Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
ORDINANCE FOR CREDIT BASED SYSTEM
for
BACHELOR OF TECHNOLOGY
(w.e.f. the academic session 2008-09)
(Including amendment suggested by 2nd meeting of the Academic Council)

1 Preliminaries

1.1 This ordinances shall apply to UG programme in the University Teaching Departments.

UG Programme

Courses	**Normal duration**	**Extended duration**
B. Tech.	Four Years (08 semesters)	Seven Years

An academic year shall consist of two semesters **(odd & even)** of approximately **20 weeks** duration inclusive of the period of examination and semester break. The eligibility criteria for admission to each programme, fee structure, academic calendar, scheme of studies and examinations, examination schedule, sports calendar and cultural activity calendar etc. for the academic year shall be published in the prospectus.

2. ORDINANCE: BACHELOR OF TECHNOLOGY

Notwithstanding anything contained in any other ordinance with regard to the matter hereunder, the courses of study for the Degrees of Bachelor of Technology and the conditions for admission thereto shall be as under:

2.1 The Bachelor of Technology Degree courses shall extend over a **minimum period of four academic years. However students will be admitted on the basis of 3 years diploma directly in the 2nd year under the LEET scheme**. Teaching in each academic year shall be divided into two semesters, each semester extending to 20 weeks including practical, semester examination and semester break. Teaching for odd semesters will normally be from August to December and for even semesters from January to May.

2.2 At the end of the each semester, there shall be an examination wherein candidates shall be examined in the courses studied by them in that semester. Each semester examination shall be designated as First Semester Examination, Second Semester Examination, and Third Semester Examination and so on.

2.3 The Examination for all semester will normally be held in **December/January** and also in **May/ June** on such dates as may be fixed by the Controller of Examination as per the Schedule provided by the University. The date(s) of commencement of examination as well as the last date(s) for the receipt of examination forms and fees shall also be notified by the controller of Examinations to the concerned University Teaching Departments.

2.4.1.1 The courses of the study and the subjects of examinations shall be as approved by the **Academic Council from time to time**. The medium of instructions and Examination shall ordinarily be **English** except otherwise decided by the Academic Council. The question paper will be set in English, except otherwise decided by the board of studies concerned and approved by the Academic Council. Every candidate shall be examined in the subjects as laid down in the syllabus approved by the Academic Council from time to time. The credits for each subject as also the contact hours per week will be mentioned in the scheme of studies approved by the Academic Council.

Evaluation Process:

a. Major Test (Theory Examination):

Written question papers for the semester examination shall be set by an **External/ Internal paper setter** appointed by the Vice-Chancellor from a panel of examiners submitted by the chairman of the department duly approved by

the BOS of the concerned department and the answer sheets shall generally be evaluated by the **internal examiners** but can be evaluated from **outside experts** with the permission of the Vice-Chancellor. At the most 50% question papers can be set by the external examiners. In case a question paper is not received in time from an external examiners or he refuses to set the question paper, the paper can be got set from an internal examiner. The evaluation of answer sheets will be done by the examiners as per the procedure laid down by the University for the purpose.

b. Practical Examination:

Examination in practical and viva-voce shall be conducted jointly by the external and Internal Examiners appointed by the Vice-Chancellor from a panel of examiners submitted by the chairman of the department duly approved by the BOS of the concerned. If an External Examiner is not able to join, alternate examiner (including those of the same University dept) may be appointed by the Chairperson of the concerned dept. with the intimation to the Controller of Examinations in the following preferential order:

i) From outside ii) from DCRUST Murthal

c. Sesssionals (Internal Assessment):

Sessional (internal assessment)works shall be evaluated by the teachers of the various subjects based on the work done during semester on the basis of the following weightage:

I. For Theory subjects:

i) Minor Test –I	30% of the weightage of the sessional
ii) Minor Test-II	30% of the weightage of the sessional
iii) Assignment/Performance in the class	20% of the weightage of the sessional
iv) Surprise Quiz/Tutorial Tests (2+2=4)	20% of the weightage of the sessional

II. For Practical/Project/Seminar/Drawing:

i) Viva-Voce/ Test	30% of the weightage of the practical
ii) Laboratory Record/Project Report/Seminar Report/Drawing Sheet	40% of the weightage of the practical
iii) Objective Tests/Multiple Choice Questions	30% of the weightage of the practical

d. General Proficiency

I. Field Work 40% of the weightage

(Technical Activities/ Extra Curricular Activities/ Industrial, Educational tour/Sports/games/community Service/Hostel Activities) (equal weightage of each)

II. Presentation/Viva -Voce 40% of the weightage

III. Faculty Counselor Assignment 20% of the weightage

The I and II components will be evaluated by a **committee, preferably interdisciplinary** constituted by the Vice-Chancellor on recommendation of the Dean Academic Affairs. A **Faculty Counselor** will be attached to group of students which will remain associated with him /her during the entire period of the degree programe in the University. Each faculty member will serve as a faculty counselor. They will act like a local guardian for the students associated with him / her and will help them in terms of carrier guidance, personal difficulties.

Every student has to appear in both the minor tests. **If a student does not take a minor test, he/she shall be awarded zero marks in that test**. The marks obtained in sessional/practical/theory/drawing/general proficiency are to be submitted to the Examination Branch duly signed by the Chairperson of the department before the close of semester examination or a date fixed by the COE. The examination branch/course coordinator shall convert the marks in to equivalent grades as per the grading procedure.

The examination shall be open to a candidate who:

- has attended regularly the prescribed courses of studies for the relevant semester examination in the department recognized by the University for the degree of Bachelor of Technology.
- has his/her name submitted to the Controller of Examinations by the Chairperson of the department.
- has a good moral character (certificate be issued by the chairperson of the department concern if required).
- has attended **not less than 75% of the total classes held in each theory / lab/project/ seminar/ drawing etc.** This requirement shall be fulfilled separately for each subject of study. A deficiency up to **10% may be condoned by the Chairman** of the department. A further condonation of **5% in attendance** may be allowed in severe/ Compassionate circumstances by the Vice-Chancellor. **However it may not be treated as a matter of right by the students.** (In case a student fails to fulfill the necessary requirement of the attendance in any subject(s) in any semester , he/ she shall not be promoted to next semester and will have to repeat that academic semester in the next academic session along with regular students.)
- whose result declaration is delayed for no fault of his/her or has applied for revaluation may attend classes of the next higher semester provisionally at his /her own risk and responsibility subject to his/her passing the concerned semester Examination. Such a candidate shall also be governed by the clause 2.6 given below. In case the candidate fails to pass the concerned Semester Examination, his / her attendance and studies in the next higher semester in which he /she was allowed to attend classes provisionally, shall stand cancelled.

2.6 If a candidate, after attending the classes for the course of studies in the Department either not appeared or having appeared in any semester examination has failed in one or more paper(s) for that examination, he/she can appear for such paper(s) at subsequent examinations without attending a fresh course of studies for that semester. Such a candidate may, in the meantime, prosecute his / her studies for the next semester(s) and appear in the examination(s) for the same along with the examination for the lower semester(s).

2.7 The examinations for reappear in any subject(s) in the **odd semester** and that of in the **even semester** shall be held in the respective semesters along with the regular students. In addition to above, examination for reappear in the subjects in odd semesters will also be held during the even semesters examinations and vice-versa.

A candidate shall be eligible for promotion to (Effective from session 2009-10)

5th semester	if passed all papers of semester 1st semester.
6th semester	if passed all papers of 1st and 2nd semesters.
7th semester	if passed all papers of 1st, 2nd and 3rd semesters.
8th semester	if passed all papers of 1st, 2nd, 3rd and 4th semesters.

A Candidate through LEET Scheme shall be eligible for Promotion to:

5th semester	if passed all papers of 3rd semester.
6th semester	if passed all papers of 3rd and 4th semesters.

7th semester if passed all papers of 3rd, 4th and 5th semesters.

8th semester if passed all papers of 3rd, 4th, 5th and 6th semesters.

The amount of Exam/Reappear/ Re-evaluation/ Improvement fee to be paid by the candidates shall be as prescribed by the University from time to time. A candidate who has paid dues for the higher class and is dropped for want of fulfillment of any of the above conditions shall not be required to pay his dues again on re-admission after fulfillment of above conditions.

Re-evaluation is permitted only for major tests (Theory course) as per University Rules for Re-evaluation. **The Re-evaluation is not permitted in the Studio Examination or in an examination which involve more than one examiner.**

A candidate who is unable to pass the Bachelor of Technology Course within a maximum of **seven consecutive academic years** from the date of his admission shall **lose the right to pursue the degree programme. In exceptional cases, mercy chance can be given by the Vice-Chancellor to a candidate if he/she applies.**

2.8 The minimum passing marks/grade for passing any semester Examination shall be:

i. 40% in each major test (theory paper).

ii. 40% in each Practical Examination/Viva-Voice Examination

iii. 40% in aggregate of sessionals and end semester theory examinations for each theory and practical subject **provided that a candidate, who fails to obtain the requisite marks in aggregate of sessionals and end semester theory examination, shall be required to reappear in the concerned subject** in the subsequent theory/practical examination(s) subject to clause 2.7. Such candidates will not be required to repeat the sessional (internal assessment) works.

iv. Minimum pass grade in each course is 'D' grade. Grade will be awarded after adding the marks of sessional (internal assessment) and major test/practical examination.

v. Grade D in General Proficiency

vi. SGPA of 4.0

vii Where a course is evaluated on the basis of sessional (internal assessment) marks only i.e. there is no end-semester examination, the candidate will be required to secure at least 40% marks to pass the course.

A candidate who fails to obtain the requisite marks/grade in any course shall **be required to appear** in the concerned course in the subsequent examination(s) as per the clause 2.6&2.7.

2.9 If a candidate has completed his/her degree with a **CGPA ≤ 6.5 and he/she wants to improve his/her grade,** he/she may be allowed to improve by depositing the requisite fee as per the University Rules. He/she is allowed to appear in **at the most half of the theory papers only** of a semester along with the regular candidates of that semester and the sessional (internal assessment)part will be retained. Such opportunity may be given only twice in succession, subject to the condition that he/she have to complete the degree within 7 consecutive years of his/her registration. If the improved CGPA is less than the original, then the original will be retained.

2.10 The result of a student at the end of each semester Examination and after completion of course shall be declared on the basis of the **SGPA & CGPA (cumulative grade point average)** obtained by the student. However result of a student admitted through **LEET SCHEME** for the diploma holders will be declared on the basis of CGPA of the grades obtained by him/ in this University only.

2.11 At the end of each semester examination, the COE shall publish the result, provided that in a case where candidate who was permitted to take examination for higher semester but has not cleared the lower semester examination his result for the higher semester examination will be declared provisionally. Each successful candidate shall be issued a copy of the result card on having passed the semester examination.

2.12 Notwithstanding the integrated nature of the course wherever it is spread over more than one academic year, the Ordinance in force at the time a student joins the course shall hold good only for the examination held during or at the end of the semester and nothing in this Ordinance shall be deemed to debar the University from amending the Ordinance and the amended Ordinance, if any, shall apply to all students whether old or new.

3. SCHOLARSHIP:

Scholarship may be awarded to students as per the terms and conditions stipulated by the funding agencies. However, it should be mentioned in the prospectus.

4. THE CREDIT SYSTEM:

The University has introduced credit system of study for all the Under Graduate and Post Graduate programs for all the students admitted from the **Academic Year 2008-09.** The prominent features of the credit system are the process of continuous evaluation of a student's performance, and a flexibility to allow the student to progress at an optimum pace.

Each Academic Program has a certain number of **credits** which describe its weightage. A student's performance is measured by the number of credits that he/she has completed satisfactorily. A minimum grade point average is required to be maintained for satisfactory progress.

Each subject (component) has a certain number of credits which reflect its weightage and is normally decided on the basis of effective contacts hours. It is mentioned in the scheme of studies and examinations.

4.1 The semester examination for the odd semesters shall ordinarily be held in the month of **December/January** and for the even semesters in the month of **May/June**, on such dates as may be fixed by University authority. The concerned teacher/ course coordinator should ensure that 100% syllabus is covered in each subject before the Semester Examination.

4.2 A faculty member shall be appointed as a **course-coordinator** by the **Chairperson** of the department who shall have the full responsibility for conducting the minor tests, coordinating the work of evaluation with other faculty members involved in the course and awarding of grades. A common paper will be set for the minor tests of the common courses.

In case of perceptible deviation in the awards given by different teachers of the same course, the **course co-ordinator will moderate the awards by calling meeting** of the teachers associated. However, where a single teacher is associated with the course, moderation of awards will be done in consultation with the chairperson of the department.

4.3 For the time being the existing system of centralized examination will be followed for conducting the Semester Examination. However the system may be reviewed as the University grows and more and more number of departments/courses/students are added to it.

4.4 The marks/grade awarded to a student in any particular subject will be based on the performance of the student evaluated throughout the semester. **The syllabus of the minor tests will be what is covered in that particular term.** The Semester Examination will be based on the entire syllabus.

4.5 The marks/grades will be displayed on the notice board of the department by the Chairperson before forwarding it to the Examination Branch.

4.6 The Chairperson of the department shall forward the awards/grades to the Examination Branch within a week after the semester ends and examination process starts. The evaluated answer sheets of minor tests are to be kept by the course so-ordiantor for at least one year. The Examination Branch will keep the evaluated answer sheets of the semester examination for **at least one year**.

5. GRADING SYSTEM:

For the award of grades in a subject, all component-wise evaluation shall be done in marks. The marks would be converted to grades as per the guidelines given below:

5.1 Award of Grades Based on Absolute Marks

The University will follow system of grading for all (irrespective of no. of students) based on absolute marks (**after applying moderation if any**) as given below:

Range of Marks (%)			**Grade**
90	to	100	A+
80	to	89	A
70	to	79	B+
62	to	69	B
55	to	61	C+
46	to	54	C
40	to	45	D
Less than		40	F

Note:

(i) The awards/grades shall be submitted by the teacher concerned through course coordinator to the Chairperson of the department. **The awards/grades should be finalized within 7 days** of the semester examination.

