dear Departed" by Stanley Houghton
- . "Refund" by Fritz Karinthy
- . "Monkey's Paw" by W. W. Jacobs

UNIT – V
Essays

- . "Of Studies" by Francis Bacon
- . "Third Thoughts" by E. V. Lucas
- . "Toasted English" by R. K. Narayana

BE 102-ENGINEERING MATHEMATICS-I

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT – I
Differential Calculus

- Asymptotes (Cartesian Coordinates Only)
- Curvature
- Concavity, Convexity and Point of Inflexion (Cartesian Coordinates Only)
- Curve Tracing (Cartesian and Standard Polar Curves – Cardioids, Lemniscates of Bernoulli, Limacon, Equiangular Spiral)

UNIT – II
Differential Calculus

- Partial Differentiation, Euler's Theorem on Homogeneous Functions
- Approximate Calculations
- Maxima & Minima of Two and More Independent Variables
- Lagrange's Method of Multipliers

UNIT – III
Integral Calculus

- Applications in Finding the Length of Simple Curves
- Surface and Volumes of Solids of Revolution
- Double Integral, Areas & Volumes by Double Integration
- Change of Order of Integration
- Beta Function and Gamma Function (Simple Properties)

UNIT - IV
Differential Equations

- Differential Equations of First Order and First Degree – Variable Separable, Homogeneous Forms, Reducible to Homogeneous Form, Linear Form, Exact Form, Reducible to Exact Form
- Linear Differential Equations of Higher Order with Constant Coefficients Only

UNIT - V
Differential Equations

- Second Order Ordinary Differential Equations with Variables Coefficients
- Homogeneous and Exact Forms
- Change of Dependent Variable
- Change of Independent Variable, Normal Forms
- Method of Variation of Parameter

BE 103-ENGINEERING PHYSICS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

Interference of Light:-

- Interference as superposition of waves in space. Intensity variation. Bright and dark fringes. Fringe width. Conditions for observing interference of Light. Newton's Rings: Theory and experiment for determining wavelength of light and refractive index of liquid
- Michelson's Interferometer: Production of circular & straight line fringes, Determination of wavelength of light, Determination of wavelength separation of two nearby wavelengths

Polarization of Light:- types of polarization, Nicol prism, Double refraction, elliptically and circularly polarized light, Brewster's law, Malus law, Quarter wave and half wave plates.

UNIT - II

Diffraction of Light:

Fresnel diffraction:- narrow slit. Fraunhofer's diffraction:-Single Slit Diffraction: Quantitative description of single slit, Positions of maxima minima and width of central maximum, Intensity variation.

- Diffraction Grating: Construction and theory, Formation of spectrum by plane transmission grating, Missing and overlapping of spectra, Determination of wavelength of light using plane transmission grating
- Resolving Power: Geometrical & Spectral, Reyleigh criterion, Resolving power of diffraction grating,

UNIT – III

Lasers:- Spatial and temporal coherence, Coherence length, Coherent time and 'Q' factor for lightTheory of Laser Action: Einstein's coefficients components of a laser, Threshold condition for laser actionTheory, design and application of He-Ne and Semiconductor lasers

Holography

- Basic theory of holography, Basic requirement of a holographic laboratory
- Application of holography in microscopy and interferrometry

UNIT - IV

Quantum Mechanics:

Origin of quantum nature of light: Black body radiation and photoelectric effect.
Unability of wave theory of light to explain photoelectric effect. Einstein Photoelectric Equation.
De-Broglie Matter waves. Uncertainity principle

- Compton effect and quantum nature of light
- Schrödinger's Wave Equation: Time dependent and time independent cases
- Physical interpretation of wave function and its properties, boundary conditions
- Particle in one and three dimensional boxes

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UNIT - V

Theory of relativity-Inertial frame of reference , Non-inertial frame of reference, Michelson- Morley experiment, Einstein's special Theory of Relativity Lorentz Transformation, length contraction, time dilation, addition of velocities, variation of mass with velocity, Equivalence of mass and energy.

BE 203-ENGINEERING CHEMISTRY

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

Water

- Common Impurities, Hardness
- Determination of hardness by Clark's test and complexometric (EDTA) method, Degree of hardness

Municipal Water Supply

- Requisites of drinking water, Purification of water, Sedimentation, Filtration, Sterilization, Break point chlorination

Water for Steam Making

- Boiler troubles carry over, Corrosion, Sludge and scale formation and caustic embrittlement

Methods of Boiler Water Treatment

- Preliminary treatments, Preheating, Lime-Soda process, Permutit (Zeolite) process, Deionizer or Demineralizer, Feed water conditioning, Internal treatment, Blow down
- Numerical problems based on water treatment (Lime-Soda process)

UNIT - II

Fuels

- Chemical Fuels: Origin and classification of fuels

Solid Fuels

- Coal, Proximate and ultimate analysis of coal, Significance of the constituents
- ross and net calorific value, Determination of calorific value by Bomb calorimeter
- Coke – Metallurgical, Coke-carbonization process
- Manufacture of coke-beehive Coke oven and byproduct coke ovens

Liquid Fuels

- Advantages, Petroleum and refining of petroleum, Synthetic petrol, Refining and reforming of gasoline
- Knocking, Octane number, Knocking – Anti knocking agents, Cracking

Gaseous Fuels

- Advantages, Manufacture, Composition and calorific value of coal gas and oil gas
- Determination of calorific value by Junker's calorimeter, Flue gas analysis by Orsat Apparatus

UNIT - III

Phase Rule

- Statement, Definition and meaning of the terms involved
- Application to one component system (Water and Sulphur systems)
- Study of two component system (Ag-Pb system)

Polymers

- Plastics: Classifications and constituents of plastics and their uses, Preparation, properties and uses of polyethylene, Bakelite, Teryline and Nylon
- Rubber: natural rubber, Vulcanization, Synthetic rubber viz. Buna-S, Buna-N, Butyl and Neoprene rubbers

Lubricants

- Classification, Types of lubrication, properties and uses
- Viscosity & Viscosity index, flash & fire point, Cloud and pour point, Emulsification

UNIT - IV

Corrosion

- Definition and its significance, Theories of corrosion, Galvanic cell and concentration

cell, Pitting and Stress corrosion, Protection against corrosion, Protective metallic coating

New Engineering Materials

- Brief idea of following: Superconductors, organic electronic materials, Fullerenes and Optical fibers

UNIT - V

Cement

- Manufacturing of Portland cement, Vertical shaft kiln technology
- Chemistry of setting and hardening

Refractories

- Definition, properties, classification, properties of silica and fireclay refractories

Glass

- Preparation, varieties and uses

BE 104-COMPUTER SYSTEMS AND PROGRAMMING

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

Introduction

- Types of computers and generations
- Basic architecture of computers and its building blocks
- Input-Output devices, Memories

UNIT - II

Number Systems

- Binary, octal, decimal and hexadecimal representation of numbers
- Integers and floating point numbers
- Representation of characters, ASCII and EBCDIC codes
- Binary Arithmetic: addition, subtraction, complements

UNIT - III

Classification of Computer Languages

- Machine, assembly and high level languages
- Brief idea of operating system
- Assembler, compiler and interpreter

Programming in 'C'

- Need of programming languages, Defining problems
- Flowcharts and algorithm development

UNIT - IV

- Data types, constants, variables, operators and expressions
- Input and output statements, Conditional and control statements, Arrays

UNIT - V

- Structures and unions
- Pointers
- File handling

BE 105-ELECTRICAL AND ELECTRONICS ENGINEERING

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I
DC Circuits

- Classification of circuit elements, V-I characteristics and current sources – ideal and practical, source conversion
- Kirchoff's voltage and current laws, Loop analysis
- Star-delta and Delta-star transformations, Superposition theorem & Thevenin's theorem

UNIT - II
Single Phase AC Circuits

- Single phase EMF generation, Instantaneous, average and RMS values
- Phase diagram, power and power factor for R, L, C, RL, RC and RLC circuits, complex representation of impedances
- Solution of RLC series, parallel and series-parallel circuits.

Three Phase AC Circuits

- Three phase EMF generation, Star and delta connections, Line and phase quantities
- 3-phase balance circuits – phasor diagram, solution and power measurement

UNIT - III
Single Phase Transformer

- Faraday's law of electromagnetic induction
- Construction and working of transformer
- Ideal transformer: EMF equation, phasor diagram, voltage and current relationship (transformation ratio)

UNIT - IV
p-n Junction Diodes

- Intrinsic and extrinsic semiconductors, open circuited p – n junction and space charge region
- The biased p – n junction and voltage – ampere characteristics

Diode Circuits

- Single phase half wave and bridge rectifiers – peak inverse voltage
- DC and RMS load currents and voltages, ripple factor, Introduction to filters

UNIT - V
Transistor

- PNP and NPN transistors, transistor current components, Common emitter Configuration- input output characteristics
- Transistor operating regions: active region, saturation region and cut off region
- Transistor as an amplifier and a switch

BE 106-PHYSICS LAB

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

OPTICS

1. To determine the wave length of monochromatic light with the help of Fresnel's Biprism.
2. To determine the wave length of Sodium light by Newton's rings.
3. To determine the specific rotation of Glucose (Sugar) solution using a Polarimeter.
4. To determine the wave length of Sodium light by Michelson's Interferometer.
5. To determine the wavelength of prominent lines of mercury by plane diffraction grating with the help of a spectrometer.
6. To determine the dispersive power of material of prism for violet and yellow colors of mercury Light with the help of a spectrometer.
7. To determine the height of water tank with the help of a sextant.
8. To measure the numerical aperture of an optical fiber.
9. To determine the coherent length and coherent time of laser using He-Ne Laser.
10. To determine the profile of He-Ne Laser beam.

ELECTRONICS / ELECTRICAL

11. To convert a galvanometer into an Ammeter of range 1.5 Amps and calibrate it.
12. To convert a galvanometer into an Voltmeter of range 1.5 Volts and calibrate it.
13. To study the variation of semiconductor resistance with temperature and hence determine the band gap of semiconductor in the form of reverse biased P-N junction diode.
14. To determine the specific resistance of the material of a wire by Carey-Foster's bridge.
15. To determine the ferromagnetic constants, retaintivity, permeability and susceptibility by tracing I-H curve using CRO.
16. To study the variation of thermo emf of Iron-Copper thermo couple with temperature.
17. To study the charge & discharge of a condenser and hence determine time constant. (Both current and voltage graphs are to be plotted)
18. To determine the high resistance by the method of leakage, using a Ballistic Galvanometer.
19. To determine dielectric constant of a liquid using moving coil Ballistic Galvanometer with standard parallel plate condenser.
20. Study G. M. counting system and hence study absorption coefficient of Lead using lead sheets.

BE 208-ENGINEERING CHEMISTRY LAB

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

(i) VOLUMETRIC ANALYSIS
1. Determination of Hardness of Water by different methods.
2. Determination of available chlorine in water.
3. Determination of Copper Sulphate Iodometrically.
4. Determination of Ferrous Ammonium Sulphate.
5. Determination of Sodium Hydroxide and Sodium Carbonate in a alkali mixture.

(ii) GRAVIMETRIC ANALYSIS
6. Determination of Barium as Barium Sulphate.
7. Determination of Silver as Silver Chloride.

(iii) PHYSCICO CHEMICAL ANALYSIS
8. Determination of Viscosity of lubricating oil by Redwood Viscometer.
9. Determination of Flash & Fire Point of lubricating oil by Pensky – Martin apparatus.
10. Determination of Cloud and Pour Point of lubricating oil.
11. Determination of Calorific Value of a solid fuel by Bomb Calorimeter.
12. Determination of proximate analysis of Coal.

(iv) PHYSCICO CHEMICAL INSTRUMENTAL ANALYSIS / CHARACTERIZATION
13. Spectrophotometer (UV – Vis) analysis / characterization.
14. Determination of pH by pH meter.
15. Determination of Conductivity of aqueous solutions of salts.
16. Determination of Sodium and Potassium by flame photometer.

BE 107-COMPUTER PROGRAMMING LAB

((L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments
1. Simple input output program integer, real character and string. (Formatted & Unformatted)
2. Conditional statement programs (if, if-else-if, switch-case)
3. Looping Program. (for, while, do-while)
4. Program based on array (one, two and three dimensions)
5. Program using Structure and Union.
6. Program using Function (with and without recursion)
7. Simple programs using pointers.
8. File handling.

BE 108-PRACTICAL GEOMETRY

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

1.
- . Lines, Lettering and Dimensioning
- . Scales: Representative factor, plain scales, diagonal scales, scale of chords
- . Conic Sections: Construction of ellipse, parabola and hyperbola by different methods. Normal and Tangents
- . Special Curves: Cycloid, Epicycloids, Hypo-cycloid, Involutes, Archemedian and logarithmic spirals

2.
- . Projections: Types of projection, Orthographic projection, First angle and third angle projection
- . Projection of points and lines, True inclinations and true length of straight lines, Traces of straight lines, Auxiliary planes

3.
- . Projection of planes and solids: Projection of planes, Projection of polyhedra, Pyramids, Cylinder and Cone

4.
- . Sections of Solids: Section of right solids by normal and inclined planes
- . Development of Surfaces: Parallel line and radial line method for right solids

5.
- . Isometric Projections: Isometric Scale, Isometric axes, Isometric projections of planes And simple solids , Introduction to development of surface .