(ii) In case of any difficulty/issue related to **courses/conduct/moderation of awards/grades/reconduct of paper,** the matter will be referred to a **departmental monitoring** committee comprising of **Chairperson, senior most teachers by rotation, course coordinator and faculty nominee of the Dean of Faculty**. The committee will be headed by the chairperson. The committee, on receipt of complaint from student or teacher, shall meet at the earliest and will give its decision within one week. The decision of the committee shall be final.

(iii) The procedure for evaluation and award of grades for professional training shall be decided by the respective Chairman/Chairperson of the department. The candidate shall be required to **submit a comprehensive report within one month of completion the training**. Training Report will be completed under the supervision of the officer of the company/institution under whose guidance and supervision the training was completed by the candidate in that company/institute. The candidate will add supervisor's certificate in the beginning of the report stating that the report is an out-come of work done by the candidate during his/her training.

iv While calculating percentage of marks to award grades, 0.5 or higher fraction may be raised to the next higher whole number.

5.2 GRADE POINTS:

The grading point of academic performance will be as under:-

Academic Performance	Grades	Grade Points
Outstanding	A+	10
Excellent	A	9
Very Good	B+	8
Good	B	7
Average	C+	6
Below Average	C	5
Marginal	D	4
Very Poor	F	0
Absent	G	-
Audit Pass	AP	-
Audit Fail	AF	-
Incomplete Dissertation	X	-

Note:

1. Pass Grade is Grade D and higher grades. 2. Grade F is Fail grade.

'F' Grade

The F grade denotes poor performance, i.e. failing a subject (or subject component). A student has to reappear in the semester examination only, in which he/she obtains 'F' grades, until a passing grade is obtained, within the stipulated time of completion of that programme.

'G' Grade

If any student, who is otherwise eligible for appearing in the semester examination as per the ordinance, but he/she is unable to appear in the semester examination then he /she will be awarded 'G' grade. The candidate will be allowed to take up the examination next time along with regular students and he /she will be awarded the grade as per grade system explained above.

AP/AF Grade

These grades are awarded to qualifying/Non-Credit subject(s) (as per scheme supplied by concerned departments). The candidate **will not be eligible for award of degree** without qualifying these courses.

Continuous Absence

If a student is continuously absent from the Department for **more than four weeks** without intimation to the Chairperson of Department, his/her name will be struck off from the roll of department. The re-admission shall not be allowed to the candidate during the same academic session.

'X' Grade

This grade is awarded for incomplete Project work as per guidelines given below and will be converted to a regular grade on the completion of the Project work and its evaluation.

A student who is unable to complete his/her Project may be awarded an 'X' grade by the Chairman/Chairperson/chairperson on the recommendation of his/her supervisor.

A student who has been awarded 'X' grade shall be required to formally register for the next semester and pay the requisite fee.

'X' grade will be awarded in exceptional circumstances beyond student's/supervisor's control. Normally, the following grounds may be considered for the award of 'X' grade:

(a) Technical reasons/grounds such as Supervisor/equipment not being available.

(b) Any other reason to the satisfaction of supervisor.

5.3 Evaluation of Performance

The performance of a student will be evaluated in terms of Cumulative Grade Point Average (CGPA) which is the Grade Point Average for all the completed semesters at any point of time.

The CGPA is calculated on the basis of all pass grades, except audit courses, obtained in all completed semesters.

- Regarding evaluation of performance.

The formula for calculating SGPA is as mentioned below:

$$SGPA \equiv \frac{\sum_{SEM}(\text{Total credits earned in a subject x Grade points out of total marks in a concerned subject}) \text{ except audit courses}}{\sum_{SEM}(\text{Total credits earned in a subject}) \text{ except audit courses}}$$

Illustration for calculating SGPA/CGPA:

Ist Semester

Course No. (1)	Course Credits (2)	Grade Awarded (3)	Earned Credits (4)	Grade Points (5)	Point Secured (6)
MALXXX	5	C+	5	6	30
CSLXXX	4	C	4	5	20
PHLXXX	4	A+	4	10	40
PHPXXX	1.5	B+	1.5	8	12
MELXXX	4	F	0	0	00
AMLXXX	4	B	4	7	28

Credits registered in the semester (total of column 2) = 22.5
Earned Credits in the semester = 18.5
Total of column 4 (total of column 2 excluding F grade)
Point secured in this semester in passed courses = 130

$$\text{SGPA} = \frac{Points \text{ secured in passed courses}}{Credits \text{ earned}} = \frac{130}{18.5} = 7.027$$

IInd Semester

Course No. (1)	Course Credits (2)	Grade Awarded (3)	Earned Credits (4)	Grade Points (5)	Point Secured (6)
MALXXX	5	D	5	4	20
EELXXX	5	F	0	0	00
CYLXXX	4	B	4	7	28
CYPXXX	1.5	C+	1.5	6	09
MELXXX	4	A	4	9	36
HULXXX	2	AP	2	N.A.	00

Credits registered in the semester (total of column 2) = 21.5
Earned Credits in the semester =14.5
Total of column 4 (total of column 2 excluding F&AP grades)

Cumulative Earned Credits (earned credits in previous semesters and current semester)
= 18.5+14.5=33.0
Points Secured in this semester in passed courses = 93
Cumulative points secured (total of point secured in previous semesters and current semester)
= 130 + 93 = 223

CGPA = $$\frac{\text{Cumulative points secured in all passed courses}}{\text{Cumulative earned credits, excluding audit courses}} = \frac{130+93}{18.5+14.5} = 6.757$$

Each successful candidate shall be issued a copy of the result card on having passed the semester examination.

- **Regarding Conversion of CGPA into Marks**

The CGPA if multiplied by 9.5 will give the equivalent marks in %age.

Candidates who pass all the prescribed subjects for all the semesters, but obtained:-

(i)	Less than CGPA of 5.26	Pass class
(ii)	5.26≤ CGPA<6.32	2nd Division
(iii)	6.32≤ CGPA<7.9	1st Division
(iv)	CGPA of 7.9 or more	1st Division with Honours provided that they have passed all the semester examinations in single sitting within the normal period of course and without reappear in any paper throughout the programme.

will be awarded aforesaid division.

SCHEME

OF

STUDIES AND EXAMINATIONS

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
SCHEME OF STUDIES & EXAMINATIONS
B. Tech. 1st YEAR (SEMESTER – I) (COMMON FOR ALL BRANCHES)
Credit Based Scheme w.e.f. 2008-09

Sr. No.	Course No.	Course Title	Teaching Schedule				Marks of Class Work	Exam. Marks		Total Marks	Credit	Duration of Exam.
			L	T	P	Total		Theory	Practical			
1	HUM-101	ESSENTIALS OF COMMUNICATION	3	1	-	4	50	100	-	150	4	3
2	MATH-101	MATHEMATICS-I	3	2	-	5	50	100	-	150	5	3
3	PHY-101	PHYSICS-I	3	1	-	4	50	100	-	150	4	3
4	ME-103	MANUFACTURING PROCESSES **(Gr – A)**	4	-	-	4	50	100	-	150	4	3
	CH-101	CHEMISTRY **(Gr - B)**	3	1	-	4	50	100	-	150	4	3
5	CSE-101	FUNDAMENTALS OF COMPUTER & PROGRAMMING IN C **(Gr – A)**	3	-	-	3	50	100	-	150	3	3
	EE-101	ELECTRICAL TECHNOLOGY **(Gr - B)**	3	1	-	4	50	100	-	150	4	3
6	GES-101	ENVIRONMENTAL STUDIES **(Gr - B)**	3	-	-	3	-	75	-	75*	0	3
7	ME-101	ELEMENTS OF MECHANICAL ENGINEERING **(Gr – A)**	3	1	-	4	50	100	-	150	4	3
	ME-105	ENGINEERING GRAPHICS & DRAWING **(Gr - B)**	-	-	4	4	50	-	100	150	4	3
8	PHY-103	PHYSICS LAB – I	-	-	2	2	25	-	25	50	2	3
9	ME-107	WORKSHOP PRACTICE **(Gr – A)**	-	-	4	4	25	-	25	50	4	3
	CH-103	CHEMISTRY LAB **(Gr - B)**	-	-	2	2	25	-	25	50	2	3
10	CSE-103	COMPUTER PROGRAMMING LAB **(Gr – A)**	-	-	2	2	25	-	25	50	2	3
	EE-103	ELECTRICAL TECHNOLOGY LAB **(Gr - B)**	-	-	2	2	25	-	25	50	2	3
11	ME-109	ELEMENTS OF MECH. ENGINEERING LAB **(Gr – A)**	-	-	2	2	25	-	25	50	2	3
12	GES-103	ENVIRONMENTAL STUDIES FIELD WORK **(Gr - B)**	-	-	-	-	-	-	25	25*	0	3
	TOTAL (Gr-A / Gr-B)		**19/18**	**5/6**	**10/10**	**34/34**	**400/375**	**600/500**	**100/175**	**1100/1050**	**34/31**	

*Not included in total marks.

Note:

1. **GROUP A** will study the subjects (ME-101,ME-103,CSE-101,ME-107,CSE-103,ME-109) **GROUP B** will study the subjects (ME-105, CH-101, EE-101, CH-103, EE-103, GES-101, GES-103)
2. **GROUP A** includes students of branches BME, BT, CSE, ECE.
   GROUP B includes students of branches CE, CHE, EE, ME.
3. Environmental Studies (GES-101) and Environmental Studies Field Work (GES-103) are qualifying courses.
4. Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
SCHEME OF STUDIES & EXAMINATIONS
B. Tech. 1st YEAR (SEMESTER – II) (COMMON FOR ALL BRANCHES)
Credit Based Scheme w.e.f. 2008-09

Sr. No.	Course No.	Course Title	Teaching Schedule				Marks of Class Work	Exam. Marks		Total Marks	Credit	Duration of Exam.
			L	T	P	Total		Theory	Practical			
1	HUM-102	COMMUNICATION SKILLS IN ENGLISH **(Except BT)**	3	1	-	4	50	100	-	150	4	3
	BTT -102	BASICS OF BIOTECHNOLOGY **(Only BT)**	3	1	-	4	50	100	-	150	4	3
2	MATH-102	MATHEMATICS-II	3	2	-	5	50	100	-	150	5	3
3	PHY-102	PHYSICS-II	3	1	-	4	50	100		150	4	3
4	ME-103	MANUFACTURING PROCESSES **(Gr - B)**	4	-	-	4	50	100	-	150	4	3
	CH-101	CHEMISTRY **(Gr – A)**	3	1	-	4	50	100	-	150	4	3
5	CSE-101	FUNDAMENTALS OF COMPUTER & PROGRAMMING IN C **(Gr - B)**	3	-	-	3	50	100	-	150	3	3
	EE-101	ELECTRICAL TECHNOLOGY **(Gr – A)**	3	1	-	4	50	100	-	150	4	3
6	GES-101	ENVIRONMENTAL STUDIES **(Gr – A)**	3	-	-	3	-	75	-	75*	0	3
7	ME-101	ELEMENTS OF MECH. ENGINEERING **(Gr - B)**	3	1	-	4	50	100	-	150	4	3
	ME-105	ENGINEERING GRAPHICS & DRAWING **(Gr – A)**	-	-	4	4	50	-	100	150	4	3
8	PHY-104	PHYSICS LAB – II	-	-	2	2	25	-	25	50	2	3
9	ME-107	WORKSHOP PRACTICE **(Gr- B)**	-	-	4	4	25	-	25	50	4	3
	CH-103	CHEMISTRY LAB **(Gr – A)**	-	-	2	2	25	-	25	50	2	3
10	CSE-103	COMPUTER PROGRAMMING LAB **(Gr - B)**	-	-	2	2	25	-	25	50	2	3
	EE-103	ELECTRICAL TECHNOLOGY LAB **(Gr – A)**	-	-	2	2	25	-	25	50	2	3
11	ME-109	ELEMENTS OF MECH. ENGG. LAB **(Gr - B)**	-	-	2	2	25	-	25	50	2	3
12	GES-103	ENVIRONMENTAL STUDIES FIELD WORK **(Gr – A)**	*	-	-		-	-	25	25*	0	3
13	GP-102	GENERAL PROFICIENCY	-	-	-	-	50	-	-	50	2	-
		TOTAL (Gr-B/ Gr-A)	**19/18**	**5/6**	**10/10**	**34/34**	**450/425**	**600/500**	**100/175**	**1150/1100**	**36/33**	

***** Not included in total marks.

Note:

1. **GROUP A** will study the subjects (ME-105, CH-101, EE-101, CH-103, EE-103, GES-101, GES-103).
   GROUP B will study the subjects (ME-101, ME-103, CSE-101, ME-107, CSE-103, ME-109).
2. **GROUP A** includes students of branches BME, BT, CSE, ECE.
   GROUP B includes students of branches CE, CHE, EE, ME.
3. Environmental Studies (GES-101) and Environmental Studies Field Work (GES-103) are qualifying courses.
4. Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
SCHEME OF STUDIES & EXAMINATIONS
B. Tech. 2nd YEAR (SEMESTER – III) MECHANICAL ENGINEERING
Credit Based Scheme w.e.f. 2009-10