BE 109-WORKSHOP PRACTICE

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

1.**Carpentry Shop**

- ¸ Timber, definition, engineering applications, seasoning and preservation
- ¸ Plywood and ply boards , simple joints

2.**Foundry Shop**

- ¸ Moulding Sands, constituents and characteristics
- ¸ Pattern, definition, materials types, core prints
- ¸ Role of gate, runner, riser, core and chaplets
- ¸ Causes and remedies of some common casting defects like blow holes, cavities, Inclusions etc., module practice.

3.**Welding Shop**

- ¸ Definition of welding, brazing and soldering processes and their applications
- ¸ Oxyacetylene gas welding process, equipment and techniques, types of flames and their applications
- ¸ Manual metal arc welding technique and equipment, AC and DC welding
- ¸ Electrodes: Constituents and functions of electrode coating, welding positions
- ¸ Types of welded joints, common welding defects such as cracks, undercutting, slag inclusion and boring etc., simple welding exercises

4.**Fitting Shop**

- ¸ Files and other common tools materials and classification, fitting exercises.

5.**Smithy Shop**

- ¸ Forging, forging principle, materials
- ¸ Operations like drawing, upsetting, bending and forge welding
- ¸ Use of forged parts

List of jobs to be made in the workshop practice

S. No. List of Experiments

CARPENTRY SHOP
1. T – Lap joint
2. Bridle joint

FOUNDRY SHOP
3. Mould of any pattern
4. Casting of any simple pattern

WELDING SHOP
5. Gas welding practice by students on mild steel flat
6. Lap joint by gas welding
7. MMA welding practice by students
8. Square butt joint by MMA welding
9. Lap joint by MMA welding
10. Demonstration of brazing

MACHINE SHOP PRACTICE
11. Job on lathe with one step turning and chamfering operations
12. Job on shaper for finishing two sides of a job
13. Drilling two holes of size 5 and 12 mm diameter on job used / to be used for shaping
14. Grinding a corner of above job on bench grinder

FITTING AND SMITHY SHOP
15. Finishing of two sides of a square piece by filing
16. Tin smithy for making mechanical joint and soldering of joint
17. To cut a square notch using hacksaw and to drill three holes on PCD and tapping

BE 110-ELECTRICAL AND ELECTRONICS LAB

(L: 0: T: 0: P: 2) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

A. ELECTRICAL LAB

1.Single line diagram of a power system and a distribution sub-station and basic functional study of main components used in power systems.

2.Make house wiring including earthing for 1-phase energy meter, MCB, ceiling fan, tube light, three pin socket and a lamp operated from two different positions. Basic functional study of components used in house wiring.

3.Study the construction and basic working of ceiling fan, single phase induction motor and three phase squirrel cage induction motor. Connect ceiling fan along with regulator and single phase induction motor through auto-transformer to run and vary speed.

4.(a) Basic functional study and connection of moving coil & moving iron ammeters and voltmeters, dynamometer, wattmeter and energy meter.
(b) Run a 3-phase squirrel cage induction motor at no load and measure its voltage, current, power and power factor. Reverse the direction of rotation.

5.Study the construction, circuit, working and application of the following lamps:
(i) Fluorescent lamp, (ii) Sodium vapour lamp, (iii) Mercury vapour lamp, (iv) Halogen lamp and (v) Neon lamp

6.(a) Study the construction and connection of single phase transformer and auto-transformer. Measure input and output voltage and fin turn ratio.
(b) Study the construction of a core type three phase transformer. Perform star and delta connection on a 3-phase transformer and find relation between line and phase voltage.

B. ELECTRONICS LAB

7.Identification, testing and applications of resistors, inductors, capacitors, PN-diode, Zener diode, LED, LCD, BJT, FET, UJT, SCR, Photo diode and Photo transistor.

8.(a) Functional study of CRO, analog & digital multi-meters and function / signal generator.
(b) Study the single phase half wave and bridge rectifier and effects of filters on waveform.

9.Study the BJT amplifier in common emitter configuration. Measure voltage gain, plot gain frequency response and calculate its bandwidth.

10.(a) Study the construction and basic working of SCR.
(b) Study the single phase half wave and bridge controlled rectifier and observe the effect of firing angle on waveform.

BE 201-COMMUNICATION TECHNIQUES

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I
Grammar - Words and Sentences, Verbs / Tenses, Questions / Questions Tags, Modal Verbs, The Passive

UNIT - II
Grammar - The Infinitive and The ING form, Nouns and Articles, Determiners ,Reported Speech, Adjectives and Adverbs

UNIT - III
Grammar - Prepositions, verbs with Prepositions and Adverbs Pronouns ,Relative Clauses, Conditionals, Linking Words

UNIT - IV
Compositions - Essay and Report Writing, Review Writing

UNIT - V
Compositions - Applications, Letter and Précis Writing, Technical Proposal Writing

BE 202-ENGINEERING MATHEMATICS – II

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I
Coordinate Geometry of Three Dimensions - Equation of a sphere,Intersection of a sphere and a plane, tangent plane, normal lines,Right circular cone,Right circular cylinder

UNIT - II
Matrices - Rank of a matrix, inverse of a matrix by elementary transformations
Solution of simultaneous linear equations , Eigen values and Eigen vectors, Cayley – Hamilton theorem (without proof) , Diagonalization of matrix

UNIT - III
Vector Calculus - Scalar and vector field, differentiation & integration of vector functions
Gradient, Divergence, Curl and Differential Operator,Line, Surface and volume Integrals
Green's Theorem in a Plane, Gauss' and Stoke's Theorem (without proof) and their Applications

UNIT - IV
Dynamics - Angular Motion, Radial and Transverse Velocities and Accelerations
Tangential and Normal Accelerations,Rectilinear Motion in Resisting Medium

UNIT - V
Differential Equations - Series Solutions of Second Order Linear Differential Equations with Variable , Coefficients (Complementary Functions only),Partial Differential Equations of First Order,Lagrange's Form, Standard Forms,Charpit's Method

BE 204-ENGINEERING MECHANICS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

- System of forces, Fundamental laws of mechanics, Composition of forces,Free body diagram, Lami's theorem,Moments and couple, Varignon's theorem, condition of equilibrium
- Types of support and loading, reaction, Analysis of simple trusses by methods of joints and method of sections

UNIT - II

- Laws of Coulomb fraction, Ladder, Wedges,Belt friction and rolling,Principle of virtual work and its applications

UNIT - III

- Location of centroid and center of gravity, area moment of inertia, mass moment of inertia,
- Law of machines, Variation of mechanical advantages, efficiency, reversibility of Machine,Pulleys, wheel and axle, wheel and differential axle,Transmission of power through belt and rope

UNIT - IV

Kinematics of Particle

- Rectilinear motion, plane curvilinear motion,Projectile motion,Constrained motion of connected particles

Dynamics of Particle and Rigid Body

- Newton's law of motion,D'Alembert's principle

UNIT - V

Work and Energy - Work, energy (Potential, Kinetic and Spring),Work – Energy relation

- Law of conservation of energy

Impulse and Momentum - Impulse, momentum,Impulse – Momentum relation, Impact

Vibration - Un-damped free vibrations

BE 205-MECHANICAL ENGINEERING

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

Basic Concepts

- Thermodynamic systems, properties, work and heat

Working Fluids

- Air and steam, calculation of properties of air as ideal gas for various thermodynamic processes, Use of steam tables and Molier charts for steam properties

First and Second Laws of Thermodynamics

- Non-flow and flow energy equations, second law statements, Carnot cycle, Application of first and second law to ideal gas system subjects to various thermodynamics processes

UNIT - II

Internal Combustion Engines

- Otto and Diesel cycle, thermal efficiency calculations , Classification, two and four stroke engines, construction and working of petrol and diesel , Engines. Introduction to various systems of IC engines

Gas Turbine Plants

- Ideal Bryton cycle, thermal efficiency calculations ,Construction and working of reciprocating and rotary air compressors, Applications of gas turbine plants

UNIT - III

Steam Power Plant

- Simple Rankine cycle, thermal efficiency calculations, classification of steam generators
- Construction and working of low and high pressure boilers, Introduction to various components of thermal power plants

Refrigeration and Air-conditioning

- Psychrometing, use of psychrometric charts, Elementary concepts of refrigeration and air-conditioning, Vapour compression cycle, working principle and schematic diagrams of refrigerators, air coolers, air conditioners and ice plants

UNIT - IV

Manufacturing Processes

- Classification, principle of working, specification, applications of various machine tools, lathe, drilling, shaper and milling machines, Basic descriptions and applications of hot and cold working processes, forging, bending, shearing, drawing and forming operations

UNIT - V

- Foundry Tools, equipments and moulding materials ,Gas welding, arc welding, soldering and brazing

Power Transmission

- Classification and application of mechanical drives like belts ropes, chains and gear, drives (excluding epicyclic trains) and their velocity ratios, Ratio of tension in belts and ropes

.

BE 206-ENVIRONMENTAL STUDIES & DISASTER MANAGEMENT

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT - I

- Do's and Don'ts for prevention of life and property due to earthquake, tsunami, cyclone fire, flood and landslides,Legislative responsibility and community base disaster management

UNIT - II

Introduction,General introduction to environment, biotic and abiotic environment

- Environmental pollution, Adverse effect of pollution n environment, control strategies
- Various acts and regulations for environmental protection

UNIT - III

Water Pollution

- Surface and underground sources of water,Water quality standards, impurities in water and their removal,River water pollution, eutrophication of lakes
- Domestic waste water management,

Air Pollution

- Sources of air pollution, adverse effects on human health,Green house effect, global warming, acid rain, ozone depletion

Ecology

- Basics of species, biodiversity, population dynamics,Energy flow, ecosystems, environmental impact assessment,Renewable sources of energy, Sustainable development

UNIT - IV

Introduction & Basic Concept of Disasters

- Types of disasters and their brief introduction: Natural & Man made disasters , Earthquakes, tsunami, cyclone, flood, drought, landslide,Nuclear, Chemical, Fire and environmental hazards

UNIT - V

Disaster Management Cycle & its Components

- Mitigation and prevention, preparedness,Response (rescue & relief), rehabilitation and recovery
- Disaster vulnerability & risk and its reduction,Maps showing earthquake, cyclone, flood and landslide hazards in India

BE 207-LANGUAGE LAB

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

The content and coverage of the Language Lab. lessons will cover the following:

1. Phonetic symbols and transcription
2. Listening Skills and comprehension
3. Conversation practice, perfecting English sounds, pronunciation, stress and intonation etc.
4. Vocabulary building, synonyms and antonyms, one word for many, words commonly misspelt and mispronounced
5. Practice of Seminar presentation, Group discussion and Interview skills.

BE 209-ENVIRONMENTAL ENGINEERING LAB

(L: 0: T: 0: P: 2) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

1. Measurement of pH of water
2. Measurement of hardness of water
3. Measurement of residual chlorine in water
4. Measurement of conductivity of water
5. Measurement of chlorides in water
6. Measurement of nitrate in water
7. Measurement of fluoride in water
8. Measurement of dissolves oxygen in water
9. Measurement of total solids in sewage
10. Measurement of dissolved solids in sewage
11. Measurement of settelable solids in sewage

BE 210-MACHINE DRAWING

(L: 0: T: 0: P: 3) **Max.Marks:100**
Min.Marks:50

S. No. List of Experiments

1.
   - Introduction to machine drawing
   - Dimensioning, locations and placing,
   - Orthographic projections: First & third angle methods
2. Sheet 1: Orthographic Projections (3 Problems)
3. Sheet 2: Sectional Views (3 Problems)
4. Sheet 3: Riveted joints, lap joints, butt joints, chain riveting, zig-zag riveting
5. Sheet 4: Screw fasteners, different threads, Nuts & bolts locking devices, set screws, foundation
6. Sheet 5: Bearing, Plumber block
7. Lectures on free hand sketches
8. List of free hand sketches
   - Different type of lines
   - Conventional representation of materials
   - Screw fasteners
   - Bearing: Ball, roller, needle, foot step bearing
   - Coupling: Protected type, flange, and pin type flexible coupling
   - Welded joints
   - Belts and pulleys
   - Pipes and pipe joints
   - Valves

BE300*SPECIAL MATHMATICS

(For Diploma passed candidates-Common for all branches)

(L: 3; T: 1) **Max.Marks:100**

Min.Marks:40

Unit1

Differential Calculus:

Introduction to successive differentiation, maxima and minima Partial Differentiation, Asymptotes, Curvature, envelopes, evolutes, concavity /convexity, singular points, curve tracing.

Unit 2

Integral Calculus: methods of integration, Definite Integral, Rectification and quadrature, Volumes and surfaces of solids of revolution. Mean values of functions, differentiation under sign of integration, Beta and Gamma functions

Unit3

Differential Equations: Differential equations of first order and first degree, Equation of the first order but not of the first degree, linear differential equation with constant coefficients, Homogeneous Linear differential equations, second order differential equation with variable coefficients

Unit4

Matrix algebra: Elementary transformations with application to inverse, Rank and Solution of simultaneous linear equations. Eigen values and Eigen vector,Cayley-Hamilton Theorem and it's applications .

Unit 5

Mechanics:

Statics: Equilibrium of coplanar forces acting at a point, Resultant and Equilibrium of coplanar forces acting on rigid body, friction, Common catenary.

Dynamics: Composition and resolution of velocities and acceleration .Relative velocity. Rectilinear Motion under constant acceleration. Vertical motion under gravity. Simple harmonic motion.

References:

1. Mathematics-Part-A, R. D. Sharma
2. Higher Engineering Mathematics, B. S. Garewal
3. Engineering Mathematics-I, Gaur & Kaul
4. Higher Engineering Mathematics. V. Ramana

ME301: MECHANICS OF SOLIDS

(L: 3; T: 1) **Max.Marks:100**
Min.Marks:40

Unit – 1
Stress & strain: Tension, compression, shearing stress & strain; Poisson's ratio: Stress-strain relationship, Hooke's law and its applications; Elastic constants and their relations for a isotropic homogenous material, anisotropy & orthotropy, thermal stresses, composite bars; simple elastic, plastic & visco-elastic behavior of common materials in tension and compression test, stress-strain curves. Concept of factor of safety & permissible stress. Conditions for equilibrium. Concept of free body diagram; Introduction to mechanics of deformable bodies.

Unit – 2
Members subjected to flexural loads: Theory of simple bending, bending moment and shear force diagrams for different types of static loading and support conditions on beams. Bending stresse, Section modulus and transverse shear stress distribution in circular, hollow circular, I, box, T, angle sections, etc.

Unit – 3
Principal planes, stresses & strains: Members subjected to combined axial, bending & torsional loads, maximum normal and shear stresses; Concept of equivalent bending & equivalent twisting moments: Mohr's circle of stress & strain.
Theories of elastic failures: The necessity for a theory, different theories, significance and comparison, applications.

Unit – 4
Torsion: Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capacity.
Stability of equilibrium: Instability & elastic stability. Long and short columns, ideal strut, Euler's formula for crippling load for columns of different end conditions, concept of equivalent length, eccentric loading of columns, Rankine formulae and other empirical relations.

Unit – 5
Transverse deflection of beams: Relation between deflection, bending moment, shear force and load, Transverse deflection of beams and shaft under static loading, area moment method, direct integration method: method of superposition and conjugate beam method. Variational approach to determine deflection and stresses in beam.
Elastic strain energy: Strain energy due to axial, bending and torsional loads; stresses due to suddenly applied loads; use of energy theorems to determine deflections of beams and twist of shafts. Castigliano's theorem. Maxwell's theorem of reciprocal deflections.

ME302: MATERIALS SCIENCE AND ENGINEERING

(L: 3; T: 0) **Max Marks: 100**
Min Marks: 40

UNIT 1
Crystal structure; Space Lattice and constants; Miller Indices; Allotropy, Inter planer spacing Imperfections in crystals : Point defects ,Line defects. Grain Boundary and its effect on properties of solids.

UNIT 2
Mechanical properties and their measurements; Hardness and impact strength.: Mechanism of plastic deformation, role of dislocation; slip and twinning, slip planes; Elementary treatment of theory of work hardening ;Theories of Recrystlisation and grain growth, Elementary treatment of creep, Fatigue and fracture.

UNIT3
Solidification of metals and some typical alloys; Phase rule and equilibrium diagram of binary systems with insoluble, soluble and partially soluble systems; Relationship with structure and properties; Eutectic system, Iron Carbon alloys, Iron-Carbon equilibrium diagram. Phase transformations in steel; Austenite formation, transformation of austenite in to pearlite or mar tensite, TTT diagram.

UNIT 4
Detailed study of various heat treatment processes-hardening, annealing and tempering normalizing hardenability; End quench test surface and case hardening methods; Flame and induction methods, carburizing, nitriding, cyaniding and carbonitriding processes. Heat treatment furnaces, batch and continuous types; Defects in heat treatments, warpage, overheating and burning.
UNIT 5:
Engineering materials: Effects of alloying elements in steel; Plain carbon steels, Low and high alloy steels, Stainless steels, Tool steels and their heat treatment, Classification of steels, Brasses and bronzes, Aluminum base alloys, Bearing materials, Engineering ceramics, Composite materials and their applications (brief study).

ME303: ENGINEERING THERMODYNAMICS

(L: 3; T: 1) **Max Marks:100**
Min Marks:40

UNIT 1
Basic Concepts of Thermodynamics: Thermodynamic systems, control volume, Properties, state, processes and cycle, equality of temperature, Zeroth Law of thermodynamics, temperature scale, laws of perfect gas, Pure substances, vapour-Liquid –solid-phase equilibrium in pure substances, thermodynamic surfaces

UNIT 2
Work and heat, Law of conservation of mass and energy, First law of thermodynamics, steady state Processes, Second law of thermodynamics, Heat engine, Carnot cycle, thermodynamic temperature scale, entropy, change of entropy for different processes, equivalence of Kelvin plank and Clausius statements, Clausius inequality.

UNIT 3
Available and unavailable energy, availability of a non flow and steady flow system, Helmbeltz and Gibb's functions, Thermodynamic Relations: Important mathematical relations, Maxwell relations, T-ds Relations, Joule- Thomson coefficient, Clayperon relation.

UNIT 4
Air – standard power cycles: Brayton cycle, Otto cycle, diesel cycle, Dual cycle, Stirling cycle, Ericssion cycle and Atkinson cycle, Mean effective pressure and efficiencies, Four stroke petrol and diesel engines Two stroke petrol and diesel engines.

UNIT 5
Properties of steam, phase change process, use of steam table & Molier chart. Rankine cycle, Reheat cycle, Regenerative cycle, cogeneration, vapour compression refrigeration cycle.

ME304: MANUFACUTRING PROCESSES

(L: 3; T: 1) **Max Marks: 100**
Min Marks: 40

UNIT 1

Importance of manufacturing, economic and technological definition of manufacturing, survey of manufacturing processes.

Foundry Technology: Patterns practices: Types of patterns, allowances and materials used for patterns, Moulding materials, Moulding sands; properties and sand testing; grain fineness number; moisture content, clay content and permeability test, core materials and core making, core print; core boxes, chaplets, Moulding practices**:** Green, dry and loam sand moulding, pit and floor moulding; shell moulding; permanent moulding; carbon dioxide moulding.**Casting practices: S**and casting, Shell-Mould casting, plaster and ceramic moulds, investment casting, vacuum casting, Permanent mould casting, slush casting, pressure casting, die casting, centrifugal casting, continuous casting, squeeze casting, casting defects, design of castings, Gating system design, riser design use of chills. Casting defects, Melting furnaces-rotary, pit, electric, and cupola furnaces.

UNIT 2

Metal Joining Processes: Principle of welding, soldering, brazing and adhesive bonding. Survey of welding and allied processes. Arc welding: power sources and consumables. Metal transfer(Elementry treatement only), Gas Metal Arc and Gas Tungsten Arc Welding, Gas welding and cutting; Processes and equipments. Resistance welding: principle and equipments; Spot, projection and seam welding processes. Atomic hydrogen, ultrasonic, plasma and laser beam welding, electron beam welding, friction and explosive welding, welding of C.I. and Al, welding defects. Electrodes and Electrode Coatings,Thermal spraying.

UNIT 3

Forming and Shaping Processes: Metal working, elastic and plastic deformation, concept of strain hardening, hot and cold working, rolling, principle and operations, roll pass sequence, extrusion, wire and tube drawing processes. Forging: Methods of forging, forging hammerstand presses, principle of forging tool design Elementary Treatment only, cold working processes- Shearing, drawing, squeezing,blanking, piercing, deep drawing, coining and embossing, metal working defects, cold heading,riveting, thread rolling, bending and forming operations.

UNIT 4

Powder Metallurgy: Powder manufacturing, mechanical pulverization, Electrolytic Process, chemical reduction, atomization, Characteristics of metal powders, compacting of powders sintering, Advantages and Engineering applications of Powder Metallurgy.

Rapid Prototyping Operations: Introduction, subtractive processes, additive processes, Virtual Prototyping and applications

UNIT 5

Plastics Technology: Introduction, Classification of Plastics, Ingredients of Moulding compounds, General Properties of Plastics, Plastic part manufacturing processes such as compression moulding, transfer moulding, injection moulding, extrusion moulding, blow moulding, calendaring, thermoforming, slush moulding, laminating,Welding and Machining of Plastics.

References:

1. Manufacturing Technology; P. N. Rao; Tata McGraw Hill
2. Workshop Technology Vol 1 & 2; S. K. Hazra chowdhary & A. K. Hazra chowdhary, Media Promoters and Publishers, Mumbai
3. Manufacturing Process; John A. Schey, McGraw Hill Book Co.
4. A course in Workshop Technology; B. S. Raghuvanshi Dhanpat Rai & Co.
5. Material and Processes in Manufacturing; Degarmo, Black & Kohser Prantice Hall of India
6. Manufacturing Processes; P. C. Sharma, S. Chand
7. Principles of Manufacturing of Materials & Processes; J. S. Campbell, Mc Graw Hill

ME305: OBJECT ORIENTED PROGRAMMING IN C++

(L: 3; T: 1) **Max Maks:100**
Min Marks: 40

UNIT 1
Introduction to Object Oriented Programming: Basic concepts: Class, Object, Method, Message passing, Inheritance, Encapsulation, Abstraction, Polymorphism.

UNIT 2
Basics of C++ Environment: Variables; Operators; Functions; user defined, passing by reference, passing an array to the function, inline function, scope, overloading; Pointers: objects and lvalue, arrays and pointers, the new and delete operators, dynamic arrays, arrays of pointers and pointers to arrays, pointers to pointers and functions; Strings: String I/O, character functions in ctype.h, string functions in string.h.

UNIT3
Object oriented concepts using C++: Classes: Member functions, Friend functions, Constructors, Access functions, Private member functions, class destructor, static data and function members; Overloading: inline functions, this operator, overloading various types of operators, conversion operators; the String Class; Composition and Inheritance: Hierarchy and types of inheritance, protected class members, private versus protected access, virtual functions and polymorphism, virtual destructors, abstract base classes.

UNIT 4
Templates and Iterators: function and class templates, container classes, subclass templates, iterator classes; Libraries: standard C++ library, contents of a standard C headers, string streams, file processing: Files and streams classes, text files, binary files, classification of files, the standard template library.

UNIT 5
Data Structures Using C++: Linked lists – Singly linked list, Doubly linked lists, Circular lists, Stacks and Queues priority Queues, Stacks, Queues.

References:

1. A.R.Venugopal, Rajkumar, T. Ravishanker “Mastering C++”, TMH, 1997.
2. S. B. Lippman & J. Lajoie, “C++ Primer”, 3rd Edition, Addison Wesley, 2000.
3. R. Lafore, “Object Oriented Programming using C++”, Galgotia Publications, 2004.
4. D . Parasons, “Object Oriented Programming with C++”, BPB Publication.
5. Steven C. Lawlor, “The Art of Programming Computer Science with C++”, Vikas Publication.
6. Schildt Herbert, “C++: The Complete Reference”, 4th Ed., Tata McGraw Hill, 1999.
7. Tony Gaddis, Watters, Muganda, “Object-Oriented Programming in C++”, 3rd Ed., Wiley Dreamtech, 2004.

ME306: ADVANCED ENGINEERING MATHEMATICS

(L: 3; T: 1) **Max Marks:100**
Min Marks: 40

UNIT 1
Fourier series: Fourier series, Half-range series, Harmonic analysis.
Integral Transforms: Fourier integral theorem, Fourier transforms, Convolution theorems, Inversion theorem for Fourier and Laplace transforms, Simple applications of these transforms to onedimensional problems.

UNIT 2
Method of separation of variables – applications to the solution of wave equation in one dimension, laplace's equation in two dimensions, Diffusion equation in one dimension.
Transform calculus : Laplace transform with its simple properties, applications to the solutions of ordinary and partial differential equations having constant co-efficient with special reference to wave and diffusion equation
.

UNIT 3
Complex Variable: Functions of a complex variable; Exponential, trigonometric, hyperbolic and logarithmic functions; Differentiation, Analytic functions, Cauchy-Riemann equations, conjugate functions; Application to two dimensional potential problems; Conformal transformations, Schwartz-Christoffel transformation; Cauchy's Integral theorem. Taylor's and Laurent's expansions; Branch points, zeros, poles and residues; Simple problems on contour integration

UNIT 4
Boundary Value Problems: Equations for vibrations of strings, heat flow and electrical transmission lines; Laplace's equation in Cartesian, cylindrical polar and spherical polar coordinates; Solution by separation of variables.
Solution in Series: Differentiation and integration of infinite series, Series solution of differential equations; Bessel and Legendre equations, their series solution, elementary properties of Bessel functions and Legendre polynomials

UNIT 5
Numerical Methods: Difference operators: forward, backward, central shift and average operators and relations between them. Newton Backward and Interpolation; Lagrange's interpolation and the error formula for interpolation. Numerical differentiation and integration. Trapezoidal rule and Simpson's one-third rule including error formula.

References:

1. Higher Engineering Mathematics ;B. S. Garewal
2. Numerical Methods;Jain & Iyenger
3. Integral Transform;Gokhroo & Saini
4. Engineering Mathematics –II;Gaur & Kaul

ME307: MECHANICS OF SOLIDS LAB.

2 Periods **Max Marks: 20**
Min Marks: 10

1. Izod Impact testing.
2. Rockwell Hardness Testing.
3. Spring Testing
4. Column Testing for buckling
5. Torsion Testing
6. Tensile Testing
7. Compression Testing
8. Shear Testing
9. Brinell Hardness Testing
10. Bending Test on UTM.
11. Study of Fatigue Testing Machine.