S. No.	Course No.	Course Title	Teaching Schedule				Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P	Total		Theory	Practical			
1	MATH-201	MATHEMATICS – III (common with all branches)	3	2	-	5	50	100	-	150	5	3
2	HUM- 201	ECONOMICS (common with all branches)	3	1	-	4	50	100	-	150	4	3
3	ME-201	THERMODYNAMICS	3	1	-	4	50	100	-	150	4	3
4	ME-203	STRENGTH OF MATERIALS-I	3	1	-	4	50	100	-	150	4	3
5	ME-205	ENGINEERING MECHANICS	3	1	-	4	50	100	-	150	4	3
6	ME-207	MACHINE DRAWING	1	-	4	5	50	-	-	50	5	-
7	ECE-211	ELECTRONICS ENGG. (CE, CHE, ME)	3	1	-	4	50	100	-	150	4	3
8	ME-209	STRENGTH OF MATERIALS -I LAB	-	-	2	2	25	-	25	50	2	3
9	ECE-231	ELECTRONICS ENGG. LAB. (CE, CHE, ME)	-	-	2	2	25	-	25	50	2	3
10	ME-211	COMPUTER AIDED DRAFTING LAB.	-	-	2	2	50	-	50	100	2	4
TOTAL			**19**	**7**	**10**	**36**	**450**	**600**	**100**	**1150**	**36**	

Note:

1. **Students will be allowed to use Non-Programmable Scientific Calculator. However, sharing of calculator will not be permitted in the examination.**

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
SCHEME OF STUDIES & EXAMINATIONS
B. Tech 2nd YEAR (SEMESTER – IV) MECHANICAL ENGINEERING
Credit Based Scheme w.e.f. 2009-10

S. No.	Course No.	Course Title	Teaching Schedule				Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P	Total		Theory	Practical			
1	HUM-202	FUNDAMENTALS OF MANAGEMENT (CE,CHE,EE, EL, ME)	3	1	-	4	50	100	-	150	4	3
2	ME-202	MANUFACTURING TECHNOLOGY	3	1	-	4	50	100	-	150	4	3
3	ME-204	MATERIAL SCIENCE	3	1	-	4	50	100	-	150	4	3
4	ME-206	STRENGTH OF MATERIALS – II	3	1	-	4	50	100	-	150	4	3
5	ME-208	FLUID MECHANICS	3	1	-	4	50	100	-	150	4	3
6	ME-210	ENERGY CONVERSION	3	1	-	4	50	100	-	150	4	3
7	ME-212	MATERIAL SCIENCE LAB	-	-	2	2	25	-	25	50	2	3
8	ME-214	FLUID MECHANICS LAB	-	-	2	2	25	-	25	50	2	3
9	ME-216	ENERGY CONVERSION LAB	-	-	2	2	25	-	25	50	2	3
10	ME-218	MANUFACTURING PRACTICE	-	-	3	3	25	-	25	50	3	3
11	GPME-202	GENERAL PROFICIENCY	-		-	-	50	-	-	50	2	-
TOTAL			**18**	**6**	**9**	**33**	**450**	**35**	**100**	**1150**	**35**	

Note:

1. **Students will be allowed to use Non-Programmable Scientific Calculator. However, sharing of calculator will not be permitted in the examination.**
2. **Each student has to undergo Professional Training of at-least 4 weeks from the industry, institute, research lab, training center etc. during summer vacation and its evaluation shall be carried out in the V Semester.**

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
SCHEME OF STUDIES & EXAMINATIONS
B. Tech. 3rd YEAR (SEMESTER – V) MECHANICAL ENGINEERING
Credit Based Scheme w.e.f. 2010-11

S. No.	Course No.	Course Title	Teaching Schedule				Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P	Total		Theory	Practical			
1	ME-301	KINEMATICS OF MACHINES	3	1	-	4	50	100	-	150	4	3
2	ME-303	MACHINE DESIGN-I	3	2	-	5	50	100	-	150	5	3
3	ME-305	FLUID MACHINES	3	1	-	4	50	100	-	150	4	3
4	ME-307	INTERNAL COMBUSTION ENGINES & GAS TURBINES	3	1	-	4	50	100	-	150	4	3
5	ME-309	MANUFACTURING SCIENCE	3	1	-	4	50	100	-	150	4	3
6	ME-311	APPLIED NUMERICAL TECHNIQUES & COMPUTING	3	1	-	4	50	100	-	150	4	3
7	ME-313	KINEMATICS OF MACHINES LAB	-	-	2	2	25	-	25	50	2	3
8	ME-315	FLUID MACHINES LAB	-	-	2	2	25	-	25	50	2	3
9	ME-317	INTERNAL COMBUSTION ENGINES & GAS TURBINES LAB.	-	-	2	2	25	-	25	50	2	3
10	ME-319	APPLIED NUMERICAL TECHNIQUES & COMPUTING LAB.	-	-	2	2	25	-	25	50	2	3
11	ME-321	PROFESSIONAL TRAINING - I	-	-	2	2	50	-	-	50	2	-
		Total	**18**	**7**	**10**	**35**	**450**	**600**	**100**	**1150**	**35**	-

Note:

1. **Students will be allowed to use Non-Programmable Scientific Calculator. However, sharing of calculator will not be permitted in the examination.**
2. **Assessment of Professional Training - I, undergone at the end of IV semester, will be based on seminar, viva-voce, report and certificate of Professional Training obtained by the student from the industry, institute, research lab, training center etc.**

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
SCHEME OF STUDIES & EXAMINATIONS
B. Tech 3rd YEAR (SEMESTER –VI) MECHANICAL ENGINEERING
Credit Based Scheme w.e.f. 2010-11

S. No.	Course No.	Course Title	Teaching Schedule				Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P	Total		Theory	Practical			
1	ME-302	DYNAMICS OF MACHINES	3	1	-	4	50	100	-	150	4	3
2	ME-304	MACHINE DESIGN – II	3	2	-	5	50	100	-	150	5	3
3	ME-306	HEAT TRANSFER	4	1	-	5	50	100	-	150	5	3
4	ME-308	AUTOMATIC CONTROLS	3	1	-	4	50	100	-	150	4	3
5	ME-310	MEASUREMENTS & INSTRUMENTATION	3	1	-	4	50	100	-	150	4	3
6	ME-312	INDUSTRIAL ENGINEERING	3	1	-	4	50	100	-	150	4	3
7	ME-314	DYNAMICS OF MACHINES LAB	-	-	2	2	25	-	25	50	2	3
8	ME-316	HEAT TRANSFER LAB	-	-	2	2	25	-	25	50	2	3
9	ME-318	MEASUREMENTS & INSTRUMENTATION LAB.	-	-	2	2	25	-	25	50	2	3
10	GPME-302	GENERAL PROFICIENCY	-	-	-	-	50	-	-	50	2	-
Total			**19**	**7**	**6**	**32**	**425**	**600**	**75**	**1100**	**34**	

Note:

1. **Students will be allowed to use Non-Programmable Scientific Calculator. However, sharing of calculator will not be permitted in the examination.**
2. **Each student has to undergo Professional Training of 4 weeks from the industry, institute, research lab, training center etc during summer vacation and its evaluation shall be carried out in the VII Semester.**

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
SCHEME OF STUDIES & EXAMINATIONS
B. Tech 4th YEAR (SEMESTER – VII) MECHANICAL ENGINEERING
Credit Based Scheme w.e.f. 2011-12

S. No.	Course No.	Course Title	Teaching Schedule				Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P	Total		Theory	Practical			
1	ME-401	AUTOMOBILE ENGG.	3	1	-	4	50	100	-	150	4	3
2	ME-403	REF. & AIR-CONDITIONING	3	1	-	4	50	100	-	150	4	3
3	ME-405	OPERATIONS RESEARCH	3	1	-	4	50	100	-	150	4	3
4		OPEN ELECTIVE*	4	0	-	4	50	100	-	150	4	3
5	ME-407	MECHANICAL VIBRATION	3	1	-	4	50	100	-	150	4	3
6	ME-409	AUTOMOBILE ENGG. LAB	-	-	2	2	25	-	25	50	2	3
7	ME-411	R. A. C. LAB.	-	-	2	2	25	-	25	50	2	3
8	ME-413	PROJECT	-	-	4	4	50	-	-	50	4	-
9	ME-415	PROFESSIONAL TRAINING – II	-	-	2	2	50	-	-	50	2	-
Total			**16**	**4**	**10**	**30**	**400**	**500**	**50**	**950**	**30**	

*** List of Open Electives**

1	HUM-451	Language Skills for Engineers	8	CSE-409	Artificial Intelligence & Expert Systems
2	HUM-453	Human Resource Management	9	CSE-301	Principles of Operating Systems
3	HUM-455	Entrepreneurship	10	EE-455	Intelligent Instrumentation for Engineers
4	HUM-457	Business Communication	11	ECE-403	Embedded Systems Design
5	PHY-451	Nano-technology	12	CH-453	Pollution & Control
6	PHY-453	Laser Technology	13	CSE-411	Management Information System
7	ME-451	Mechatronics Systems	14	CSE-308	Multimedia Technologies

Note:

1. **Students will be allowed to use Non-Programmable Scientific Calculator. However, sharing of calculator will not be permitted in the examination.**
2. **Students will be permitted to opt for any one elective run by the other department. However, the department shall offer those elective for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise.**
3. **Assessment of Professional Training-II, undergone at the end of VI semester, will be based on seminar, viva-voce, report and certificate of Professional Training obtained by the student from the industry, , institute, research lab, training center etc.**
4. **Project coordinator will be assigned the project load of, maximum of 2 hrs. per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her. Project will commence in 7th semester where the student will identify the project problem, complete design, procure the material, start the fabrication, complete the survey etc. depending upon the nature of problem. Project will continue in next semester.**

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonepat)
SCHEME OF STUDIES & EXAMINATIONS
B. Tech 4th YEAR (SEMESTER – VIII) MECHANICAL ENGINEERING
Credit Based Scheme w.e.f. 2011-12

S. No.	Course No.	Course Title	Teaching Schedule				Marks of Class work	Examination Marks		Total	Credit	Duration of Exam
			L	T	P	Total		Theory	Practical			
1	ME-402	COMPUTER AIDED DESIGN	3	1	-	4	50	100	-	150	4	3
2	ME-404	POWER PLANT ENGG.	3	1	-	4	50	100	-	150	4	3
3		DEPTT. ELECTIVE-I	4	-	-	4	50	100	-	150	4	3
4		DEPTT. ELECTIVE-II	4	-	-	4	50	100	-	150	4	3
5	ME-406	CAD LAB.	-	-	3	3	50	-	50	100	3	3
6	ME-408	SEMINAR	-	-	2	2	50	-	-	50	2	-
7	ME-413	PROJECT	-	-	8	8	50	-	100	150	8	3
8	GFME-402	GENERAL FITNESS FOR THE PROFESSION	-	-	-	-	-	-	100	100	4	3
Total			**14**	**2**	**13**	**29**	**350**	**400**	**250**	**1000**	**33**	

Deptt. Electives - I

1. ME- 432 Optimization Methods for Engineering Systems
2. ME- 434 Automobile Design
3. ME- 436 Mechatronics
4. ME- 438 Flexible Manufacturing System
5. ME- 440 Reliability Engineering

Deptt. Electives - II

1. ME-442 Robotics Engineering
2. ME-444 Ergonomics and Work Place Design
3. ME-446 Modern Manufacturing Processes
4. ME-448 Emerging Automotive Technologies
5. ME-450 Manufacturing Management
6. ME- 452 Quality Engineering

Note

1. **Students will be allowed to use the non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.**
2. **Project coordinator will be assigned the project load of, maximum of 2 hrs. per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her. Project involving design, fabrication, testing, computer simulation, case studies etc., which has been commenced by students in VII semester will be completed in VIII Semester.**
3. **For the course ME-408-Seminar, a student will select a topic from emerging areas of Engineering and Technology and study it independently. Student will give a seminar talk on the topic.**
4. **The evaluation of the student for his/her General Fitness for the Profession shall be carried out by a team consisting of Dean of faculty, Chairperson of the department and external examiner appointed by the University.**

SYLLABUS

HUM – 101 ESSENTIALS OF COMMUNICATION

B. Tech. Semester - I (Common for all Branches)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

The course aims at inculcating a minimum level of language proficiency among students of Engineering and Technology. The purpose is to sensitize them to the nuances of English and its applications for various communication needs.

COURSE CONTENT:

Unit-I: **Semantics:** Synonyms, Antonyms, Homophones, Homonyms, Form and function of words

Unit-II: **Syntax:** Sentence structures, Verb patterns and their usage

Unit-III: **Phonetics:** Basic Concepts – Vowels, Consonants, Phonemes, Syllables; Articulation of Speech Sounds – Place and Manner of Articulation; Transcription of words and simple sentences, using International Phonetic Alphabet.

Unit-IV: **Comprehension:** Listening and Reading comprehension – Note taking, Reviewing, Summarising, Interpreting, Paraphrasing and Précis Writing.

Unit-V: **Composition:** Descriptive, Explanatory, Analytical and Argumentative Writing - description of simple objects like instruments, appliances, places, persons, principles; description and explanation of processes and operations; analysis and arguments in the form of debate and group discussion

Unit-VI: **Text:** ***English for Students of Science*** by A.Roy and P.L. Sharma (Orient Longman)

Chapters for Study:

i) "The year 2050" by Theodore J. Gordon.

ii) "The Mushroom of Death" by A. Bandhopadhyay.

iii) "The Discovery" by Herman Ould.

The prescribed text will be used as a case study for various components of the syllabus.

Unit-VII (For Internal Evaluation Only): Book Review – Herein the students will be required to read and submit a review of a book (Literary or non-literary) of their own choice. This will be followed by a presentation of the same in the class.

TEXT BOOKS:

1. English for Students of Science edited by A. Roy and P.L. Sharma, Orient Longman.
2. Spoken English for India by R.K. Bansal and J.B. Harrison, Orient Longman.
3. Intermediate Grammar, Usage and Composition by M.L. Tickoo and A.E. Subramanian, Orient Longman.

SUGGESTED READING:

1. English Grammar, Composition and Correspondence by M.A. Pink and S.E. Thomas, S. Chand and Sons Pvt. Ltd.,Delhi.
2. A Practical English Grammar by Thomson and Martinet, OUP, Delhi.
3. Guide to Patterns and Usage in English by A.S. Hornby, OUP, Delhi.
4. A Textbook of English Phonetics for Indian Students by T. Balasubramanian, MacMillan, Chennai.
5. Better English Pronunciation by J.D.O'Connor, Cambridge Univ. Press, London.
6. English Vocabulary in Use by McCarthy, Foundation Books (Cambridge University Press), Delhi.