ME308: MATERIALS SCIENCE AND HEAT TREATMENT LAB

2/2 Periods **Max Marks: 20**
Min Marks: 10

1. Study of Engineering Materials and crystals structures. Study of models of BCC, FCC, HCP and stacking sequence, tetrahedral and octahedral voids.
2. Study of brittle and ductile fractures.
3. To prepare metallic samples for metallographic examination and to study the principle and construction of the Metallurgical Microscope.
4. Study of the following Micro structures: Hypo, Hyper and Eutectoid Steel, Grey, White, Nodular and Malleable Cast Iron.
5. Annealing of Steel - Effect of annealing temperatures and time on hardness.
6. Study of Microstructure and hardness of steel at different rates of cooling. Microstructure examination of white cast iron.
7. Study of Iron-Carbon Equilibrium Diagram and sketch the various structures present at room Temperature.
8. Effect of Carbon percentage on the hardness of Steel.
9. Plotting hardenability curve of a steel by End Quench Test.

ME309: THERMAL ENGINEERING LAB 1

2 Periods **Max Marks: 30**
Min Marks: 15

1. Comparative study of four stroke diesel and petrol engines.
2. Comparative study of two stroke petrol and diesel engines.
3. Studies of fuel supply systems of diesel and petrol engines.
4. Study of cooling, lubrication and ignition system in diesel and petrol engines.
5. To study various types of Boilers and to study Boiler mounting and accessories.
6. To study various types of Dynamometers.
7. To find the BHP, Thermal efficiency of four stroke diesel engine.
8. To prepare a comparison sheet of various automobiles (4 Wheeler and 2 Wheeler).

ME 310: PRODUCTION ENGINEERING LAB-I

3 Periods **Max Marks: 50**
Min Marks: 25

(a)Metal Cutting and Machine Tools

1. Study of lathe machine, lathe tools cutting speed, feed and depth of cut.
2. To perform step turning, knurling and chamfering on lathe machine as per drawing.
3. Taper turning by tailstock offset method as per drawing.
4. To cut metric thread as per drawing.
5. To perform square threading, drilling and taper turning by compound rest as per drawing.
6. To study shaper machine, its mechanism and calculate quick return ratio.
7. Study of Milling Machine and its cutters.

(b)Foundry

1. To prepare mould of a given pattern requiring core and to cast it in aluminium.
2. Moisture test and clay content test.
3. Strength Test (compressive, Tensile, Shear Transverse etc. in green and dry conditions) and Hardness Test (Mould and Core).
4. Permeability Test.
5. A.F.S. Sieve analysis Test.

ME311: COMPUTER PROGRAMMING LAB I

2 Periods **Max Marks: 30**
Min Marks: 15

List of programs in C:

1. Program for revising control statements, arrays and functions.
2. Program using string handling and various functions described in string.h, ctype.h.
3. Program using structures and sorting algorithm (Insertion, Selection, Quick, Heap sort) and functions described in math.h.
4. Program using file handling and related functions defined in stdio.h, io.h.
5. Program using pointers, array and pointers, pointers to structures, dynamic memory allocation.

List of Programs in C++

6. Program using basic I/O and control statements.
7. Program using class, objects, objects as function parameters.
8. Program using functions and passing reference to a function, inline functions. Program using Inheritance and virtual base class.
9. Program using pointers, arrays, dynamic arrays. Program using functions defined in ctype.h and string.h.
10. Program using constructors, destructors. Program using function and operator over loading

List of program in C++ implementing Data Structures

11. Creating and managing (add, delete, print, insert) nodes of a Linked list.
12. Creating and managing (create, pop, push etc.) stacks and queues.

Note: Students should submit and present a minor project at the end of the Semester teaching.

ME312: MACHINE DRAWING

3 Periods **Max Marks: 50**
Min Marks: 25

Detailed drawings:
Couplings: Pin-type flexible coupling, etc,
IC. Engine parts: connecting rod, crank shaft, etc,
Boiler Mountings: Steam stop valve/ feed check-valve/ safety valve /three way stop valve blow off cock.
Bearings: Swivel bearing
Machine Tool Parts: Shaper tool head, Lathe Tail Stock, Turret Tool Post, Turret Bar feeding Mechanism / Universal Dividing Head, Swivel machine vice.
Miscellaneous: Screw jack and drill-press vice.
Free Hand Sketches: Pipes and Pipe fittings, clutches, bearings, bearing puller, valve gear mechanisms, machine arbor and cutter, universal dividing head, jigs and fixtures, Step - less drive , sliding gear box.

ME401: DESIGN OF MACHINE ELEMENTS-I

(L: 3;) **MaxMarks:150**
Min Marks:60

UNIT - 1
Materials: Properties and IS coding of various materials, Selection of material from properties and economic aspects.
Manufacturing aspects in Design : Selection of manufacturing processes on the basis of design and economy, Influence of rate of production, standard size, Influence of limits, fits tolerances and surface finish. Change in the shape of the designed element to facilitate its production, Design of castings, working drawing.

UNIT - 2
Design for strength: Allowable stresses, detailed discussion on factor of safety (factor of ignorance): Stress concentration. Causes and mitigation. Introduction of various design considerations like strength, stiffness, weight, cost, space, etc. Concept of fatigue failures. Design of machine elements subjected to direct stresses, Pin, cotter and keyed joints, Design of screw fastening.

UNIT - 3
Design of members in Bending: Beams, levers and laminated springs.

UNIT - 4
Design of members in torsion : Shafts and shaft couplings.

UNIT - 5
Design of shafts, brackets under combined stresses, Calculation of transverse and torsional deflections. Screw fasteners subjected to eccentric loading.

References:

ME402: THERMAL ENGINEERING-I

(L: 3; T: 1) **Max.Marks:100**
Min Marks: 40

UNIT- I

I.C. Engines: Modern carburetors, fuel pump, injector. Study of cooling, lubrication and ignition system in diesel and petrol engines.
Engine Performance and Testing: Indicators, Various efficiencies, Morse test and Willans line, torque and mean effective pressure, performance and heat balance sheet, measurement of volumetric efficiency. Effect of atmospheric condition on performance, high altitude problems, supercharging.

UNIT- II
Boilers Testing: Testing of boilers, heat balance sheet
Boiler Draught: Natural draught, height of chimney, artificial draught.
Condensors: Types, calculations involving efficiency and cooling water requirement. Capacity of air pump with and without air cooling section. Cooling of circulating water;
spray pond and cooling tower.

UNIT- III
Steam nozzles: Steam flow through nozzles, type of nozzles, critical pressure, throat and exit areas for optimum discharge, friction effect. Effect of back pressure. Super saturation phenomenon. Steam injectors.

UNIT- IV
Steam Turbines: Types and classification. Construction details of components; nozzles, blades and their attachment methods, Labyrinth packing.
Impulse and reaction turbines, methods of reducing rotor speeds. Velocity diagrams, stage and other efficiencies, condition for maximum efficiency of a single stage turbine, reheat factor, regenerative feed heating (bleeding). Principles of speed governing and emergency governor. Introduction to mixed pressure, back pressure turbines and binary vapour cycle.

UNIT -V
Reciprocating Air Compressors: Single stage compressor working, work done, volumetric and isothermal efficiencies. Muti-stage air compressor; condition for maximum efficiency and work done.

ME 403: FLUID MECHANICS

(L: 3;T: 1) **Max.Marks:100**
Min Marks: 40

UNIT - 1

Basic Definitions and Fluid Properties ; Definition of Fluid, Incompressible and compressible fluids, Fluid as a continuum, Mass, Density, specific weight, relative density, specific volume, Bulk modulus, velocity of sound Ideal fluid Viscosity. Newtonian and Non - Newtonian fluid, Kinematic viscosity, Effect of temperature and pressure on viscosity, surface tension capillarity, vapour pressure and cavitation.
Fluid Statics : General differential equation, Hydrostatics Manometry, Fluid forces on submerged surfaces. Curved surfaces, Aerostatics, Isothermal atmosphere, polytropic atmosphere. The international standard atmosphere, static stability submerged bodies. Floating bodies.

UNIT - 2

Kinematics and conservation of Mass : Flow classifications. Fluid velocity and acceleration, streamlines and the stream function. Pathlines and streak lines. Deformation of a fluid element, verticity and circulation. Irrotational and Rotational flow. Flownet, Laplace equation. Conservation of mass and the continuity equation for three dimensions.
Fluid Momentum : The Momentum theorem Applications of the momentum theorem Equation of motion, Euler's equation of motion Integration of Euler's equation of motion.
Bernoulli's equation. Applications of Bernoulli's Pitot tube, Equation of motion for Viscous fluid, Navier Stoke's equation.

UNIT - 3

Orifice discharging free, Jet, vena contracts, coefficient of contraction, velocity and discharge, coefficient of resistance. Orifices and mouthpieces Nozzles and weires.
Flow Through Pipes : Reynold's experiment Darcy's Weisback equation. Loss of head due to sudden enlargements, contraction, entrance, exit obstruction, bend, pipe fittings. Total and Hydraulic grandient lines, Flow through pipe line. Pipes in series, parallel Transmission of power through pipes.

UNIT - 4

Laminar Flow: Simple solution of Navier Stokes equations. Hagen – Poiseuille flow. Plain Poiseuille flow and Coutte flow.
Turbulent Flow; Variation of friction factor with Reynolds number. The Prandt Mixing length hypothesis applied to pipe flow, velocity distribution in smooth pipes, rough pipes.
The Universal pipe friction laws, Colebrook. White formula. Dimensional Analysis: Buckingham variables, Model Similitude, Force ratio, Reynolds, Froude's Mach, Weber and Euler numbers and their applications. Undistorted model distorted model scale effect.

UNIT - 5

The Boundary Layer: Description of the boundary layer. Boundary Layer thickness, boundary layer separation and control. The Prandtl boundary layer equation. Solution for laminar boundary layer. The momentum equation for the boundary layer. The flat plate in uniform free stream with no pressures gradients. Approximate momentum analysis laminar boundary, Aerofoils Theory.
Flow round a body ; Drag, skin friction drag, pressure drag, combined skin friction and pressure drag (profile drag) wave drag, lift induced drag. Flow past sphere and cylinder.

References:

1. Engineering Fluid Mechanics; K. L. Kumar, Eurasia Publishing House, New Delhi
2. Fluid Mechanics and Fluid Power Engineering; D. S. Kumar; S. K. Kataria & Sons.
3. Fluid Mechanics and Heat Transfer; M. L. Mathur & Mehta, Jain Brothers, New Delhi

ME404: MACHINING AND MACHINE TOOLS

(L: 3; T: 1) **Max.Marks:100**
Min Marks: 40

UNIT 1
Classification of metal removal processes and machines
Mechanics of metal cutting: Geometry of single point cutting tool and tool angles. Tool nomenclature in ASA, ORS, NRS and interrelationships. Mechanism of chip formation and types of chips, chip breakers. Orthogonal and oblique cutting, cutting forces and power requirement, theories of metal cutting. Thermal aspects of machining and measurement of chip tool interface temperature. Friction in metal cutting.

UNIT 2
Machinability: Concept and evaluation of machinability, mechanisms of tool failure, tool life and cutting parameters, machinability index, factors affecting machinability. Cutting fluids: Types, properties, selection and application methods
General Purpose Machine Tools: Classification and constructional details of lathe, drilling, milling, shaping and planing machines. Tooling, attachments and operations performed, selection of cutting parameters, calculation of forces and time for machining. Broaching operation.

UNIT 3
Special Purpose Machine Tools: Automatic lathes, capstan and turret lathe machines. Swiss type automatic, operational planning and tool layout, sequence of operations. Tracer attachment in Machine Tools: mechanical-copying machines; Hydraulic Tracing Devices; Electric Tracing systems; Automatic tracing.
Abrasive processes: Abrasives; natural and synthetic, manufacturing, nomenclature. Selection of grinding wheels, wheel mounting and dressing, characteristic terms used in grinding. Machines for surface and cylindrical grinding, their constructional details and processes. Surface finishing: Honing, lapping, superfinishing, polishing and buffing processes. Abrasive blasting

UNIT 4
Thread Manufacturing: casting; thread chasing; thread cutting on lathe; thread rolling, die threading and tapping; thread milling; thread grinding.
Gear Manufacturing Processes: hot rolling; stamping; powder metallurgy; extruding etc. Gear generating processes: gear hobbing, gear shaping. Gear finishing processes; shaving, grinding, lapping; Gear testing.

UNIT 5
High Velocity Forming Methods (High-energy rate forming processes): Definition; Hydraulic forming, Explosive forming, Electro-hydraulic forming, Magnetic pulse forming.
Industrial Safety: Human factor in machine equipment safety; reducing industrial noise; precautions to be taken by operators for safe working on different machine tools.

References:

1. Manufacturing Science, Amitabh Ghosh & A. K. Malik, Affiliated East West Press, New Delhi
2. Production Technology; P. C. Sharma and S. Chand
3. Production Engg. Sciences; P. C. Pandey, C. K . Singh
4. Manufacturing Technology Metal Cutting and M/C Tools, P. N. Rao, Tata Mc. Graw Hill

ME405: KINEMATICS OF MACHINES

(L: 3;T: 1) **Max.Marks:100**
Min Marks: 40

UNIT - 1
Kinematics: Elements, pairs , mechanisms, four bar chain and its inversions, velocity and acceleration, Klein's construction, coriolis component, instantaneous center method, synthesis of mechanisms, panto - graph, scott-Russel, Tchbeicheff straight line, indicator diagram mechanisms.

UNIT - 2
Automotive vehicle mechanisms: Overhead valve mechanism, Davis and Ackerman steering mechanism, Trifler suspension and Hookes joint.
Power transmission: Belts and ropes, effect of centrifugal force, creep, chain drive.

UNIT - 3
Friction: Laws of static, dynamic and rolling friction, dry and viscous friction, inclined plane and screw jack, pivots, bearing, clutches. Theory of film lubrication.

UNIT - 4
Brakes and dynamometers: Band, block and band & block brakes, braking action, absorption and transmission type dynamometers, rope and hydraulic dynamometers, braking system of automobiles.

UNIT - 5
Cams: Type of cams, displacement, velocity and acceleration curves for different cam followers, consideration of pressure angle and wear, analysis of motion of followers for cams with specified contours.

References:

ME406: MECHANICAL MEASURMENTS & CONTROL

(L: 3; T: 1) **Max.Marks:100**
Min Marks: 40

UNIT - 1
Configuration, basic characteristic, calibration, classification and performance characteristics of a instrumentation system, Specification and testing of dynamic response.
Strain Measurement : Electric Strain Gauges - Types ; Selection and Installation, Strain gauge circuits; temperature compensation and calibration; Use of Strain Gauges on Rotating Shafts, Load Cells, Mechanical and Optical Strain Gauges.

UNIT - 2
Various Mechanical, Electro- Mechanical & Photoelectric Sensors for sensing of Displacement, Velocity, Acceleration, Torque, Force, Temperature from Low to High Range, flow, level of fluid , pressure, angular speed, voltage, frequency and current.

UNIT - 3
Introduction to Multi-Channel Data-Acquisition System, Measurement Pods, Interface Hardware, Data Analysis Software, Interfacing.
Concepts and examples of automatic control systems, Representation systems by differential equations, transfer function, open loop and feed back control systems, signal flow graphs and, block diagram reduction techniques. Control System components, error sensing devices and servo motors.

UNIT - 4
Control for mechanical systems & processes ; speed control system for steam/gas turbines. A constant tension ;reeling system, Electro-mechanical systems. Thermal systems, Pneumatic systems; Mathematical Models of physical systems, Feed back characteristics of Control Systems.

UNIT - 5
Time response analysis; transient response analysis, time response specifications, steady state-error. Concepts of stability, Routh-Hurwiz stability criterion, relative stability. Root locus technique.
Frequency response analysis, Polar plots; stability in frequency domain, Bode / Logrithmic plots. Nyquist stability criterion.

References:

ME407: DYNAMICS OF MACHINES LAB.

2 Periods **Max Marks: 50**
Min Marks: 25

1. To study inversion of four bar chain
2. Coupling Rod
3. Beam Engine
4. Steering Mechanism
(a) Study of quick return mechanism.(crank and Slotted lever mechanism.)
(b) To draw velocity and acceleration diagram for Crank and slotted lever mechanism.
5. Study of inversion of Double slider chain
Oldhum Coupling
Scotch Yoke
Elliptical Trammel
6. To plot displacement v/s Ø curve for various cams.
7. Study of various cam- follower arrangements.
8. To determine coefficient of friction.
9. Study of various types of dynamometers, Brakes and Clutches.
10. To determine moment of inertia of the given object using Trifler suspension.

ME408: FLUID MECHANICS LAB

2 Periods **Max Marks: 30**
Min Marks: 15

NAME OF EXPERIMENTS
1. Determine Metacentric height of a given body.
2. Determine Cd, Cv & Cc for given orifice.
3. Determine flow rate of water by V-notch.
4. Determine velocity of water by pitot tube.
5. Verify Bernoulli's theorem.
6. Determine flow rate of air by Venturi meter
7. Determine flow rate of air by orifice meter
8. Determine head loss of given length of pipe.
9. Determine flow rate of air by nozzle meter.
10. Study of Pelton, Kaplan Turbine models.

ME409: THERMAL ENGINEERING LAB. – II

3 Periods **Max Marks: 50**
Min Marks: 25

1. Disassembling and assembling of major sub-assemblies of multi-cylinder petrol or diesel engines and study of their parts.
2. To disassemble and assemble a 2-stroke petrol engine.
3. Load test on a single cylinder 4-stroke diesel engine using a rope brake dynamometer and calculate volumetric and thermal efficiency and draw a heat balance-sheet.
4. Study of a modern carburettor and MPFI system and disassembling and assembling of their parts.
5. To calculate valve timing of a multi-cylinder petrol engine and valve tappets adjustment.
6. Disassemble all the parts of a fuel injection pump and study of its.
7. To disassemble the governor and study its various parts.

ME410: MECHANICAL MEASURMENTS & CONTROL LAB.

2 Periods **Max Marks: 30**
Min Marks: 15

INSTRUMENTATION LAB.

1. Displacement Measurement using Capacitive Pick - up System
2. Displacement Measurement Using Inductive Pick-up System
3. Displacement Measurement Using Light Dependent Register Set up
(i) Displacement v/s Registance at Constant Voltage
(ii) Voltage v/s Registance at Constant Displacement
4. Study of Speed Measurement System
(i) Magnetic Pick-up
(ii) Strobometer
5. Study of Load Measurement System
Load Cell + Load Indicator
6. Calibration of Thermocouple Wire.

CONTROL LAB.

1. Problems on
2. Block diagram reduction technique 3. Block diagram formation for Control Systems.
4. Root Locus Plot
5. Bode Plot
6. Polar plot & Nyquist Stability Criterion

Experiments on
(1) Hydraulic System
(2) Control System

ME411: MACHINE DESIGN

2Periods **Max Marks: 50**
Min Marks: 25

1. Selection of material & IS coding
2. Selecting fit & assigning tolerances
3. Examples of Production considerations.

Problems on

1. Knuckle and Cotter joints
2. Torque : Keyed joints and shaft couplings
3. Design of screw fastening
4. Bending : Beams, Levers etc.
5. Combined stresses : Shafts, brackets, eccentric loading.
6. Design for rigidity (Transverse / Torsional)

B.E V SEMESTER
ME 501: ADVANCED MECHANICS OF SOLIDS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT 1:- Analysis of stress in 3-Dimensions: Body force, surface force and stress vectors, state of stress at a point, normal shear stress components, stress component on arbitrary plane, principal stresses in 3-Dimentions, stress invariants, decomposition of stress matrix into hydrostatic and pure shear states, Lame's stress ellipsoid, differential equations of equilibrium.

UNIT 2:- Analysis of strain in 3-Dimensions: introduction, deformation in neighborhood of a point, change of length of linear element, state of strain at a point, principal axes of strain and principal strains, compatibility conditions.

UNIT 3:- Stress strain relations for linearity elastic bodies, generalized Hooke's law, stress-strain relations for anisotropic, orthotropic and isotropic materials.

UNIT 4:- Bending of curved beams (Winkler-Bach formula); unsymmetrical bending of beams, shear centre.

UNIT 5:- Stresses in thick cylinders, shrink fit stresses, stresses in rotating discs.

ME 502: HEAT TRANSFER

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT 1:- Introduction to heat transfer processes, conduction and radiation. Fourier's law of heat conduction, thermal conductivity, thermal conductivity of solids, liquids and gases, effect of temperature on thermal conductivity. Newton's law of cooling, definition of overall heat transfer coefficient. General parameters influence the value of heat transfer coefficient.

Conduction : General 3-Dimensoinal conduction equation in Cartesian , cylindrical and spherical coordinates; different kinds of boundary conditions; nature of differential ; one dimensional heat conduction with and without heat generation; electrical analogy; heat conduction through composite walls; critical thickness of insulation.

UNIT 2:- Heat transfer from finned surfaces; fin efficiency and effectiveness, two dimensional steady state heat conduction using analytical and numerical methods, periodic heat conduction.
Convection: review of Navier – Stokes and energy equation, hydrodynamic and thermal boundary layers; laminar boundary layer equations; forced convection appropriate non dimensional members; effect of Prandtl number; empirical relations for flow over a flat
plate and flow through pipes.
UNIT 3:-Natural convection: Dimensional analysis, Granhoff number, boundary layers in external flows (flow over a flat plate only), boundary layer equations and their solutions, heat transfer correlations.
Heat transfer with change of phase : nature of vaporization phenomena; different regimes of boiling heat transfer; correlations fo r saturated liquid vaporization; condensation on flat plates; correlation of experimental results, drop wise condensation.
UNIT4:- Heat exchanger: Different types of heat exchangers, arithmetic and logarithmic mean temperature differences, heat transfer coefficient for parallel, counter and cross flow type heat exchanger; effectiveness of heat exchanger, N.T.U. method, fouling factor. Constructional and manufacturing aspects of Heat Exchangers.
UNIT 5:- Thermal Radiation: Plank distribution law, Krichoff's law; radiation properties, diffuse radiations; Lambert's law. Radiation intensity, heat exchange between two black bodies heat exchanger between gray bodies. Shape factor; electrical analogy; reradiating surfaces heat transfer in presence of reradiating surfaces.

ME 503: FUNDAMENTALS OF AERODYNAMICS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT 1:- Aerodynamic forces and moments over the body surface, concept of lift and drag, dimensionless force and moment coefficient, centre of pressure of an aerofoil, nomenclature of aerofoil, angle of attack, circulation and lift over an-aerofoil, Kutta condition, Kelvin's circulation theorem.
UNIT 2:- Blade theory; Symmetrical and non-symmetrical aerofoil. Energy transfer in terms of lift and drag, cascade nomenclature, turbine cascade nomenclature, cascade lift and drag coefficient.
UNIT3:- Isentroic Flow: Velocity of sound; Mach angle; Mach number, steady isentropic flow
through ducts; use of isentropic tables; condition for maximum discharge; choked flow; flow through convergent and convergent-divergent nozzle, supersaturated flow in nozzle.
UNIT 4:- Adiabatic flow and flow with Heat Transfer: Adiabatic flow; Fanno line tables; entropy change; choking due to friction; flow through long ducts; Diabatic flow ; Rayleigh line; use of tables; change in entropy; effect of change in stagnation temperature.
UNIT 5:- Normal Shock: Plane stationary normal shock; Ranking-Hugoniot relations; increase in entropy; Prandtl's relations; change in stagnation pressure across the shock.

ME 504: INDUSTRIAL ENGINEERING

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT l:- Management Theory and Functions: Evolution of management, scientific management, Contribution to scientific management: Reactions and criticisms of Taylor, Fayol, Mayo, Levels of 'Management Administration and Management, functions of management. Decision-making.

UNIT 2:-
Business Forms and Organization: Forms of Business:(i)Single proprietorship (ii) Partnership (iii) Joint stock company (iv) Private Ltd- Companies and public limited companies Forming Joint Stock Companies (a) Registration (b) issue of Prospectus (c) Commencement Certificate (iv) co-operative Society choice of Business forms (v) State undertaking. Organization meaning. Types of organization; (i) Line organization (ii) Functional Organization (iii) Line Staff organization (iv) Line Staff Committee organization, span of control.

UNIT 3:- Finance & Financial Statements: Introduction, Needs of Finance, Kinds of Capital Sources of fixed capital, Shares - (i) Ordinary Shares (ii) Preference Shares. Borrow capital. Surplus profits. Sources of Working capital. Management of working capital. Financial Institutions. Profit & Loss Statement, Balance Sheet, Financial ratio: Liquidity ratio, Profits investment ratio, equity ratio, inventory ratio.

UNIT4:- Interest and Depreciation: interest meaning, Compound interest. Annuities capital Annuity present worth annuity sinking funds annuity compound Amount Annuity Nominal andeffective rate of interest. Depreciation Meaning and causes. Need of Depreciation calculation, Methods of Depreciation. Straight line Methods. Sinking funds methods. Declining Balance Method, sum of years digits method (Syd Method).

UNIT 5:- Labour relations and legislation: Profit sharing, fringe benefits etc.Trade Unions. Methods of setting disputes (i) Collective bargaining (ii) Conciliation (iii) Mediation (iv) Arbitration industrial disputes in India, Machinery for setting disputes. Trade Disputes Acts. The factory Act 1944, payment of wages act. Workman's compensation act.

ME 505: DYNAMICS OF MACHINES

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT l:- Governors: Watt, Porter, Proell, Hartnell and spring controlled governors, governor effort, power, stability, inertia effects.

UNIT 2:- Gyroscope: Principle of gyroscopic couple, effect of gyroscopic couple and centrifugal force on vehicle taking a turn, stabilization of sea vessels. Inertia force analysis: Velocity andacceleration of slider crank and four bar mechanism, inertia force, piston thrust and forces on connecting rod, turning moment diagram, flywheel.

UNIT 3:- Gears: Law of gearing, terminology, tooth form, standard interchangeable tooth profile, minimum number of teeth on pinion in contact with gear or rack, interference and undercutting, bevel, helical and spiral gears.

UNIT 4:- Gear trains: Simple, compound, reverted and epicyclic gear trains, analytical, tabular, graphical and vector methods for velocity ratio, gear boxes- sliding and constant mesh for automobiles.