7. Assessing Listening by Buck, Foundation Books (Cambridge University Press), Delhi.
8. Reading Between the Lines by McRae, Foundation Books (Cambridge University Press), Delhi.

SCHEME OF EXAMINATION:

There will be seven questions in all covering all the units, except Unit VII which (besides other modes of internal evaluation) is for internal assessment only.

All questions will be compulsory and will have sufficient internal choice.

Unit-I: 15 Marks

The question will be set so as to evaluate the following: Usage of the words given, Changing the grammatical quality and function of the words, One word Substitutes, synonyms, antonyms, homophones, homonyms.

Unit-II: 20 Marks

There will be one question having different parts. The question should test students' knowledge of sentence structures and verb patterns. The question can be in the nature of 'Do as directed', 'Tracing and rectifying structural

Errors', 'Elucidating patterns through sentences and vice-versa', 'Changing the word-order', 'Synthesizing the sentences' and 'Completing the sentences', etc.

Unit-III: 15 Marks

There will be two questions from this Unit. Question one will be in the nature of short notes testing the basic concepts and articulation of speech sounds. The second question would require transcription of individual words and simple sentences.

Unit-IV: 15 Marks

Comprehension and Interpretation of a passage given (Literary or non-literary, newspaper article, story, extract from a speech etc.), will be judged for its vocabulary, general understanding and interpretation of the content in the form of question answer exercise, culling out important points, suggesting a suitable topic/title, summarising and précis writing etc.

Unit-V: 15 Marks

The question will require the definition, description, analysis, explanation of various objects and processes. Bedsides, a topic of contemporary relevance may be given for writing a paragraph in any one of the writing forms prescribed in the unit.

Unit-VI: 20 Marks

There will be two questions from the text prescribed. The first question will evaluate the comprehension of the text through short answer questions or a long answer question.

The second question will judge the linguistic aspect of the text such as using a particular word in its various syntactic forms like noun, adjective, verb etc.; matching the lists of words and their explanation; providing opposite/similar meanings, adding suffixes and prefixes etc.

MATH – 101 MATHEMATICS - I

B. Tech. Semester - I (Common for all Branches)

L	T	P	Credits			
3	2	--	5	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Part - A

Infinite series: Convergence and divergence, Comparison, D' Alembert's ratio, Integral, Raobes, Logrithmic and Cauchy root tests, Alternating series, Absolute and conditional convergence.

Applications of Differentiation: Taylor's and Maclaurin's series, Asymptotes, Curvature Asymptotes.

Partial Differentiation & its Applications: Functions of two or more variables; partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions, Jacobians, Higher order partial derivatives.

Homogeneous functions, Euler's theorem, Taylor's series for functions of two variables (without proof), maxima-minima of function of two variables, Lagrange's method of undetermined multipliers, Differentiation under integral sign.

Part - B

Applications of Single & Multiple Integration: Applications of single integration to find volume of solids and surface area of solids of revolution. Double integral, change of order of integration, Double integral in polar coordinates, Applications of double integral to find area enclosed by plane curves and volume of solids of revolution.

Triple integral, volume of solids, change of variables, Beta and gamma functions and relationship between them.

Vector Calculus : Differentiation of vectors, scalar and vector point functions Gradient of a scalar field and directional derivative, divergence and curl of a vector field and their physical interpretations.

Integration of vectors, line integral, surface integral, volume integral, Green, Stoke's and Gauss theorems (without proof) and their simple applications.

TEXT BOOKS:

1. Advanced Engineering Mathematics : F. Kreyszig.
2. Higher Engineering Mathematics : B.S. Grewal.

REFERENCE BOOKS:

1. Engineering Mathematics Part-I: S.S. Sastry.
2. Differential and Integral Calculus: Piskunov.
3. Advanced Engineering Mathematics: R.K. Jain and S.R.K. Iyengar
4. Advanced Engg. Mathematics: Michael D. Greenberg

Note: Examiner will set eight questions, taking four from Part-A and four from Part-B. Students will be required to attempt five questions taking at least two from each part.

PHY - 101 PHYSICS - I

B. Tech. Semester - I (Common for all Branches)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Part - A

PHYSICAL OPTICS

Interference: Division of wave front-Fresnel's biprism, Division of amplitude – Newton's rings, Michelson interferometer, applications.

Diffraction: Difference between Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a slit. Plane transmission diffraction grating, its dispersive and resolving powers.

Polarization : Polarised and unpolarized light, double refraction; Nicol prism, quarter and half wave plates,Polarimetry; Biquartz and Laurent's half-shade polarimeters, Simple concepts of photoelasticity.

LASER: Spontaneous and stimulated emissions, Laser action, characteristics of laser beam-concepts of coherence, He-Ne and semiconductor lasers (simple ideas), applications.

FIBRE OPTICS: Propagation of light in fibres, numerical aperture, single mode and multi mode fibres, applications.

Part - B

WAVE AND OSCILLATIONS: Simple concepts of Harmonic Oscillator, resonance, quality factor.

E.M. wave theory-review of basic ideas, Maxwell's equations, simple plane wave equations, simple concepts of wave guides and co-axial cables, Poynting vector.

DIELECTRICS: Molecular theory, polarization, displacement,susceptibility, dielectric coefficient, permitivity & various relations between these, Gauss's law in the presence of a dielectric, Energy stored in an electric field. Behaviour of dielectrics in a.c. field-simple concepts, dielectric losses.

SPECIAL THEORY OF RELATIVITY: Michelson-Moreley experiment, Lorentz transformations, variation of mass with velocity, mass energy equivalence.

NUCLEAR PHYSICS: Neutron Cross-section, Nuclear fission, Moderators, Nuclear reactors, Reactor criticality, Nuclear fusion. Interaction of radiation with matter-basic concepts, radiation detectors-ionisation chamber, G.M. Counter, Scintillation and solid state detectors, cloud chamber and bubble chamber.

TEXT BOOKS:

1. Physics of the Atom - Wehr, Richards & Adair (Narosa)
2. Perspectives of Modern Physics - Arthur Beiser (TMH)
3. Modern Engineering Physics – A.S. Vasudeva (S. Chand)

REFERENCE BOOKS :

1. Electricity and Magnetism – F.W. Sears (Narosa)
2. Physics Vol-I & II – Resnick & Halliday (Wiley Eastern)
3. A Text Book of Optics – Brij Lal & Subramanyam

Note: The Examiners will set eight questions, taking four from each part. The students will be required to attempt five questions in all selecting at least two from each part. All questions will carry equal marks.

CH - 101 CHEMISTRY

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit-1: **Thermodynamics** - Second law, concept of Entropy, Entropy change for an ideal gas, free energy and work functions, Free energy change, Chemical Potential, Gibb's Helmholtz equation, Clausius - Clapeyron equation, Related numerical problems with above topics.

Unit-2: **Phase-Rule** - Terminology, Derivation of Gibb's Phase Rule Equation, One Component System (H_2O System), Two Components systems, Eutectic system (Pb-Ag), system with congruent m.pt. (Zn-Mg), systems with incongruent m.pt. (Na-K), Applications of above Systems.

Unit-3: **Water & its treatment** : Part I – Sources of water, impurities in water, hardness of water and its determination, units of hardness, alkalinity of water and its determination, Related numerical problems, scale and sludge formation (composition properties and methods of prevention).

Unit-4: **Water and its treatment** : Part II – Treatment of water for domestic use, coagulation, sedimentation, filtration and dis-infection, water softening, ion-exchange process, mixed bed demineralisation, Desalination (reverse osmosis) (electrodialysis).

Unit-5: **Corrosion and its prevention** - Galvanic & concentration cell, Dry and wet corrosion, Electrochemical theory of corrosion, Galvanic corrosion, pitting corrosion, water-line corrosion, differential aeration corrosion, stress corrosion, factors affecting corrosion, Preventive measures (proper design, Cathodic protection, protective coatings).

Unit-6: **Lubrication and Lubricants** - Friction, mechanism of lubrication, classification and properties of lubricants, Additives for lubricants, synthetic lubricants, Greases – Preparation & properties (consistency, drop point) and uses.

Unit-7: **Polymers and Polymerization** - Organic polymers, polymerisation, various types of polymerisation, effect of structure on properties of polymers, preparation properties and technical applications of thermo-plastics (PVC, PVA), thermosets (PF,UF), & elastomers (SBR,GR-N), Silicones, Introduction to polymeric compsites.

Unit-8: **Analytical Methods** - Thermal methods, Principle, method and application of Thermogravimetric analysis, Differential thermal analysis and Differential scanning calorimetry , (Experimental details are excluded),Spectroscopic methods, Spectrophotometry, interaction of E.M. radiations with a molecule and origin of spectrum, spectroscopic, techniques-vibrational and electronic spectroscopy (Experimental details are excluded), conductometric titration, elementary discussion on Flame-photometry.

TEXT BOOKS:

1. Engineering Chemistry, P.C. Jain, Monica Jain (Dhanpat Rai & Co.).
2. Chemistry in Engineering & Tech., Vol.I & II, Rajaram, Kuriacose (TMH).

REFERENCE BOOKS:

1. Instrumental methods of Chemical Analysis, MERITT & WILLARD East-West Press).
2. Physical Chemistry, P.W. Atkin (ELBS, Oxford Press).
3. Physical Chemistry, W.J. Moore (Orient-Longman).

Note: Eight questions are to be set with a fair weightage of all the units. The candidates will be required to attempt five questions in all.

CSE - 101 FUNDAMENTALS OF COMPUTER & PROGRAMMING IN C

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
3	--	--	3	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit-1: **An Overview of Computer System:** Anatomy of a digital Computer, Memory Units, Main and Auxiliary Storage Devices, Input Devices, Output Devices, Classification of Computers.

Radix number system: Decimal, Binary, Octal, Hexadecimal numbers and their inter-conversions; Representation of information inside the computers.

Unit-2: **Operating System Basics**: The user Interface, Running Programmes, Managing files, Introduction to PC operating Systems: Unix/Linux , DOS, Windows 2000.

Unit-3: **Internet basics**: **:** Introduction to the basic concepts of Networks and Data Communications**,** How Internet works, Major features of internet, Emails, FTP, Using the internet.

Unit-4: **Programming Languages:** Machine-, Assembly-, High Level- Language, Assembler, Compiler, Interpreter, debuggers, Programming fundamentals: problem definition, algorithms, flow charts and their symbols, introduction to compiler, interpreter, assembler, linker and loader and their inter relationship.

Unit-5: **C Programming language**: C fundamentals, formatted input/ output, expressions, selection statements, loops and their applications; Basic types, arrays, functions, including recursive functions, program organization: local and external variables and scope; pointers & arrays.

Unit-6: **Strings:** strings literals, string variables, I/O of strings, arrays of strings; applications. Preprocessor: preprocessor directives, macro definition, conditional compilation; Structures, Unions and Enumerations: Structure variables and operations on structures; Structured types, nested array structures; unions; enumeration as integers, tags and types.

Declaration: Declaration syntax, storage classes, types qualifiers, declarators, initializers.

Program Design: modules, information hiding, abstract data types, difference between C & C++, Low level programming: Bitwise operators, Bit fields in structures, other low level techniques.

Unit-7: Standard library: Input / output; streams, file operations, formatted I/O, character I/O, line I/O, block, string I/O, Library support for numbers and character data, error handling:

TEXT BOOKS:

1. Using Information Technology, 5th Edi, Brian K Williams & Stacey C. Sawyer, 2003, TMH
2. The C Programming Language by Dennis M Ritchie, Brian W. Kernigham, 1988, PHI.
3. C Programming – A modern approach by K.N. King, 1996, WW Norton & Co.

REFERENCE BOOKS:

1. Information technology, Dennis P. Curtin, Kim Foley, Kunal Sen, Cathleen Morin, 1998, TMH
2. Theory and problem of programming with C, Byron C Gottfried, TMH
3. Teach yourself all about computers by Barry Press and Marcia Press, 2000, IDG Books India.
4. Using Computers and Information by Jack B. Rochester, 1996, Que Education & Training.

Note: Eight questions will be set by the examiner (at least 2 questions from unit-1 to 4, 2 each from unit –5 & 6, and one from unit-7). The students will be required to attempt 5 questions in all.

EE - 101 ELECTRICAL TECHNOLOGY

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit-I: D.C. CIRCUITS: Ohm's Law, Kirchoff's Laws, D.C. Circuits, Nodal and Loop methods of analysis.

Unit-II: a) A.C. CIRCUITS: Sinusoidal signal, instantaneous and peak values, RMS and average values, phase angle, polar & rectangular, exponential and trigonometric representations; R,L and C components, behaviors of these components in A.C. circuits. Concept of complex power, power factor.

b) TRANSIENT RESPONSE: Transient response of RL, RC and RLC Circuits with step input.

Unit- III: NETWORK THEOREMS: Thevenin's theorem, Norton's theorem, superposition theorem, maximum power transfer theorem, Reciprocity theorem, Tellegen's theorem, Milman's theorem. Star to Delta & Delta to Star transformation.

Unit-IV: SERIES AND PARALLEL A.C. CIRCUITS: Series and parallel A.C. circuits, series and parallel resonance, Q factor, cut-off frequencies and bandwidth.

Unit-V: THREE PHASE CIRCUITS: Phase and line voltages and currents, balanced star and delta circuits, power equation, measurement of power by two wattmeter method, Importance of earthing.

Unit-VI: TRANSFORMERS: Principle, construction & working of transformer, Efficiency and regulation.

Unit-VII: ELECTRICAL MACHINES: Introduction to D.C. Machines, Induction motor, Synchronous machines.

Unit-VIII: MEASURING INSTRUMENTS: Voltmeter, Ammeter, Watt meter, Energy meter.