UNIT 5:- Balancing: Balancing of rotating masses, balancing of reciprocating masses, locomotives, IC engines, balancing machines.

ME 506: PRINCIPLES OF TURBOMACHINES

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1:- Basic concepts of turbomachines: Definition of Turbomachine, classification; Basic laws and governing equations; continuity equation, steady flow energy equation(1 law of slthermodynamics),2 law of thermodynamics applied to turbomachines, Newton's 2 nd law of motion applied to turbomachines - Euler's pump equation and Euler's turbine equation, dimensional analysis applied to hydraulic machines, power coefficient, flow coefficient, head coefficient, non-dimensional specific speed; Range of 'specific speeds for various turbomachines. Dimensional analysis applied to compressible flow machines, pressure ratio as a Function of temperature ratio, mass flow rate parameter and speed parameter.

Unit 2:- Centrifugal pumps: Main parts, work done and velocity triangles, slip and slip factor, pump losses and efficiencies, minimum starting speed, net positive suction head, performance curve.
Unit 3:- Axial flow pumps; Description, velocity triangles, work done on the fluid, energy transfer, axial pump characteristics, cavitation.
Unit 4:- Centrifugal compressors and fans: Components and description, velocity diagrams, slip , energy transfer, power input factor, stage pressure rise and loading coefficient, pressurecoefficient, degree of reaction. Centrifugal compressor characteristic, surging, rotating Stall and Choking.
Unit5:- Axial flow compressors and fans: Basic constructional features; turbine v/s compressor blades; Advantages of axial flow compressors, working principle, velocity triangle,elementarytheory; stage work, work done factor, stage loading, degree of reaction; vortex theory; simple design calculations; introduction to blade design; cascade test; compressibility effects; operating characteristics.

ME 507: PROD. ENGG. LAB. - I

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

Perform any twelve experiments :

1. Study of single point cutting tool geometry & grind the tool as per given tool geometry.
2. Study the milling machine, milling cutters, indexing heads and indexing methods.
3. Prepare a gear on milling machine.
4. Prepare a hexagonal / octagonal nut using indexing head on milling m/c and to cut BSW/METRIC internal threads on lathe.
5. To cut multi-start square / metric threads.
6. To cut external metric threads & to meet it with the nut
7. To prepare the job by eccentric turning on lathe machine.
8. To prepare a job on shaper from given MS rod.
9. To study the various crystal structures and dislocations through models.
10. To study the Iron-Iron Carbide Equilibrium Diagram and sketch the various structures present at room temps.
11. Study of capstan lathe and its tooling and prepare a tool layout & job as per given drawing.
12. Study the principle & construction of the Metallurgical Microscope.
13. Prepare metallic samples for metallographic examination for study of Microstructure
14. Study the hardening of steel in different medium and at different cooling rates.
15. Study the effect of Carbon percentage on the hardness of Steel

ME 508: AUTOMOBILE ENGG. LAB

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1. Valve refacing and valve seat grinding and checking for leakage of valves
2. Trouble shooting in cooling system of an automotive vehicle
3. Trouble shooting in the ignition system, setting of contact breaker points and spark plug gap
4. Demonstration of steering system and measurement of steering geometry angles and their impact on vehicle performance.
5. Trouble shooting in braking system with specific reference to master cylinder, brake shoes, overhauling of system and the adjusting of the system and its testing.
6. Fault diagnosis in transmission system including clutches, gear box assembly and differential.
7. Replacing of ring and studying the method of replacing piston after repair.

ME 509: DYNAMICS OF MACHINES LAB. - II

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1. To verify the relation T=I for gyroscope. p
2. To plot force vs. radius and lift vs. speed curves for governors.
3. To plot pressure distribution curves on a journal bearing.
4. To perform wheel balancing.
5. To perform static and dynamic balancing on balancing set up.
6. To determine mass moment of inertia of a flywheel.
7- Study of a lathe gear box.
8. Study of a sliding mesh automobile gear box.
9. Study of a planetary gear box.

ME 510: MATLAB AND COMPUTER GRAPHICS

(L: 0; T: 0; P=2) **Max.Marks:75**
Min.Marks:38

(A) MATLAB: Use of MATLAB and its application to Mechanical Engineering problems.

(B) Turbo C Graphics: To make C programs to animate different mechanisms and system: Such as Slider Crank Mechanism, Quick Return Mechanism, Cam Follower, Solar system, ball motion in billiard, Rolling of wheel from inclined plane, Seesaw motion, Projectile motion of a wheel, etc.

ME 511 ENTREPRENEURSHIP DEVELOPMENT

(L: 0; T: 0; P=2) **Max.Marks:75**
Min.Marks:38

1 Definition of entrepreneur, qualities of a successful entrepreneur, Charms of being an entrepreneur, achievement- motivation, leadership and entrepreneurial competencies.
2 Decision-making, procedures and formalities for starting own business, financial support system.
3 Identification and selection of business opportunities and market survey, business plan. Implementation and customer satisfaction.
4 Business crises, problem-solving attitude, communication skill. Government policies for entrepreneurs.
5 Knowledge based enterprises, Scope of entrepreneur in present context, area of future entrepreneurship.
6 Marketing & Sales Promotion, Techno-Economic Feasibility Assessment by Preparation of Preliminary & Detailed project report.

B.E VI SEMESTER

ME 601: DESIGN OF MACHINE ELEMENTS- II

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Fatigue Considerations in Design: Variable load, loading pattern, Endurance stresses, influence of size, surface finish, notch sensitivity & stress concentration. Goodman line, Soderberg, Design of machine members subjected to combined, steady and alternating stresses. Design for finite life. Design of Shafts under Variable Stresses.

Unit 2 Pre loading of bolts; effect of initial tension & applied loads, Bolts subjected to variable stresses. Design of members which are curved like crane hook, body of C-clamp, machine frame etc. Power screws like lead screw, screw jack.

Unit 3 Design of helical compression, tension, torsional springs. Springs under variable stresses. Design of belt, rope and pulley drive system, selection of chain & sprocket drive systems.

Unit 4 Design of gear teeth, Lewis and Buckingham equations; wear and dynamic load considerations, Design and force analysis of spur, helical, bevel and worm gears. Bearingreactions due to gear tooth forces.

Unit 5 Design of sliding & journal bearing; method of lubrication, hydrodynamic, hydrostatic, boundary etc. Minimum film thickness and thermal equilibrium. Selection of anti-frictionbearings for different loads and load cycles. Mounting of the bearings. Method of lubrication, selection of oil seals.

ME 602: INTERNAL COMBUSTION ENGINES AND DIESEL POWER PLANT

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Introduction : Historical & Modern Development, Nomenclature, Classification & Comparison : SI & CI, 4 stroke – 2 stroke, First Law analysis, Energy Balance.Testing & Performance : Performance parameters, Measurement of operating parameters e.g. speed, fuel & air consumption, Powers IHP, BHP, FHP, Efficiencies Thermal, Mechanical, Volumetric, Emission Measurement, Numerical problems, India & International standards of Testing, Emission.

Unit 2 Fuel & Combustion Combustion in CI & SI engines : Ignition Limits, Stages of combustion, Combustion parameters. Delay period and Ignition Lag, Turbulence and Swirl, Effects of engine variables on combustion parameters, Abnormal combustion in CI & SI engines, Detonation & knocking, , Theories of detonation, Control of abnormal combustion, Combustion chamber Design principles, Types of combustion chamber.

Fuel:- Conventional : Petroleum, structure, Refusing Fuels for SI & CI engines, Knock rating, Additives, Fuels for Turbine & Jet Propulsion.

Alternative : Methanol, Ethanol, Comparison with gasoline, Manufacturing, Engine performance with pure Methanol, Ethanol & blends, Alcohols with diesel engine, Vegetable oils, Bio gas.

Unit 3 Engine Systems & Components Fuel Systems : SI Engine : Combustion & Injection, process & parameters properties of A/F mixture, Requirements of A/F per different operating conditions, Carburetion & Carburetors, types, Aircraft carburetor, comparison of carburetion & injection, F/A ratio calculations, Numerical problems.

CI engine : Mixture requirements & constraints, Method of injection, Injection systems, CRDI etc. system components, pumps injectors. Ignition system : Conventional & Modern ignitionsystems Magneto v/s Battery, CB point v/s Electronic ignition, Fuel Ignition Energy requirements. Spark galvanic, centrifugal, vacuum Firing order, spark plugs.

Unit 4 Engine Friction & Lubrication : Determination of friction, Lubrication principles, Types of lubrication, Places of lubrication Bearings and piston rings etc., Functions of Lubrication, Properties, Rating and Classification of lubricating oil, Additives, Lubrication systems.

Engine Cooling : Requirements of cooling, Areas of heat flow, High temperature regions of combustion chamber. Heat Balance, Cooling Systems, Air, Water Cooling, Cooling system components.

Supercharging : Objectives, Thermodynamic cycle & performance of super charged SI & CI engines Methods of super charging, Limitations

Two stroke engines : Comparison of 4s & 2s engines construction & valve lining scavenging. Process parameters, systems, supercharging of 2 stroke engines.

Unit 5 Dual & Multi fuel engines : Principle, fuels, Combustion, performance Advantages, Modification in fuel system.Working principles of . Rotary, Stratified charge, Free piston, Variable compression ratio engines.

Diesel Power plant: Requirements, capacity, operation, safety, Engine Generator Coupling, Electrical load, Switching

ME 603: MANUFACTURING SCIENCE AND TECHNOLOGY

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 JIGS AND FIXTURES:- Introduction, definition and difference; usefulness of jigs and fixtures; design considerations; materials used; principles and methods of location; clamping elements; jig bushes; drilling jigs; fixtures for milling turning, boring and welding; assembly fixtures; indexing devices; economics of jigs and fixtures; complete design of a jig and a fixtures; complete design of a jig and a fixtures.

Unit 2 NEW MACHINING METHODS: Types of machining methods; hot machining; electric discharge machining (E.D.M.) ultrasonic machining (U.S.M.) ; Electron beam machining (E.B.M.) laser beam Machining (L.B.M.); abrasive jet machining (A.J.M.) ; plasma arc machining (PAM); economics of machining! ,

Unit 3 Precision Measurement : Standards of linear measurements; linear and angular measurements; screw thread measurement; measurement of effective diameter, pitch and thread angles; Gear measurement, measurement of tooth profile, tooth thickness and pitch, Measurement of surface roughness. Quantitative methods of roughness measurements, Stylus and profilograph methods.
Precision Measuring Instruments: Comparators types; working principles applications and limitations of various comparators; optical flat; autocollimator indicators, slip gauges, bevel protector.

Unit 4 DESIGN OF SINGLE POINT CUTTING TOOLS: Introduction; functions of various tool angles; design of single point turning too]; parting tool; empirical determination of force components; optimum value of tool angles.
DESIGN OF Multipoint Cutting tool: Introduction; angle of contact; force analysis; approach through dimensional analysis; force and power consumption; tooth forn1 and cutter design.

Unit 5 Design of Machine Tool Element Design of Lathe bed, Material and construction feature, various bed section, designing for torsional rigidity, use of reinforcing stiffener in lathe bed. Theoretical aspect of design of guide ways, Material and construction features, Antifriction guide ways.

ME 604: NOISE, VIBRATION & HARSHNESS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Sound level and subjective response to sound; Frequency dependent human response to sound, Sound pressure dependent human response. Decibel scale; Decibel addition, subtraction and averaging. Relationship among sound power, sound intensity and sound pressure level. Sound spectra. Octave band analysis. Loudness. Noise: Effects, Ratings and Regulations; Non-auditory effects of noise on people, Auditory Effects of noise, Noise standards and limits in India. Majorsources of the noise; Industrial noise sources. Industrial noise control-strategies; Noise control at the source, Noise control along the path, Acoustic barriers, Noise control at the receiver.

Unit 2 Scope of vibration, important terminology and classification, Degrees of freedom, Harmonic motion; vectorial representation, complex number representation, addition. Derivation of equation of motion for one dimensional longitudinal, transverse and torsional vibrations without damping using Newton's second law, D' Alembert's principle and Principle of conservation of energy. Compound pendulum and centre of percussion. Damped vibrations ofsingle degree of freedom systems. Viscous damping; underdamped, critically damped andoverdamped systems, Logarithmic decrement. Vibration characteristics of Coulomb damped and Hysteretic damped systems.

Unit 3 Forced vibrations of single degree of freedom systems. Forced vibration with constant harmonic excitation. Steady state and transient parts. Frequency response curves and phase angle plot. Forced vibration due to excitation of support. Vibration Isolation and transmissibility; Force transmissibility, Motion transmissibility. Forced vibration with rotating and reciprocating unbalance. Materials used in vibration isolation.

Unit 4 System with two degrees of freedom; principle mode of vibration, Mode shapes. Undamped forced vibrations of two degrees of freedom system with harmonic excitation. Vibration Absorber; Undamped dynamic vibration absorber and centrifugal pendulum absorber. Many degrees of freedom systems: exact analysis.

Unit 5 Many degrees of freedom systems: approximate methods; Rayleigh's, Dunkerley's, Stodola's and Holzer's methods. Vibrations of continuous systems; Transverse vibration of astring, Longitudinal vibration of a `bar, Torsional vibration of a shaft.