TEXT BOOKS:

1. Basic Electrical Engg (2nd Edition) : Kothari & Nagarath, TMH
2. Electrical Technology (Vol-I) : B.L Theraja & A K Theraja, S.Chand

REFERENCE BOOKS:

1. Electrical Engineering Fundamentals: Deltoro, PHI
2. Network Analysis: Valkenburg, PHI

Note: Eight questions are to be set in all by the examiner taking at least one question from each unit. Students will be required to attempt five questions in all.

ME - 101 ELEMENTS OF MECHANICAL ENGINEERING

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit-I: **Properties of Steam & Boilers:** Formation of steam at constant pressure, Thermodynamics properties of steam, Condition of steam, Steam tables, Measurement of dryness fraction by throttling calorimeter, Classification of boilers, Comparison of water and fire tube boilers mounting and accessories with their functions, Constructional and operational details of Cochran and Babcock and Wilcox boilers, Problems.

Unit-II: **Steam Turbines and Condensers:** Classification of turbines, Working principle of impulse and reaction turbine, Compounding of impulse turbine, Comparison of impulse and reaction turbines, Types of condensers, Cooling ponds and cooling towers, Condenser and vacuum efficiencies.

Unit-III: **I.C. Engines and Gas Turbines:** Introduction, Classification, Constructional details and working of two-stroke and four-stroke diesel and petrol engines, Otto, Diesel and Dual cycles, Working principle of gas turbine, Constant pressure gas turbine cycle.

Unit-IV: **Water Turbines, Pumps and Hydraulic Devices:** Introduction, Classification, Construction details and working of Pelton, Francis and Kaplan turbines, Specific speed and selection of turbines, Classification of water pumps and their working, Hydraulic jack and lift.

Unit-V: **Simple Lifting Machines:** Definition of machine, Velocity ratio, Mechanical advantage, Efficiency, Laws of machines, Reversibility of machine, Wheel and axle, Differential pulley block, Single, double and triple start worm and worm wheel, Single and double purchase winch crabs, Simple and compound screw jacks. Problems.

Unit-VI: **Power Transmission Methods and Devices:** Introduction to Power transmission, Belt drive, Rope drive, Chain drive, Pulley, Gear drive, Types of gears, Gear train, Clutches, Types and function of clutches, Types and function of brakes, Power measurement by dynamometer, Types of dynamometers.

Unit-VII: **Stresses and Strains:** Introduction, Concept & types of Stresses and strains, Poison's ratio, stresses and strains in simple and compound bars under axial loading, Stress-strain diagrams, Hooks law, Elastic constants & their relationships, Principle stresses & strains and principal- planes, Mohr's circle of stresses. Numerical problems.

Unit-VIII: **Bending Moment & Shear Force:** Definitions, SF and BM diagrams for cantilever and simply supported beam. Calculation of maximum SF, BM and point of contra-flexure under the loads of (i) concentrated load (ii) uniformly distributed load (iii) combination of concentrated and uniformly distributed loads. Problems.

TEXT BOOKS:

1. Strength of Materials - G.H. Ryder, Pub.- ELBS.
2. Hydraulic and Fluid Mechanics – Modi and Seth, Pub. – Standard Book House, New Delhi
3. Engineering Thermodynamics – C.P. Arora, Pub. - TMH, New Delhi
4. Thermal Engineering – A.S. Sarad, Pub. - Satya Prakashan, New Delhi.
5. Engineering Mechanics – K.L. Kumar, Pub. - TMH, New Delhi.
6. Theory of Machines – S.S. Rattan, Pub. – TMH, New Delhi.

REFERENCE BOOKS:

1. Strength of Materials – Popov, Pub. - PHI, New Delhi.
2. Hydraulic Machines – Jagdish Lal, Pub.- Metropolitan, Allahbad.
3. Thermal Science and Engineering – D.S. Kumar, Pub. – Kateria & Sons, New Delhi.

Note: In the semester examination, the examiner will set eight questions, at least one question from each unit. The students will be required to attend only 5 questions.

ME - 103 MANUFACTURING PROCESSES

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit-I Introduction: Introduction to Manufacturing Processes and their Classification. Industrial Safety; Introduction, Types of Accidents, Causes and Common Sources of Accidents, Methods of Safety, First Aid.

Unit-II Engineering Materials: General Properties and Applications of Engineering Materials, Mild Steel, Medium Carbon Steel, High Carbon Steel, High Speed Steel and Cast Iron.

Unit-III Foundry: Introduction to Casting Processes, Basic Steps in Casting Process, Pattern, Types of Patterns, Pattern Allowances, Risers, Runners, Gates, Moulding Sand and its composition, Sand Preparation, Molding Methods, Core Sands and Core Making, Core Assembly, Mold Assembly, Melting (Cupola) and Pouring, Fettling, Casting Defects and Remedies.

Unit-IV Cold Working (Sheet Metal Work): Sheet Metal Operations, Measuring, Layout Marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining - Advantages and Limitations.

Hot Working Processes: Introduction to Hot Working, Principles of Hot Working Processes, Forging, Rolling, Extrusion, Wire Drawing..

Unit-V Introduction to Machine Tools: Specifications and Uses of commonly used Machine Tools in a Workshop such as Lathe, Shaper, Planer, Milling, Drilling, Slotter, Introduction to Metal Cutting. Nomenclature of a Single Points Cutting Tool and Tool Wear. Mechanics of Chips Formation, Type of Chips , Use of Coolants in machining.

Unit-VI Welding: Introduction to Welding, Classification of Welding Processes, Gas Welding: Oxy-Acetylene Welding, Resistance Welding; Spot and Seam Welding, Arc Welding: Metal Arc, TIG & MIG Welding, Welding Defects and Remedies, Soldering & Brazing.

Unit-VII Plant Layout, Objectives of Layout, Types of Plant Layout and their Advantages.

TEXT BOOKS:

1. Workshop Technology Vol. I & II - Hazra & Chaudhary, Asian Book Comp., New Delhi.
2. Process and Materials of Manufacture -- Lindberg, R.A. Prentice Hall of India,New Delhi.
3. Principles of Manufacturing Materials and Processes - Campbell, J.S.- McGraw- Hill.

REFERENCE BOOKS:

1. Manufacturing Science - Amitabha Ghosh & Ashok Kumar Malik, - East-West Press.
2. Manufacturing Process and Systems - Ostwald, Munoz , John Wiley.
3. Workshop Technology, Vol. 1, 2 & 3 – Chapman, WAJ, Edward Arnold.

Note: In the semester examination, the examiner will set eight questions, at least one question from each unit. The students will be required to attend only 5 questions.

PHY - 103 PHYSICS LAB. - I

B. Tech. Semester - I (Common for all Branches)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS

The experiments in 1st semester will be based mainly upon optics, electrostatics, wave and oscillations which are the parts of the theory syllabus of 1st semester.

1. To find the wavelength of sodium light by Newton's rings experiment.
2. To find the wavelength of sodium light by Fresnel's biprism experiment.
3. To find the wavelength of various colours of white light with the help of a plane transmission diffraction grating.
4. To find the refractive index and cauchy's constants of a prism by using spectrometer.
5. To find the wavelength of sodium light by Michelson interferometer.
6. To find the resolving power of a telescope.
7. To find the pitch of a screw using He-Ne laser.
8. To find the specific rotation of sugar solution by using a polarimeter.
9. To compare the capacitances of two capacitors by De'sauty bridge and hence to find the dielectric constant of a medium.
10. To find the flashing and quenching potentials of Argon and also to find the capacitance of unknown capacitor.
11. To study the photoconducting cell and hence to verify the inverse square law.
12. To find the temperature co-efficient of resistance by using platinum resistance thermometer and Callender and Griffith bridge.
13. To find the frequency of A.C. mains by using sonometer.
14. To find the velocity of ultrasonic waves in non-conducting medium by piezo-electric method.

RECOMMENDED BOOKS:

1. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
2. Practical Physics – S.L.Gupta & V.Kumar (Pragati Prakashan).
3. Advanced Practical Physics Vol.I & II – Chauhan & Singh (Pragati Prakashan).

Note: Students will be required to perform atleast 10 experiments out of the list in a semester.

CH - 103 CHEMISTRY LAB.

B. Tech. Semester - I (Common for all Branches)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS

1. Determination of Ca^{++} and Mg^{++} hardness of water using EDTA solution.
2. Determination of alkalinity of water sample.
3. Determination of dissolved oxygen (DO) in the given water sample.
4. To find the melting & eutectic point for a two component system by using method of cooling curve.
5. Determination of viscosity of lubricant by Red Wood viscometer (No. 1 & No. 2).
6. To determine flash point & fire point of an oil by Pensky - Marten's flash point apparatus.
7. To prepare Phenol-formaldehyde and Urea formaldehyde resin.
8. To find out saponification No. of an oil.
9. Estimation of calcium in lime stone and dolomite.
10. Determination of concentration of $KMnO_4$ solution spectrophotometerically.
11. Determination of strength of HCl solution by titrating it against NaOH solution conductometerically.
12. To determine amount of sodium and potassium in a, given water sample by flame photometer.
13. Estimation of total iron in an iron alloy.

SUGGESTED BOOKS:

1. A Text Book on Experimental and Calculation – Engineering Chemistry, S.S. Dara, S. Chand & Company (Ltd.)
2. Essential of Experimental Engineering Chemistry, Shashi Chawla, Dhanpat Rai Publishing Company.
3. Theory & Practice Applied Chemistry – O.P. Virmani, A.K. Narula (New Age)

Note: At least ten experiments are to be performed by the students.

EE - 103 ELECTRICAL TECHNOLOGY LAB

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS

1. To verify KCL and KVL.
2. To verify Thevenin's & Norton's Theorems.
3. To verify maximum power transfer theorem in D.C. Circuit & A.C circuit.
4. To verify reciprocity & Superposition theorems.
5. To study frequency response of a series R-L-C circuit and determine resonant frequency & Q- factor for various Values of R, L, C.
6. To study frequency response of a parallel R-L-C circuit and determine resonant frequency & Q -Factor for various values of R, L, C.
7. To perform direct load test of a transformer and plot efficiency Vs load characteristic.
8. To perform direct load test of a D.C. shunt generator and plot load voltage Vs load current curve.
9. To plot V-curve of a synchronous motor.
10. To perform O.C. and S.C. tests of a three phase induction motor.
11. To study various type of meters.
12. .Measurement of power by 3 voltmeter / 3 ammeter method.
13. Measurement of power in a 3 phase system by two watt meter method.

Note: 1 At least 10 experiments are to be performed by students in the semester.

2 At least 7 experiments should be performed from the above list; remaining three experiments may either be performed from the above list or designed and set by the Dept. as per the scope of the syllabus of EE - 101.

CSE - 103 C PROGRAMMING LAB

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
--	--	2	2	**Class Work**	:	**25 Marks**
				Examination	:	**25Marks**
				Total	:	**50 Marks**
				Duration of Examination	:	**3 Hours**

REPRESENTATIVE PROGRAMMING PROBLEMS:

1. Write a program to find the largest of three numbers. (if-then-else)
2. Write a program to find the largest number out of ten numbers (for-statement)
3. Write a program to find the average mail height & average female heights in the class (input is in form of sex code, height).
4. Write a program to find roots of quadratic equation using functions and switch statements.
5. Write a program using arrays to find the largest and second largest no. out of given 50 nos.
6. Write a program to multiply two matrices.
7. Write a program to read a string and write it in reverse order.
8. Write a program to concatenate two strings.
9. Write a program to sort numbers using the Quicksort Algorithm.
10. Represent a deck of playing cards using arrays.
11. Write a program to check that the input string is a palindrome or not.

Note: At least 5 to 10 more exercises to be given by the teacher concerned.

ME - 105 ENGINEERING GRAPHICS AND DRAWING

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
--	--	4	4	Class Work	:	50 Marks
				Examination	:	100Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit-I Various types of projections, First and Third angle systems of orthographic projections. Projection of Points in different quadrants.

Unit-II Projections of Straight Lines – parallel to one or both reference planes, contained by one or both planes, perpendicular to one of the planes, inclined to one plane but parallel to the other planes, inclined to both the planes, true length of a line and its inclination with reference planes, traces of a line.

Unit-III Projections of Planes – parallel to one reference plane, inclined to one plane but perpendicular to the other, inclined to both reference planes.

Unit-IV Projections of Polyhedra Solids and Solids of Revolution - in simple positions with axis perpendicular to a plane, with axis parallel to both planes, with axis parallel to one plane and inclined to the other, Projections of sections of Prisms, Pyramids, Cylinders and Cones. True shape of section. Development of surfaces of various solids.

Unit-V Isometric projections - introduction, isometric scale, Isometric views of plane figures, prisms, pyramids and cylinders.

Unit-VI Orthographic drawings of Bolts and Nuts, Bolted Joints, Screw threads, Screwed Joints.

Unit-VII Free Hand Sketching - Orthographic Views from Isometric, Views of Simple Machine Components such as Brackets, Bearing Blocks , Guiding Blocks and Simple Couplings.

Note: Some simple exercises may be attempted with AUTOCAD.

TEXT BOOKS:

1. Engineering Drawing Plane and Solid Geometry : N.D. Bhatt and V.M.Panchal, Forty-Fourth Edition 2002, Charotar Publishing House.

REFERENCE BOOKS:

1. Engineering Graphics and Drafting : P.S. Gill, Millennium Edition, S.K. Kataria and Sons.
2. A Text Book of Engineering Drawing : S.B. Mathur, Second Revised and Enlarged Edition 2000, Vikas Publishing House.
3. Engineering Graphics using AUTOCAD 2000 : T. Jeyapoovan, First Edition 2002, Vikas Publishing House.

ME - 107 WORKSHOP PRACTICE

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
--	--	4	4	Class Work	:	25 Marks
				Examination	:	25Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS / JOBS

1. To study different types of measuring tools used in metrology and determine least counts of vernier calipers, micrometers and vernier height gauges.
2. To study different types of machine tools (lathe, shaper or planer or slotter, milling, drilling machines).
3. To prepare a job on a lathe involving facing, outside turning, taper turning, step turning, radius making and parting-off.
4. To study different types of fitting tools and marking tools used in fitting practice.
5. To prepare lay out on a metal sheet by making and prepare rectangular tray, pipe shaped components e.g. funnel.
6. To prepare joints for welding suitable for butt welding and lap welding.
7. To perform pipe welding.
8. To study various types of carpentry tools and prepare simple types of at least two wooden joints.
9. To prepare simple engineering components/ shapes by forging.
10. To prepare mold and core assembly, to put metal in the mold and fettle the casting.
11. To prepare horizontal surface/ vertical surface/ curved surface/ slots or V-grooves on a shaper/ planner.
12. To prepare a job involving side and face milling on a milling machine.

Note: 1. At least ten experiments/ jobs are to be performed/ prepared by students in the semester.

2. At least 8 experiments/ jobs should be performed / prepared from the above list, remaining two may either be performed/ prepared from the above list or designed and set as per the scope of the syllabus of Manufacturing Processes.

ME - 109 ELEMENTS OF MECHANICAL ENGINEERING LAB.

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS

1. To study Cochran & Babcock & Wilcox boilers.
2. To study the working & function of mountings & accessories in boilers.
3. To study 2-Stroke & 4-Stroke diesel engines.
4. To study 2-Stroke & 4-Stroke petrol engines.
5. To calculate the V.R., M.A. & efficiency of single, double & triple start worm & worm wheel.
6. To calculate the V.R., M.A. & efficiency of single & double purchase winch crabs.
7. To find the percentage error between observed and calculated values of stresses in the members of a Jib crane.
8. To draw the SF & BM diagrams of a simply supported beam with concentrated loads.
9. To study the simple & compound screw jacks and find their MA, VR & efficiency.
10. To study the various types of dynamometers.
11. To study the constructional features & working of Pelton/Kaplan/Francis.
12. To prepare stress-strain diagram for mild steel & cast iron specimens under tension and compression respectively on a Universal testing machine.
13. To determine the Rockwell / Brinell /Vickers hardness no. of a given specimen on the respective machines.

Note: 1. Total ten experiments are to be performed in the Semester.

2. At least seven experiments should be performed from the above list. Remaining three experiments should be performed as designed & set as per the scope of the syllabus of ME – 101: Elements of Mechanical Engineering.

GES - 101 ENVIRONMENTAL STUDIES

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
3	--	--	0	Examination	:	75Marks
				Total	:	75 Marks
				Duration of Examination	:	3 Hours

UNIT – I The Multidisciplinary nature of environmental studies, Definition, scope and importance.

Need for Public awareness

UNIT – II Natural Resources:

Renewable and non-renewable resources:

Natural resources and associated problems.

a) Forest resources: Use and over-exploitation: deforestation, case studies, Timber exploitation, mining, dams and their effects and forests tribal people.
b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources: World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources; case studies.
f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
   - Role of an individual in conservation of natural resources.
   - Equitable use of resources for sustainable lifestyles.

UNIT- III Ecosystems:

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following eco-system:
  a) Forest ecosystem.
  b) Grassland ecosystem.
  c) Desert ecosystem.
  d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT- IV Biodiversity and its conservations:

- Introduction – Definition: Genetic, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.

UNIT – V Environmental Pollution:

Definition, causes, effects and control, measures of:

a) Air pollution
b) Water pollution
c) Soil pollution
d) Marine pollution
e) Noise pollution
f) Thermal Pollution
g) Nuclear hazards

- Solid waste management: Causes effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: Floods, earthquake, cyclone and landslides.

UNIT – VI Social issues and the Environment:

a) From unsustainable to sustainable development
b) Urban problems related to energy
c) Water conservation, rain water harvesting, watershed management
d) Resettlement and rehabilitation of people; its problems and concerns, case studies
e) Environmental ethics: Issues and possible solutions
f) Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies
g) Wasteland reclamation
h) Consumerism and waste products
i) Environment Protection Act
j) Air (Prevention and Control of Pollution) Act
k) Water (Prevention and Control of Pollution) Act
l) Wildlife Protection Act
m) Forest Conservation Act
n) Issues involved in enforcement of environmental legislation
o) Public awareness

UNIT – VII Human population and the Environment.
Population growth, variation among nations.
Population explosion – Family Welfare Programme.
Environment and human health.
Human Rights.
Value Education.
HIV/ AIDS.
Woman and Child Welfare.
Role of Information Technology in Environment and human health.
Case Studies.

REFERENCES:

1. Agarwal, K.C. 2001, Environmental Biology, Nidi Pub. Ltd. Bikaner.
2. Bharucha, Franch, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380013, India .
3. Brunner R.C. 1989, Hazardous Waste Incineration, Mc. Graw Hill Inc. 480p.
4. Clark R.S., Marine Pllution, Slanderson Press Oxford (TB).
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Pub. House, Mumbai. 1195p.
6. De A.K., Environmenal Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment ®.

8. Gleick, H.P., 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security, Stockholm Env. Institute, Oxford Univ., Press 473p.
9. Hawkins R.E. Encyclopedia of Indian Natural History, Bomaby Natural History Scociety, Bombay (R).
10. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
11. Jadhav, H & Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Helhi 284p.
12. Mckinney, M.L. & Schoch, RM 1996, Environmental Sciences Systems & Solutions, Web enhanced Edition 639p.
13. Mhaskar A.K., Mater Hazardous, Tekchno-Sciences Publications (TB).
14. Miller T.G. Jr. Environmental Science, Wadsoworth Publishing Co. (TB).
15. Odum, E.P. 1971, Fundamentals of Ecology, W.B. Saunders Co. USA, 574p.
16. Rao M.N. & Dutta, A.K. 1987, Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd., 345p
17. Sharma, B.K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.
18. Survey of the Environment, The Hindu (M).
19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Sciences (TB).
20. Trivedi, R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II Enviro Mdiea (R).
21. Trividi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol I and II Enviro Media (R).
22. Trividi R.K. and P.K. Goel, Introduction to air pollution, Techno Sciences Pub. (TB).
23. Wagner K.D., 1998, Environmental Management, W.B. Saunders Co. Philadelophia, USA 499p.
24. A text bok environmental education G.V.S. Publishers by Dr. J.P. Yadav.

(M) Magazine (R) Reference (TB) Textbook

Note: 1. Examiner will set eight questions. Students will be required to attempt five Questions.
2. The awards of this paper shall not be counted in the award of the Degree/DMC.

GES - 103 ENVIRONMENTAL STUDIES FIELD WORK

B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits			
--	--	--	0	Field Work	:	25Marks
				Total	:	25 Marks

FIELD WORK:

- Visit to a local area to document environmental assets – river/ forest/ grassland/ hill/ mountain.
- Visit to a local polluted site-Urban/ Rural/ Industrial/ Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems – pond, river, hill slopes, etc. (Field work equal to 5 lectures hours).

Note: The awards of this paper shall not be counted in the award of the Degree/DMC.

HUM – 102 COMMUNICATION SKILLS IN ENGLISH

B. Tech. Semester - II (Common for all Branches except BIO-TECHNOLOGY)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

This course is designed for the students of Engineering and Technology who need English for specific purposes in specific situations. It aims at imparting the communication skills that are needed in their academic and professional pursuits. This is achieved through an amalgamation of traditional lecture-oriented approach of teaching with the task based skill oriented methodology of learning.

COURSE CONTENT:

Unit-I: Communicative Grammar: Spotting the errors pertaining to nouns, pronouns, adjective and adverbs; Concord - grammatical concord, notional concord and the principle of proximity between subject and verb.

Unit-II: Lexis: Idioms and phrases; Words often confused; One-Word Substitutes; Formation of words (suffixes, prefixes and derivatives); Foreign Words (A selected list).

Unit-III: Oral Communication: Part-A: Introduction to principal components of spoken English – Word-stress patterns, Intonation, Weak forms in English

Part-B: Developing listening and speaking skills through various activities, such as (a) role play activities, (b) Practising short dialogues (c) Group discussion (d) Debates (e) Speeches (f) Listening to news bulletins (g) Viewing and reviewing T.V. programmes etc.

Unit-IV: Written Communication: Developing reading and writing skills through such tasks/activities as developing outlines, key expressions, situations, slogan writing and theme building exercises

Reading verbal and non-verbal texts-like cartoons, Graphs and tabulated data etc.

Unit-V (For Internal Evaluation Only): Book Review – Herein the students will be required to read and submit a review of a book (Literary or non-literary) of their own choice. This will be followed by a presentation of the same in the class

Unit-VI: Technical Writing:

(a) Business Letters, Format of Business letters and Business letter writing

(b) E-mail writing

(c) Reports, Types of Reports and Format of Formal Reports

(d) Press Report Writing

SUGGESTED READING:

1. Language in Use (Upper intermediate Level, Adrian Doff Christopher Jones, Cambridge University Press
2. Common Errors in English, Abul Hashem, Ramesh Publishing House, New Delhi.
3. Objective English, Tata Mc. Graw Hill Publishing Company Ltd., New Delhi.
4. Spoken English for India, R.K. Bansal & J.B. Harrison, Orient Longman, Delhi.
5. The sounds of English, Veena Kumar, Makaav Educational Software, New Delhi.
6. English Phonetics & Phonology, P. Roach, Cambridge University Press, London.
7. English for Engineers and Technologists: A Skill Approach, Vol. 2, Orient Longman,Delhi.
8. Business Communication, M.S. Ramesh and C. C. Pattanshetti, R.Chand and Company, Delhi
9. Group Discussion, Sudha Publications/Ramesh Publishing House, New Delhi.

SCHEME OF EXAMINATION:

All questions will be compulsory and will cover all the aspects of the syllabus **except unit V**. There will be sufficient internal choice.

Unit-I: 20 Marks

Questions No. 1 will require the students to carefully read the sentences given and trace the errors, if any, and then supply the correct alternatives/answers.

Unit-II: 20 Marks

Question No. 2 may have four or five parts testing knowledge of different items of vocabulary.

Unit-III: 20 Marks

Question No. 3 will have two parts of 10 marks each from part A and B of the unit. Part A will have content words, form words and sentences for stress marking, transcription and intonation marking respectively. Part B will test students' speaking skills through various oral tasks and activities - debate, group discussion and speech - in written form only.

Note: Speaking and listening skills will primarily be tested orally through internal assessment.

Unit-IV: 20 Marks

Question No. 4 may have many parts. The questions will be framed to test students' composition skills on the elements prescribed in the unit. For example, the students may be required to develop a hypothetical situation in a dialogue form, or to develop an outline, key expression, graph etc.

Unit-V is for internal assessment only.

Unit-VI: 20 Marks

Question No. 5 may have two parts. While the one part may require the students to frame either a press/news report for the print media or write the given business letter, or e-mail a message, the second part will have a theory question on the format of formal report and business letter.

BTT – 102 BASICS OF BIOTECHNOLOGY
B. Tech. Semester - II (Only for BIO-TECHNOLOGY)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit – I:

1. **Cell Structure and Function**: Prokaryotes and Eukaryotes: Cell Wall, Membrances, Nucleus, Mitochondria, Chloroplast, Ribosome, Vacuoles, Bacteria and viruses: brief descriptions.
2. **Biomolecules**: A brief account of structure of Carbohydrates, Lipids, Proteins.
3. **Cell Division**: Mitosis and Meiosis.
4. **Genes**: Classical- brief idea about Mendel's laws and chromosomes, Nature of Genetic material, DNA and RNA, DNA replication.

Unit – II:

5. **Gene Expression**: Central dogma, genetic code, molecular mechanism on mutations, regulation of gene expression, housekeeping genes, differentiation and development mutations and their molecular basis.
6. **Genetic Engineering**: an introduction to genetic engineering: Cloning (vectors, enzymes); DNA and genomic libraries, Transgenics, DNA fingerprinting, Genomics.

Unit – III:

7. **Development of Biotechnology**: Nature and Scope of Biotechnology.
8. **Applications of Biotechnology** : Bioprocess and fermentation technology, Cell Culture, Enzyme technology, Biological fuel generation, Single cell protein, Sewage Treatment, Environmental Biotechnology, Biotechnology and medicine, Biotechnology in agriculture & forestry industry, Food and Beverage Technology Production of Biological inventions, Safety in Biotechnology.

TEXT/REFERENCE BOOKS:

1. Biotechnology, Smith, Cambridge Press.
2. Modern Concepts of Biotechnology, H. D. Kumar, Vikas Publishing House (P) Ltd.
3. Elements of Biotechnology, P. K. Gupta, Rastogi Publications.

MATH – 102 MATHEMATICS - II

B. Tech. Semester - II (Common for all Branches)

L	T	P	Credits			
3	2	--	5	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Part - A

Matrices & its Applications : Rank of a matrix, elementary transformations, elementary matrices, inverse using elementary transformations, normal form of a matrix, linear dependence and in dependence of vectors, consistency of linear system of equations, linear and orthogonal transformations, eigen values and eigen vectors, properties of eigen values, Cayley - Hamilton theorem and its applications.

Part - B

Ordinary Differential Equations & its Applications : Exact differential equations. Equations reducible to exact differential equations. Applications of Differential equations of first order & first degree to simple electric circuits, Newton's law of cooling, heat flow and orthogonal trajectories.

Linear differential equations of second and higher order. Complete solution, complementary function and particular integral, method of variation of parameters to find particular Integral, Cauchy's and Legender's linear equations, simultaneous linear equations with constant co-efficients. Applications of linear differential equations to simple pendulum, oscillatory electric circuits.