ME 605: HYDRAULIC MACHINES AND HYDRO ELECTRIC POWER PLANT

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Review of fundamentals Euler's turbine equation, principles of similarity applied to hydraulic machines, non-dimensional specific speed. Classification of turbines on the basis ofnon-dimensional specific speed. Unit and specific quantities.

Impact of Free Jets

Impulse momentum principle, force exerted by the jet on stationary flat and curved plate, hinged plate, moving plate and moving curve vanes.

Unit 2 Impulse Turbine

Classification of turbine, impulse turbines, Pelton wheel, Construction, working. Work done, head, efficiency and design aspects. Governing of impulse turbine.

Unit 3 Reaction Turbine Radial flow reaction turbine, Francis turbine: construction and working. Work done, efficiency, design aspects.

Axial flow reaction turbine

Propeller and Kaplan turbine, bulb or tubular turbine- construction and working. Draft tube, governing of reaction turbine. Performance characteristics and comparison of all the turbines.

Cavitation Phenomenon in hydraulic machines

Unit 4 Reciprocating Pumps Classification, component and working, single acting and double acting, discharge, work done and power required, coefficient of discharge, indicator diagram, slip,effect of friction and acceleration theory of air vessels.

Fluid system Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic Ram, hydraulic coupling, hydraulic torque converter, air lift pump, jet pump.

Unit 5 Hydro Electric power station (HEPP) – Advantages and disadvantages of water power, selection of site for HEPP, hydrological cycle, hydrographs, essential elements of HEPP. Types of dams, conduits, spillways, surge tanks. Classification of HEPP. Major, mini and micro powerplants- present scenario in Rajasthan and India. Selection of turbine.

ME 606: NUMERICAL METHODS AND APPLIED STATISTICS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Errors and significant digits, Roots of algebraic equations Bisection method, secant method, Newton Raphson method, Graff's root- squaring method, Iterated synthetic division with quadratic factors method for finding complex roots,

Unit 2 Solutions of systems of equations (Gauss elimination, Gauss Jordan, and Partition method for linear system of equations, power method for partition, method for linear system of equations, power method for finding eigen values), Forward, backward , central and Divided differences, Newton's formula of interpolation for equal and unequal intervals. Lagrange's interpolation formula, Stirling's and Bessell's formula,

Unit 3 Numerical differentiation, Numerical Integration:- Trapezoidal, Simpson's rule and Gaussian integration (only formula applications) Differential equations and their solutions. Numerical methods for ordinary differential equations (Picard method, Taylor series method, Euler's method, Ranga Kutta Method, Predictor- corrector method, Adams- Bashforth method).

Unit 4 Sampling theory: Introduction: Moments, Moment generating functions, Skewness, Kurtosis, Correlation and Regression, Normal sampling distributions; Binomial distribution, Poisson distribution, Normal distribution; Sampling distribution of the means; sampling distribution of the differences of the means; sampling distributions of proportions.

Unit 5 Tests of Significance; t-distributions, chi square distributions, F-distributions. Regression And Correlation; Linear regression; correlation, multiple correlation & partial correlation Confidence Limits; Large samples, small samples, error bands in regression

ME 607: HEAT TRANSFER LAB

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

EXPERIMENTS TO BE PERFORMED (MINIMUM TEN NUMBERS)
1. To Determine Thermal Conductivity of Insulating Powders.
2. To Determine Thermal Conductivity of a Good Conductor of Heat (Metal Rod).
3. To Measure the thermal Conductivity of Liquid.
4. To determine the transfer Rate & Temperature Distribution for a Pin Fin.
5. To Measure the Emmissivity of the Test plate Surface.
6. To Determine Stefan Boltzman Constant of Radiation Heat Transfer.
7. To Determine the Surface Heat Transfer Coefficient For Heated Vertical Cylinder in Natural Convection.
8. Determination of Heat Transfer Coefficient in Drop Wise & Film Wise condensation.
9. To Determine Critical Heat Flux in Saturated Pool Boiling.
10. To Study Performance of Simple Heat Pipes.
11. To Study and Compare LMTD and Effectiveness in Parallel and Counter Flow Heat Exchangers.
12. To Find the Heat transfer Coefficient in Forced Convection in a tube.
13. To determine the total thermal conductivity and thermal resistance of the given compound resistance in series.
14. To find out the thermal conductivity of given slab material.
15. To determine the individual thermal conductivity of different lagging in a lagged pipe.
16. To study the rates of heat transfer for different materials and geometries
17. To understand the importance and validity of engineering assumptions through the lumped heat capacity method.
18. Testing and performance of different heat insulators.

ME 608: TURBOMACHINERY LAB

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1. Determination of Mechanical and volumetric efficiency of Reciprocating Air Compressor.
2. Testing of Reciprocating Air Compressor.
3. Determination of efficiency and Pressure distribution of Axial Flow Compressor.
4. Performance testing of Axial Flow Compressor.
5. Study and Performance of Simple Steam Turbine
6. Performance characteristics of Pelton wheel turbine.
7. Performance characteristics of Francis turbine.
8. Performance characteristics of Kaplan turbine.
9. Performance characteristics of variable speed centrifugal pump
10. Performance characteristics of rated speed centrifugal pump.
11. Performance characteristics of multistage centrifugal pump.

ME 609: COMPUTER ORIENTED NUMERICAL METHODS LAB

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1. To develop computer program to determine roots of a given equation using method of
a. False position b. Newton -Raphson method,
2. To develop computer programs for solution of system of simultaneous linear equations using:
a. Gauss Elimination Technique, without and with specified boundary conditions, for full as well as bounded symmetric and unsymmetrical matrices
b. Gauss Shield iterative technique Successive over Relaxation(S.O.R) Technique
3. Linear and Non-Linear curve fitting technique
4. Numerical Integration with Simpson's rule and Gaussian Integration
5. Solution of ordinary differential equations by (i) Eular Method (ii) Runge-Kutta Method (iii) Taylor Series Methods
6. Solution of partial differential equations using S.O.R. Technique with special reference to heat conclusion equation.

ME 610: MACHINE DESIGN – II SESSIONAL

(L: 0; T: 0; P=2) **Max.Marks:75**
Min.Marks:38

Problems on
1. Fatigue loading
2. Helical compression, tension and torsional springs design
3. Curved Beams
4. Preloaded bolts and bolts subjected to variable stresses
5. Belt, Rope and Chain drive system
6. Gear Design
7. Sliding contact bearing design
8. Anti-friction bearing selection

ME 611: CAD LAB.

(L: 0; T: 0; P=2) **Max.Marks:75**
Min.Marks:38

EXPERIMENTS TO BE PERFORMED (MINIMUM FIVE EXPERIMENTS)
1. Introduction & different features of the CAD Software
2. 2-D Drafting
3. 3-D Modeling
4. 3-D Advanced Modeling
5. Assembly modeling
6. Feature Modification and Manipulation
7. Detailing
8. Sheet Metal Operations
9. Surface Modeling
10. One Dimensional problems of Finite Element Method.

(These exercises may be performed by any of the following Advanced CAD Software such as Pro E /Unigraphics/ AotoCAD Inventor)

B.E VII SEMESTER

ME 701: COMPUTER AIDED DESIGN

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

UNIT I. Overview of Computer Graphics, Picture representation, Coordinate Systems, Output Graphcis Display devices. Raster Scan Graphics : DDA for line generation and Bresenham's algorithm for line and circle generation.

UNIT II Wire frame models, Parametric representation of curves, Plane curves : line, circle, ellipse, parabola and hyperbola. Space curves : Cubic spline curve, Bezier Curve and B Spline Curves. Blending of Curves.

UNIT III Surface models and entities Parametric representation of Hermite Bicubic surfaces, Bezier surfaces and B-spline surfaces. Solid Models and entities, Solid Representation : B-rep. and CSG. Comparison between three types of models **.**

UNIT IV Two and three dimensional transformation of Geometric models: Translation, Scaling Reflection, Rotation and Shearing. Homogeneous Representation, Combined Transformation. Projection of Geometric models: Parallel and Perspective Projection.

UNIT V Clipping : Point clipping, Line clipping, Cohen- Sutherland algorithm etc. Viewing Transformation, Hidden Line and surface Removal : Techniques and Algorithms.

ME 702: REFRIGERATION AND AIR CONDITIONING

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Introduction
Refrigeration and second law of Thermodynamics, Refrigeration effect and unit of Refrigeration, Heat pump, reversed Carnot cycle.
Vapour Compression Refrigeration System
Analysis of simple vapour compression Refrigeration cycle by p-h and T-S diagram. Effect of operating conditions, liquid vapour heat exchangers, actual refrigeration cycle.
Multiple Evaporator and compressor system.
Application, air compressor system, Individual compressor, compound compression, cascade system. Application, air compressor systems, individual compressor, compound compression, cascade system.

Unit 2 Gas cycle Refrigeration
Limitation of Carnot cycle with gas, reversed Brayton cycle, Brayton cycle with regenerative H.E.
Air cycle for air craft
Necessity of cooling of air craft, Basic cycle, boot strap, regenerative type air craft refrigeration cycle.

Unit 3 Vapour Absorption System
Simple Vapour absorption system, Electrolux Refrigerator, Analysis of Ammonia absorption refrigeration system, Lithium Bromide Absorption Refrigeration System.
Refrigerants
Classification, Nomenclature, selection of Refrigerants, global warming potential of CFC Refrigerants.
Refrigeration Equipments
Compressor, condenser, evaporator, expansion devices – types & working.

Unit 4 Psychrometry
Psychrometric properties, psychometric relations, pyschrormetric charts, psychrometric processes, cooling coils, By-pass factor and air washers.
Human Comfort
Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart.
Unit 5 Cooling load calculations
Internal heat gain, system heat gain, RSHF, ERSHF, GSHF, cooling load estimation, heating load estimation, psychrometric calculation for cooling, selection of air conditioning, apparatus for cooling and dehumidification, Air conditioning system

ME 703: OPERATIONS RESEARCH

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Linear Programming-
Introduction & Scope, Problem formulation, Simplex methods, primal & dual problem dual Simplex, sensitivity analysis

Unit 2 Transportation, Transshipment & Assignment problems
Dynamic Programming- Multistage decision problems & solution, Principle of optimality.

Unit 3 Decision theory- Decision under various conditions.
Game Theory- Minimax & maximum strategies. Application of linear programming.
Integer Programming- Cutting Plane method and Branch & Bound method

Unit4 Deterministic and Stochastic inventory models-
Single & multi period models with continuous & discrete demands, Service level & reorder policy

Unit 5 Simulations- Simulation V/S mathematical modeling, Monte Carlo simulation, simulation language ARENA, Example & cases.
Queing models- Introduction Model types, M.M. 1 & M/M/S system cost consideration

ME 704: STEAM TURBINES AND STEAM POWER PLANT

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Steam Turbines: Principle and working of steam turbines, type of turbines, impulse and reactions, compounding for pressure and velocity. Velocity triangles for various types.

Unit 2 Stage efficiency, diagram efficiency, steam speed to blade, speed ratio for optimum performance. Energy losses in steam turbine, turbine performance at various loads and governing of steam turbines. Constructional details and description of steam turbine components in brief.

Unit 3 Regenerative feed heating cycles: Introduction : Most Ideal Regenerative feed heating cycle. Regenerative feed heating cycles and their representation on T-s and h-s Diagram.Representation of actual process on T-s and h-s Diagram Regenerative cycles. Othertypes of feed heating arrangements. Optimum feed water and saving in Heat Rate. Feed Heaters, Direct Contact Heaters, Surface Heaters
Reheating – Regenerative and Regenerative water – Extraction Cycles. Reheating of steam, Practical reheating and Non- reheating cycles, advantage & disadvantages of reheating, regenerative water extraction cycles, practical feed heating arrangements.

Unit 4 Governing and performance of Steam Turbines. Description of back pressure Turbines, pass-out Turbines and Mixed Pressure Turbines.

Unit 5 Steam Power Plant Steam power plants selection of location, working medium. Fuels and fuel handling equipments, ash handling equipments. Air pre-heater, feed water treatment. Methods of combustion and various type of combustors. Types of boilers. Modern developmentsin steam boilers. Description of cooling tower.

ME 705: PRODUCT DEVELOPMENT AND LAUNCHING

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Importance of new product-Definition-importance-Development Process.
Importance of new product for growth of enterprise. Definition of product and new product. Responsibility for new product development. Demands on product development team. Classification of products from new product development. Point of view- Need based/Market pull products, Tech. push, Platform based, Process based and customized products. New product development process and organization. Generic product development process for Market Pull Products. Modification of this process for other types of products.

Unit 2 Need analysis- Problem Formulation
Establishing economic existence of need, Need Identification and Analysis, Engineering Statement of Problem, Establishing Target Specification.

Unit 3 Generation of Alternatives and Concept Selection
Concept generation- a creative process, Creativity, Road Elects to creative thinking- Fear of criticism and Psychological set. Tools of creativity like brain storming, Analogy, Inversion etc., Creative thinking Process. Concept feasibility and Concept Selection, Establishing Engineering Specification of Products.

Unit 4 Preliminary & detailed design- Design Review
Preliminary design- Identification of subsystems, Subsystem specifications, Compatibility. Detailed design of subsystems, component design, Preparation of assembly drawings. Review of product design from point of view of Manufacturing, Ergonomics and aesthetics.