Part - C

Laplace Transforms and its Applications: Laplace transforms of elementary functions, properties of Laplace transforms, existence conditions, transforms of derivaties, transforms of integrals, multiplication by t^n, division by t. Evaluation of integrals by Laplace transforms. Laplace transform of Unit step function, unit impulse function and periodic function. Inverse transforms, convolution theorem, application to linear differential equations and simultaneous linear differential equations with constant coefficients.

Partial Differential Equations and Its Applications: Formation of partial differential equations, Lagrange's linear partial differential equation, First order non-linear partial differential equation, Charpit's method. Method of separation of variables and its applications to wave equation and one dimensional heat equation, two dimensional heat flow, steady state solutions only.

TEXT BOOKS:

1. Advanced Engg. Mathematics F Kreyszig
2. Higher Engg. Mathematics B.S. Grewal

REFERENCE BOOKS:

1. Differential Equations – H.T.H. Piaggio.
2. Elements of Partial Differential Equations – I.N. Sneddon.
3. Advanced Engineering Mathematics – R.K. Jain, S.R.K.Iyengar.
4. Advanced Engg. Mathematics – Michael D. Greenberg.

Note: Examiner will set eight questions, taking two from Part-A, three from Part-B and three from Part-C. Students will be required to attempt five question taking atleast one from each part.

PHY - 102 PHYSICS - II

B. Tech. Semester - II (Common for all Branches)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Part - A

CRYSTAL STRUCTURE: Space Lattice, unit cell and translation vectors, Miller indices, simple crystal structure, Bonding in solids, Experimental x-ray diffraction method, Laue method, powder Method, Point defects in solids, Elementary idea of quarks and gluons.

QUANTUM PHYSICS: Difficulties with Classical physics, Introduction to quantum mechanics-simple concepts, discovery of Planck's constant, Group velocity and phase velocity, Schrodinger wave equations - time dependant and time independent Schrodinger equations, Elementary ideas of quantum statistics.

FREE ELECTION THEORY: Elements of classical free electron theory and its limitations, Drude's Theory of Conduction, quantum theory of free electrons, Fermi level, Density of states, Fermi-Dirac distribution function, Thermionic emission, Richardson's equation.

Part - B

BAND THEORY OF SOLIDS: Origin of energy bands, Kronig, Penney Model (qualitative), E-K diagrams, Brillouin Zones, Concept of effective mass and holes, Classification of solids into metals, Semiconductors and insulators, Fermi energy and its variation with temperature. Hall effect and its Applications.

PHOTOCONDUCTIVITY AND PHOTOVOLTAICS: Photoconductivity in insulating crystals, variation with illumination, effect of traps, applications of photoconductivity, photovoltaic cells and their characteristics.

MAGNETIC PROPERTIES OF SOLIDS: Atomic magnetic moments, orbital diamagnetism, Classical theory of paramagnetism, ferro magnetism - molecular fields and domains.

SUPER CONDUCTIVITY: Introduction (experimental survey), Meissner effect, London equation.

TEXT BOOKS:

1. Introduction to Solid State Physics (VII Ed.) – Charles Kittel (John Wiley).
2. Quantum Mechanics – Powell and Crasemann (Oxford & IBH)
3. Fundamentals of Solid State Physics – B. S. Saxena, R. C. Gupta and P. N. Saxena (Pragati Prakashan).

REFERENCE BOOKS:

1. Sold State Physics – Pillai (New Age).
2. A text book of Engg. Physics – Avadhanulu and Kshirsagar (S.Chand)
3. Quantum Mechanics – Ghatak & Loknathan.

Note: The Examiners will set eight questions, taking four from each part. The students will be required to attempt five questions in all selecting at least two from each part. All questions will carry equal marks.

PHY - 104 PHYSICS LAB. - II

B. Tech. Semester - II (Common for all Branches)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS

The experiments in Second semester will be based upon electricity, Magnetism, Modern Physics and Solid State Physics which are the parts of theory syllabus.

1. To find the low resistance by carey - Foster's bridge.
2. To find the resistance of a galvanometer by Thomson's constant deflection method using a post office box.
3. To find the value of high resistances by Substitution method.
4. To find the value of high resistances by Leakage method.
5. To study the characteristics of a solar cell and to find the fill factor.
6. To find the value of e/m for electrons by Helical method.
7. To find the ionisation potential of Argon/Mercury using a thyratron tube.
8. To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus.
9. To study the characteristics of (Cu-Fe, Cu-Constantan) thermo couple.
10. To find the value of Planck's constant by using a photo electric cell.
11. To find the value of co-efficient of self-inductance by using a Rayleigh bridge.
12. To find the value of Hall Co-efficient of semi-conductor.
13. To study the V-I characteristics of a p-n diode.
14. To find the band gap of intrinsic semi-conductor using four probe method.
15. To calculate the hysteresis loss by tracing a B-H curve.

RECOMMENDED BOOKS:

1. Advanced Practical Physics – B.L. Worshnop and H.T. Flint (KPH)
2. Practical Physics – S. L. Gupta & V. Kumar (Pragati Prakashan).
3. Advanced Practical Physics Vol.I & II – Chauhan & Singh (Pragati Prakashan).

Note: Students will be required to perform atleast 10 experiments out of the list in a semester.

GP - 102 GENERAL PROFICIENCY

B. Tech. Semester – II (Common for all Branches)

L	T	P	Credits			
--	--	--	2	Class Work	:	50Marks
				Total	:	50 Marks

The purpose of this course is to inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of his/ her performance / achievements in different walks of life.

The evaluation will be made by the panel of experts/ teachers, preferably interdisciplinary to be appointed by the Vice-Chancellor of the University on recommendation of the Dean Academic Affairs. A Faculty Counselor will be attached to a group of students which will remain associated with him /her during the entire period of the degree program in the University. Each faculty member will serve as a faculty counselor. They will act like a local guardian for the students associated with him / her and will help them in terms of career guidance, personal difficulties.

A. The student will present a written report before the committee with following in view:

The student will present before the committee his/her achievements during the current academic session in the form of a written report highlighting followings:

I.	Academic Performance	--------
II.	Extra Curricular Activities	**(4 Marks)**
III	Technical Activities	**(4 Marks)**
IV	Industrial, Educational tour	**(4 Marks)**
V	Sports/games	**(4 Marks)**
VI	Community Service, Hostel Activities	**(4 Marks)**

NOTE: Report submitted by the students should be typed on both sides of the paper.

B. A student will support his/her achievement and verbal & communicative skill through presentation before the committee. **(20 Marks)**

C. Faculty Counselor Assignment **(10 Marks)**

It will be the duty of the student to get evaluated by respective faculty counselor and to submit the counselor assessment marks in a sealed envelope to the committee.

A counselor will assess the student which reflects his/her learning graph including followings:

1. Discipline throughout the year
2. Sincerity towards study
3. How quickly the student assimilates professional value system etc.

MATH – 201 MATHEMATICS - III

B. Tech. Semester – III (Common for all Branches)

L	T	P	Credits			
3	2	--	5	Class Work	:	50 Marks
				Examination	:	100Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Part - A

Fourier Series and Fourier Transforms : Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and consine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

Part - B

Functions of Complex Variable : Definition, Exponential function, Trignometric and Hyperbolic functions, Logrithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy - Integral theorem and formula.

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series. Zeroes and singularities of complex functions, Residues. Evaluation of real integrals using residues (around unit and semi circle only).

Part - C

Probability Distributions and Hypothesis Testing : Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.

Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only), Chi-square test of goodness of fit.

Linear Programming : Linear programming problems formulation, Solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

TEXT BOOKS:

1. Advanced Engg. Mathematics: F Kreyszig.
2. Higher Engg. Mathematics: B.S. Grewal.

REFERENCE BOOKS:

1. Advance Engg. Mathematics: R.K. Jain, S.R.K.Iyenger.
2. Advanced Engg. Mathematics: Michael D. Greenberg.
3. Operation Research: H.A. Taha.
4. Probability and statistics for Engineers: Johnson. PHI.

Note: Examiner will set eight questions, taking two from Part-A, three from Part-B and three from Part-C. Students will be required to attempt five question taking atleast one from each part.

HUM – 201 ECONOMICS

B. Tech. Semester – III (Common for all Branches)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

COURSE OBJECTIVE: The purpose of this course is to:

1. Acquaint the student in the basic economic concepts and their operational significance and
2 .Stimulate him to think systematically and objectively about contemporary economic problems.

UNIT-I: Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve Economic laws and their nature. Relation between Science, Engineering, Technology and Economics.

UNIT-II: Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance.

UNIT-III: Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.

UNIT-IV: Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

UNIT-V: Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligoply, Monoplistic Competition (Main features of these markets)

Supply and Law of Supply, Role of Demand & Supply in Price Determinition and effect of changes in demand and supply on prices.

UNIT-VI: Nature and characteristics of Indian economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalisation of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement.

TEXT BOOKS :

1. Principles of Economics : P.N. Chopra (Kalyani Publishers).
2. Modern Economic Theory – K.K. Dewett (S.Chand)

REFERENCE BOOKS:

1. A Text Book of Economic Theory Stonier and Hague (Longman's Landon)
2. Micro Economic Theory – M.L. Jhingan (S.Chand)
3. Micro Economic Theory - H.L. Ahuja (S.Chand)
4. Modern Micro Economics : S.K. Mishra (Pragati Publications)
5. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.)
6. Indian Economy : Rudar Dutt & K.P.M. Sundhram

Note: Eight questions are to be set atleast one question from each unit and the students will have to attempt five questions in all.

ME – 201 THERMODYNAMICS

B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I: Basic Concepts: Macroscopic and Microscopic Approaches, Thermodynamic Systems, Surrounding and Boundary, Thermodynamic Property – Intensive and Extensive, Thermodynamic Equilibrium, State, Path, Process and Cycle, Quasi-static, Reversible and Irreversible Processes, Working Substance. Concept of Thermodynamic Work and Heat, Equality of Temperature, Zeroth Law of Thermodynamic and its utility. Problems.

Unit II: First Law of Thermodynamics: Energy and its Forms, Energy and 1st law of Thermodynamics, Internal Energy and Enthalpy, PMMFK, Steady flow energy equation, 1st Law Applied to Non- flow process, Steady Flow Process and Transient Flow Process, Throttling Process and Free Expansion Process. Problems.

Unit III: Second Law of Thermodynamics: Limitations of First Law, Thermal Reservoir, Heat Source and Heat Sink, Heat Engine, Refrigerator and Heat Pump, Kelvin- Planck and Clausius Statements and their Equivalence, PMMSK. Carnot Cycle, Carnot Heat Engine and Carnot Heat Pump, Carnot Theorem and its Corollaries, Thermodynamic Temperature Scale. Entropy, Clausius Inequality, Principle of Entropy Increase, Temperature Entropy Plot, Entropy Change in Different Processes, Introduction to Third Law of Thermodynamics. Problems.

Unit IV: Availability and Irreversibility: High and Low Grade Energy, Availability and Unavailable Energy, Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference, Dead state of a system, Availability of a Non-Flow or Closed System, Availability of a Steady Flow System, Helmholtz and Gibb's Functions, Effectiveness and Irreversibility, Second law efficiencies of processes & cycles. Problems.

Unit V: Pure Substance: Pure Substance and its Properties, Phase and Phase Transformation, Vaporization, Evaporation and Boiling, Saturated and Superheat Steam, Solid – Liquid – Vapour Equilibrium, T-V, P-V and P-T Plots During Steam Formation, Properties of Dry, Wet and Superheated Steam, Property Changes During Steam Processes, Temperature – Entropy (T-S) and Enthalpy – Entropy (H-S) Diagrams, Throttling and Measurement of Dryness Fraction of Steam. Problems.

Unit VI: Ideal and Real Gases: Concept of an Ideal Gas, Basic Gas Laws, Characteristic Gas Equation, Avogadro's law and Universal Gas Constant, P-V-T surface of an Ideal Gas. Vander Waal's Equation of state, Reduced Co-ordinates, Compressibility factor and law of corresponding states. Mixture of Gases, Mass, Mole and Volume Fraction, Gibson Dalton's law, Gas Constant & Specific Heats, Entropy for a mixture of non-reactive gases. Problems.

Unit VII: Thermodynamic Relations: Maxwell Relations, Clapeyron Equation, Relations for changes in Enthalpy and Internal Energy & Entropy, Specific Heat Capacity Relations, Joule Thomson coefficient & inversion curve.

TEXT BOOKS:

1. Engineering Thermodynamics – Jones and Dugan, PHI, New Delhi.
2. Fundamentals of Engineering Thermodynamics – E. Radhakrishnan, PHI, New Delhi.

REFERENCE BOOKS:

1. Theory and Problems of Thermodynamics – Y. V.C. Rao, Wiley Eastern Ltd., New Delhi.
2. Engineering Thermodynamics – C P Arora, Tata McGraw Hill
3. Engineering Thermodynamics – P K Nag, Tata McGraw Hill

Note: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME – 203 STRENGTH OF MATERIALS –I
B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit 1: Simple Stresses & Strains: Concept & types of Stresses and strains, Poison's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.

Unit II: Compound Stresses & Strains: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principal stresses & strains and principal- planes, Mohr's circle of stresses, Numerical.

Unit III: Shear Force & Bending Moments: Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contra-flexure under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii) combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.

Unit IV: Torsion Of Circular Members: Torsion of thin circular tube, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numericals.

Unit V: Bending & Shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with combined bending, torsion & axial loading of beams. Numericals.

Unit VI: Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Eulers, Rankine, Gordon's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numerical.

Unit VII: Slope & Deflection: Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical.

Unit VIII: Fixed Beams: Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (i) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributed load.

TEXT BOOKS:

1. Strength of Materials – G. H. Ryder - Macmillan, India
2. Strength of Materials– Andrew Pytel and Fredinand L. Singer, Addison – Wesley

REFERENCE BOOKS:

1. Strength of Materials – Popov, PHI, New Delhi.
2. Strength of Materials A Rudimentary Approach – M.A. Jayaram, Sapna Book House, Bangalore

Note: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME – 205 ENGINEERING MECHANICS
B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit-I: Review of Basic Force Systems: Dimensions and units of mechanics, idealization of mechanics, laws of mechanics, vector algebra review, moment of a force about a point and axis, the couple and couple moment, addition and subtraction of couples, moment of a couple about a line, translation of a force to a parallel position, resultant of a force system, Problems (vector method).