Unit 5 Management of New Product – development and Launch.
New Product Management's Challenges – Maintaining focus, Promotion of Right Culture, Management of Creativity, Top Management attention. Design Team Staffing and Organization. Setting key mile stone, Identification of Risk Areas, Execution and Evaluation Product Launch Strategies. Project Planning – Project Task matrix, estimation of time & resources, projectscheduling.

ME 706: ROBOTICS

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Introduction to Robotics
Evolution of Robots and Robotics, Laws of Robotics, What is and What is not a Robot, Progressive Advancement in Robots, Robot Anatomy, Human Arm Characteristics, Design and Control Issues, Manipulation and Control, Sensors and Vision, Programming Robots, The Future Prospects, Notations.

Unit 2 Coordinate Frames, Mapping and Transforms
Coordinate Frames, Description of Objects in Space, Transformation of Vectors, Inverting a Transform, Fundamental Rotation Matrices

Unit 3 Symbolic Modeling of Robots – Direct Kinematic Model
Mechanical Structure and Notations, Description of Links and Joints, Kinematic Modeling of the Manipulator, Denavit – Hartenberg Notation, Kinematic Relationship between Adjacent Links, Manipulator Transformation Matrix. Introduction to Inverse Kinematic model

Unit 4 Robotic Sensors and Vision
The Meaning of Sensing, Sensors in Robotics, Kinds of Sensors used in Robotics, Robotic vision, Industrial Applications of Vision-Controlled Robotic Systems, Process of Imaging, Architecture of Robotic Vision Systems, Image Acquisition.

Unit 5 Robot Applications
Industrial Applications, Material Handling, Processing Applications, Assembly Applications, Inspection Application, Principles for Robot Application and Application Planning, Justification of Robots, Robot Safety, Non-Industrial Applications.

ME 707: P.E. LAB.-II

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

Minimum any ten experiments can be performed

1. By using lathe tool dynamometer measure the cutting forces in all directions and calculate the following:
a) Shear plane angle
b) Coefficient of friction
c) Power consumption
2. By using the drill dynamometer measure the torque, and thrust in Drilling operation.
3. By using the tool work thermocouple, measure the tool chip interface temp
4. To determine chip reduction coefficient in turning.
5. To study the different mechanisms of tool wear and their measurements.
6. To determine Taylor Tool life exponents by Facing test
7. To study the effect of cutting variables on surface finish in any cutting (Turning, Drilling, Milling, Shaping, grinding etc) operation
8. Study of the effect of clearance and shear angle on the blanking and piercing operations
9. To determine the effect of percentage of reduction and the semicone angle of the die on the drawing load.
10. To find the effect of percentage of reduction and the die geometry on extruding force.
11. Experimental determination of coefficient of friction for metal forming.
12. Study of the drop forging operation (flow ability, forging load etc by plasticine model.
13. To determine roll load in the sheet rolling process.
14. Students will be given at least one practical problem regarding design and fabrication of Jig, Fixture or Press tool.
15. To measure a gap with help of slip gauges
16. Measurement of angle/taper using a sine bar.
17. Study and use of a bore gauge.
18. Flatness testing of a surface pate and machine tool bed by using a sensitive spirit level.
19. Measurement of screw thread elements by tool Makers microscope and Inspection of various elements of screw thread by optical projector.
20. To measure flatness and surface defects in the given test piece with the help of monochromatic check light and optical flat.
21. Measurement of chordal thickness of Gear tooth by Gear tooth vernier caliper.
22. Use of three-wire method to determine the effective diameter of external threads.
23. To study the capstan lathe, tool holders and attachments and to prepare the given job as per given drawing.
24. Cutting forces measurement during milling using milling dynamometer.
25. Measurement of flatness and roundness of a given machine/ground/lapped flat and round surface respectively using dial gauge.

ME 708: MECHANICAL VIBRATIONS LAB.

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

1. To verify relation T = 2p / (l/g) for a simple pendulum.
2. To determine radius of gyration of compound pendulum.
3. To determine the radius of gyration of given bar by using bifilar suspension.
4. To determine natural frequency of a spring mass system.
5. Equivalent spring mass system.
6. To determine natural frequency of free torsional vibrations of single rotor system.
(a) Horizontal rotor (b) Vertical rotor
7. To verify the Dunkerley's rule.
8. Study of free damped torsional vibration to performing the experiment to find out damping co-efficient.
9. To conduct experiment of trifler suspension.
10. Harmonic excitation of cantilever beam using electro-dynamic shaker and determination of resonant frequencies.
11. Study of Vibration measuring instruments.

ME 709: I. C. Engine Lab.

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

Perform any 10 experiments
1. Study of IC Engine models
2. Study of working of four stroke petrol engine and four stroke diesel engine with the help of cut section models.
3. Study of working of two stroke petrol and two stroke diesel engine with the help of cut section models.
4. Study of fuel supply system of a petrol engine (fuel pump and simple carburetor)
5. Study of complete carburetor (Solex carburetor)
6. Study of Petrol Injection System.
7. Study of fuel supply system of a Diesel engine (fuel pump and fuel injector)
8. Study of Ignition systems of an IC Engine (Battery and Magneto ignition system) and Electronic ignition system.
9. Study of Lubrication system of an IC Engine (mist, splash and pressure lubrication)
10. Study of cooling systems of an IC Engine (air cooling and water cooling)
11. To conduct a performance test on diesel engine to draw heat balance sheet for given load and speed
12. To determine friction power of diesel engine by Willan's line or fuel rate extrapolation method.
13. To conduct a performance test on the variable compression ratio engine and to draw the heat balance sheet for given compression ratio, speed and load and plot the performance curves.
14. To conduct a performance test on a four cylinder four stroke petrol engine and to draw the heat balance sheet and performance curves.
15. To calculate the indicated power, friction power and mechanical efficiency of four stroke four cylinder petrol engine at full load and rated speed by Morse test.
16. To draw the valve timing diagram of a Four stroke S.I. or C.I. Engine using experimental setup.
17. Analysis of engine exhaust gases using Orsat apparatus / gas analyzer.

B.E VIII SEMESTER

ME 801: RENEWABLE ENERGY TECHNOLOGY

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Global and National scenarios, Form and characteristics of renewable energy sources
Solar Energy
Solar radiation, its measurements and prediction. Solar thermal collectors, flat plate collectors, concentrating collectors. Basic theory of flat plate collectors, solar heating of buildings, solar still, solar water heaters, solar driers; conversion of heat energy in to mechanical energy, solar thermalpower generation systems.
Solar Photovoltaic
Principle of photovoltaic conversion of solar energy, types of solar cells and fabrication. photovoltaic applications: battery charger, domestic lighting, street lighting, water pumping, power generation schemes

Unit 2 Wind Energy
Atmospheric circulations, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS: classification, characteristics, applications.

Unit 3 Ocean Energy
Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

Unit 4 Other Sources:
Nuclear fission and fusion; Geothermal energy: Origin, types of geothermal energy sites, site selection, geothermal power plants; Magneto-hydro-dynamic (MHD) energy conversion. Formation of biomass, photosynthesis; Biomass resources and their classification; Chemical constituents and physicochemical characteristics of biomass; Biomass conversion processes;

Unit 5 Fuel Cells
Thermodynamics and electrochemical principles; Basic design, types, applications.
Hydrogen Energy Economics of hydrogen; Production methods.

ME 802: OPERATIONS MANAGEMENT

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit 1 Introduction: Scope of Operations Management, operations manager and the management process. Operations Strategy, Competitiveness and Productivity. Demand Forecasting: components of forecasting demand, Approaches to forecasting: Qualitative methods, Time series methods, Regression methods, Accuracy and control of forecasts, Selection of forecasting technique.

Unit 2 Products and Services, Process, Types of Production Systems: Mass, Batch, Job shop production. Product and process matrix. Process planning and Process analysis. Capacity Planning: Defining and measuring capacity, steps in capacity planning process, determining capacity requirements, Capacity alternatives, Evaluation of alternatives- Cost- Volume analysis etc.

Unit 3 Production Planning: Production planning objective and functions, Bill of material, Capacity and man power requirement planning, Planning levels: long range, Intermediate range and Short range planning, aggregate planning; Objective, Strategies, graphical and mathematical techniques of aggregate planning, master production scheduling, MRP and MRPII Systems

Unit 4 Production Control: Capacity control and priority control, production control functions; Routing, scheduling, dispatching, expediting and follow up. Techniques of production control in job shop production, batch production and mass production systems,

Unit 5 Material Management: Objectives, scope and functions of material management, planning, procurement, storing, ending and inventory control. Purpose of inventory, inventory cost, inventory control systems, Selective inventory control systems, Determination of EOQ, Lead time and reorder point. Methods of physical stock control

ME 803: GAS TURBINES AND GAS POWER PLANT

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1 Review of basic principles and fundamentals of rotating machines. Cycle arrangements, open cycle arrangements, closed cycle arrangements, basic requirement of the working medium, properties of various working media, applications of gas turbine, comparison of gas turbines with reciprocating engines. Ideal cycles: simple gas turbine cycle, heat exchange cycle, reheat cycle, reheat and heat exchange cycle, intercooled cycle, intercooled cycle with heat exchanger, intercooled and reheat cycle, intercooled cycle with heat exchange and reheat. Comparison of various cycles.

Unit 2 Practical cycles and their analysis, effect of variable specific heat, mechanical losses, loss due to incomplete combustion, polytropic efficiency, performance of actual cycles, comparison of ideal vs actual cycles. Jet propulsion cycles.

Unit 3
Thermodynamic cycles, advantages, disadvantages and performance characteristics of Ramjet engine, pulsejet engine, turboprop engine, turbojet engine, turbofan engine.
Calculation of specific thrust and efficiency.

Unit 4 Combustion systems, combustion theory applied to gas turbine combustor, factors affecting combustion chamber design and performance. Combustion chamber geometry, fuel injection and ignition, use of cheap fuels. Impulse and reaction type gas turbines. Velocity triangles and calculation of work done,efficiency etc..

Unit 5 Advantages of a gas turbine power plant, comparison with steam, diesel and hydel power plant. Performance of GT power plant-part load efficiency, airflow rate, thermal efficiency, gas turbine blading and fuels. Gas turbine materials. Free piston engine plant.

ME 804: COMPUTATIONAL FLUID FLOW AND HEAT TRANSFER

(L: 3: T: 1) **Max.Marks:100**
Min.Marks:40

Unit1 Review of basic fluid mechanics and the governing (Navier-Stokes) equations. Types of partial differential equations- hyperbolic, parabolic and elliptic. Traditional solution methods- method of characteristics, separation of variables, Greens function method.

Unit2 Preliminary computational techniques: Discretisation, converting derivatives to discrete algebric expressions, spatial derivatives, time derivatives. Approximation of derivatives, Taylor series expansion, general techniques. Accuracy of discretisation process-higher order vs lower order formulae.

Unit3 Finite difference method: conceptual implementation, application to transient heat conduction problem. Convergence, consistency and stability of FD equation.

Unit4 Weighted residual methods: General formulation, Introduction to Finite Volume method. Finite Volume method: Equations with first derivatives and second derivatives. FV method applied to Laplace's equation.

Unit5 Finite Element method: Linear interpolation, quadratic interpolation, two dimensional interpolation. Application to heat transfer problems.

ME 805: CAM AND ROBOTICS LAB.

(L: 0; T: 0; P=2) **Max.Marks:100**
Min.Marks:50

EXPERIMENTS TO BE PERFORMED

CAM (Minimum Five Experiments)

1. To prepare part programming for plain turning operation.
2. To prepare part programming for turning operation in absolute mode.
3. To prepare part program in inch mode for plain turning operation.
4. To prepare part program for taper turning operation.
5. To prepare part program for turning operations using turning cycle.
6. To prepare part program for threading operation.
7. To prepare part program for slot milling operation.
8. To prepare part program for gear cutting operation.
9. To prepare part program for gear cutting using mill cycle.
10. To prepare part program for drilling operation.
11. To prepare part program for multiple drilling operation in Z-axis.
12. To prepare part program for multiple drilling in X-axis.
13. To prepare part program for multiple drilling in X and Z axis using drilling cycle.

Robotics (Minimum Five experiments)

1. To detect the sensor scanning system to overcome limitation of fixed sensors on various robotic applications, ultrasonic sensor, laser range finders, infrared detectors and miniature.
2. To find the horizontal and vertical movement up to 180o in either direction.
3. To detect objects with infrared ray detector.
4. To determine object distance (3cm – 300cm).
5. To detect distance (10cm to 80 cm) with infrared object detector.
6. To determine 5 Axis Robotic Arm movement and its degree of rotation.
7. To lift the object and place 100m away in various directions.
8. To find the gripper movement (0 to 50mm).
9. To study various Robotic Arm Configurations.
10. To study Pick and Place Robot

ME 806: INDUSTRIAL ENGINEERING LAB.

(L: 0; T: 0; P=2) **Max.Marks:150**
Min.Marks:75

1. Determination of time standard for a given job using stopwatch time- study.
2. Preparation of flow process chart, operation process chart and man-machine charts for an existing setup and development of an improved process.
3. Study of existing layout of a workstation with respect to controls and displays and suggesting improved design from ergonomic viewpoint.
4. To carryout a work sampling study.
5. To conduct process capability study for a machine in the workshop.
6. To design a sampling scheme based on OC curve.
7. To conduct Shewart's experiments on known population
8. Generation of random numbers for system simulation such as facility planning, job shop scheduling etc.