Unit-II: Equilibrium: Introduction, free body diagram, control volumes, general equations of equilibrium, two point equivalent loading, static in-determinancy, simple truss, method of joints, method of sections, co-planer cable-loading a function of x, coplanar cables- loading the weight of the cable itself. Problems.

Unit-III: Properties of Surfaces & Moments and Products of inertia : First moment of an area and the centroid, principal axes, formal definition of inertia quantities, relation between mass-inertia terms and area-inertia terms, translation of coordinate axes, transportation properties of the inertia terms, a brief introduction to tensors, the inertia of ellipsoid and principal moments of inertia, Problems (vector method).

Unit-IV: Kinematics of Particles and Rigid Bodies: Velocity and acceleration in path and cylindrical coordinates, motion of a particle relative to a pair of translating axes, translation and rotation of rigid bodies, Chasles theorem, moving references, velocity and acceleration for different references, inertia and coriolis forces. Problems(vector method).

Unit-V: Particle Dynamics, Energy Methods & Momentum Methods: Newton's law for rectangular coordinates & cylindrical coordinates, rectifier translation, central force motion, Newton's law for path variables, work energy equations, work energy equations for a systems of particles, linear and angular momentum equations for a systems of particles. Problems(vector method).

Unit-VI: Variational Mechanics: Hamilton principle, Lagrange equations, principle of virtual work, methods of minimum potential energy, stability.

TEXT BOOK:

1. Engineering Mechanics - Statics & Dynamics by I.H. Shames, PHI, New Delhi.
2. Engineering Mechanics – Timoschenko.

REFERENCE BOOKS:

1. Statics & Dynamics by J.L. Meriam, JohnWiley & Sons (P) Ltd. New York.
2. Statics & Dynamics by Beer & Johnson, MGH, New Delhi.

Note: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

ME – 207 MACHINE DRAWING
B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
				Class Work	:	50 Marks
1	--	4	5	Total	:	50 Marks

PART-A

Introduction to BIS Specification SP : 46 – 1988 Code of Engineering drawing – Limits , fits and Tolerance (Dimensional and Geometrical tolerance) , Surface finish representation.

Gear: Gear terminology, I.S. convention representation of assembly of spur gears, helical gears, bevel gears , worm and worm wheel.

PART-B

Orthographic views from isometric views of machine parts / components. Dimensioning, Sectioning. Exercises on Coupling, Crankshaft, Pulley, Piston and Connecting rod, Cotter and Knuckle joint. Riveted Joint and Welded Joint.

PART-C

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies : Lathe Tail stock , Machine vice , Pedestal bearing , Steam stop valve , Drill jigs and Milling fixture.

NOTE: 1 In the semester examination, the examiner will set total six questions in all, taking two questions from each part. The students will be required to attempt three questions in all, taking one question from each part

2 The questions from Part-A and Part-B will carry 20 marks each. Question from Part-C will carry 60 marks.

TEXT BOOKS:

1. Machine Drawing - N D Bhatt and V M Panchal, Charotar Publishing House.
2. A Text Book of Machine Drawing - P S Gill Pub.: S K Kataria & Sons.
3. Engineering Graphics with Auto CAD 2002 -JamesD.Bethune, Pearson Education.

REFERENCE BOOKS :

1. A Text Book of Machine Drawing Laxmi Narayana and Mathur, M/s. Jain Brothers, New Delhi.
2. Machine drawing by N Sidheshwar, Kannaieh, V S Sastry, TMH., New Delhi.

ECE – 211 ELECTRONICS ENGINEERING
B. Tech. Semester – III (CE, CHE, ME)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

UNIT – I: **DIODES**: P-N junction, P-N junction as a rectifier, V-I characteristics, Breakdown diodes, Light emitting diodes, Load – Line concept, Clipping, Clamping, Rectifiers.

UNIT – II: **TRANSISTORS**: Operation and Characteristics of a Transistor, Common Emitter, Common Collector and Common Base Configurations of a transistor, Biasing Techniques, Transistor as an amplifier and oscillator.

UNIT – III: **OP-AMPS**: Basic Characteristics of an OP-AMP, Applications of OP-AMP (Inverter, Non-Inverter, Integrator, Differentiator, Logarithmic amplifier, Square wave generator).

UNIT – IV: **POWER AMPLIFIERS**: Class A, Class B and Class C Amplifiers.

UNIT – V: **STABILISED POWER SUPPLIES:** Regulated power supply, series voltage regulator, shunt voltage regulator.

UNIT – VI: **DIGITAL GATES**: Binary numbers, OR, AND, NAND, NOR, NOT, EX-OR Gates, their realization and Boolean algebra.

TEXT BOOK:

1. Integrated Electronics Milman & Halkias (MGH).

REFERENCE BOOKS :

1. Digital Electronics by R.P.Jain (MGH).
2. Microelectronics – Ramana (MGH).
3. Electronics Principles Malvino, TMH.

Note: **1. Five out of eight questions are to be attempted.**

2. At least one question should be set from each unit.

ME – 209 STRENGTH OF MATERIALS –I LAB
B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To study the Brinell hardness testing machine & perform the Brinell hardness test.
2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.
3. To study the Vickers hardness testing machine & perform the Vickers hardness test.
4. To study the Erichsen sheet metal testing machine & perform the Erichsen sheet metal test.
5. To study the Impact testing machine and perform the Impact tests (Izod & Charpy).
6. To study the Universal testing machine and perform the tensile test.
7. To perform compression & bending tests on UTM.
8. To perform the shear test on UTM.
9. To study the torsion testing machine and perform the torsion test.
10. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.
11. To determine Mechanical Advantage and Efficiency of Single and Double Purchase Winch Crab.
12. To determine Mechanical Advantage and Efficiency of Worm and Worm Gear of Single, Double and Triple start.
13. To determine Mechanical Advantage, Efficiency of Simple and Compound Screw Jack.
14. To find Moment of Inertia of a Fly Wheel.

Note: 1 At least ten experiments are to be performed in the semester.

2 At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus.

ECE – 231 ELECTRONICS ENGINEERING LAB
B. Tech. Semester – III (CE, CHE, ME)

L	T	P	Credits			
--	--	2	2	**Class Work**	:	**25 Marks**
				Examination	:	**25Marks**
				Total	:	**50 Marks**
				Duration of Examination	:	**3 Hours**

LIST OF EXPERIMENTS:

1. Study of V-I Characteristics of Diode.
2. Study of a Clipping and Clamping circuits.
3. Study of a Half wave rectifier.
4. Study of a Full wave rectifier.
5. Study and Analysis of a Transistor in Common Emitter Configuration.
6. Study of OP-AMP as Inverter and Comparator.
7. Study of OP-AMP as Differentiator.
8. Study of OP-AMP as Integrator.
9. Study of OP-AMP as Square wave generator.
10. Realization of Truth Tables of AND, OR, NOT Gates.
11. Realization of Truth Tables of NAND, NOR and EX-OR Gates.

Note: At least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus.

ME – 211 COMPUTER AIDED DRAFTING LAB
B. Tech. Semester – III (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	50 Marks
				Examination	:	50 Marks
				Total	:	100 Marks
				Duration of Examination	:	4 Hours

The students will be required to carry out the following exercises using educational soft-wares (AutoCad-2002, I-DEAS, Pro-Engineer etc).

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.
2. Layout drawing of a building using different layer and line colors indicating all Building details. Name the details using text commands, Make a title Block.
3. To Draw Orthographic projection Drawings (Front, Top and side) of boiler safety valve giving the name of various components of the valve.
4. Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.
5. Draw quarter sectional isometric view of a cotter joint.
6. Draw different types of bolts and nuts with internal and external threading in ACME and square threading standards. Save the bolts and nuts as blocks suitable for insertion.
7. Draw 3D models by extruding simple 2D objects, dimension and name the objects.
8. Draw a spiral by extruding a circle.

HUM - 202 FUNDAMENTALS OF MANAGEMENT
B. Tech. Semester – IV (CE, CHE, EE, ECE, ME)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

UNIT-I Meaning of management, Definitions of Management, Characteristics of management, Management Vs. Administration. Management-Art, Science and Profession. Importance of Management. Development of Management thoughts.

Principles of Management. The Management Functions, Inter-relationship of Managerial functions.

UNIT-II Nature and Significance of staffing, Personnel management, Functions of personnel management, Manpower planning, Process of manpower planning, Recruitment, Selection; Promotion - Seniority Vs. Merit. Training - objectives and types of training.

UNIT-III Production Management: Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control. Brief introduction to the concepts of material management, inventory control; its importance and various methods.

UNIT-IV Marketing Management - Definition of marketing, Marketing concept, objectives & Functions of marketing. Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process. Advertising - meaning of advertising, objectives, functions, criticism.

UNIT-V Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management. Brief Introduction to the concept of capital structure and various sources of finance.

TEXT BOOKS:

1. Principles and Practice of Management - R.S. Gupta, B.D.Sharma, N.S. Bhalla. (Kalyani Publishers)
2. Organisation and Management - R.D. Aggarwal (Tata Mc Graw Hill)

REFERENCE BOOKS:

1. Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)
2. Management – Harold, Koontz and Cyrilo Donell (Mc.Graw Hill).
3. Marketing Management – S.A. Sherlikar (Himalaya Publishing House, Bombay).
4. Financial Management - I.M. Pandey (Vikas Publishing House, New Delhi)
5. Management - James A.F. Stoner & R.Edward Freeman, PHI.

Note: Eight questions are to be set at least one question from each unit and the students will have to attempt five questions in all.

ME-202 MANUFACTURING TECHNOLOGY
B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Metal Casting Processes: Advantages and limitations, sand mold making procedure. Patterns and Cores: Pattern materials, pattern allowances, types of pattern, color coding. Molding materials: Molding sand composition, sand preparation, sand properties and testing, Sand molding processes

Unit II Cores: Types of cores, core prints, chaplets, and chills. Gating systems: Gates and gating systems, risers. Melting practice: Cupola, charge calculations. Casting cleaning and casting defects, Fettling, defects in castings and their remedies, methods of testing of castings for their soundness.

Unit III Special Casting Processes: Shell molding, precision investment casting, permanent mold casting, die casting, centrifugal casting, continuous casting.

Unit IV Metal Forming Processes: Nature of plastic deformation, hot working and cold working. Principles of rolling roll passes, roll pass sequences. Forging: Forging operations, smith forging, drop forging, press forging, forging defects.

Unit V Extrusion and other processes: Extrusion principle, hot extrusion, cold extrusion, wire drawing, swaging, tube making. Sheet metal operations: Press tools operations, hearing action, drawing dies, spinning, bending, stretch forming, embossing and coining.

Unit VI Gas and Arc Welding: Classification: oxy- acetylene welding equipment and techniques. Electric arc welding: Electrodes, manual metal arc welding, inert gas shielded arc welding, tungsten inert gas welding (TIG), metal inert gas welding(MIG), submerged arcwelding (SAW).

Unit VII Resistance Welding: Principles, resistance spot welding, resistance seam welding, upset welding, flash welding,

Unit VIII Other Welding Processes: Introduction of thermit welding, electro slag welding, electron beam welding, forge welding, friction welding, diffusion welding, brazing and soldering.

TEXT BOOKS:

1. Principles of Manufacturing Materials & Processes – Campbell J. S., Publisher – Mc Graw Hill.
2. Manufacturing Science - Ghosh A; Mallik A.K. Affiliated East-West Press Pvt. Ltd., New Delhi

REFERENCE BOOKS:

1. Foundry Technology - K.P. Sinha, D.B. Goel, Roorkee Publishing House.
2. Welding and Welding Technology, Richard L. Little Tata McGraw Hill Ltd.
3. Principle of Metal casting - Rosenthal, Tata McGraw Hill, New Delhi
4. Manufacturing Processes and Systems: Ostwald Phillip F., Munoz Jairo, John Wiley & Sons
5. Manufacturing Technology-Foundry, Forming and Welding - P.N. Rao, Tata McGraw Hill
6. Elements of Manufacturing Processes – B.S. Nagendra Parasher, RK Mittal, PHI N. Delhi

Note: In the semester examination, the examiner will set 8 questions, at least one question from each unit, and students will be required to attempt only 5 questions.

ME-204 MATERIAL SCIENCE
B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Crystallography: Review of crystal structure, space lattice, crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor, Numericals related to crystallography.

Unit II Imperfection in metal crystals: Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations, surface defects, volume defects & effects of imperfections on metal properties.

Unit III Solid solutions and phase diagram: Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, systems, phase and structural constituents, cooling curves, unary & binary phase diagrams, Gibbs's phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram.

Unit IV Heat Treatment: Principles, purpose, classification of heat treatment processes, annealing, normalizing, stress relieving, hardening, tempering, carburizing, nitriding, cyaniding, flame and induction hardening. Allotropic transformation of iron and steel, Properties of austenite, ferrite, pearlite, martensite.

Unit V Deformation of Metal: Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking. Recovery, re-crystallization and grain growth.

Unit VI Failures of metals: Failure analysis, fracture, process of fracture, types of fracture, fatigue, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue.

Unit VII Creep & Corrosion: Definition and concept, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep. Corrosion: Mechanism and effect of corrosion, prevention of corrosion.

Unit VIII Plastic, Composite and Ceramics: Polymers, formation of polymers, polymer structure and crystallinity, polymers to plastics types, reinforced particles-strengthened and dispersion strengthened composites. Ceramic materials: Types of ceramics, properties of ceramic, ceramic forming techniques, mechanical behavior of ceramic.

TEXT BOOKS:

1. Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp.
2. Material Science - Narula, Narula and Gupta. New Age Publishers

REFERENCE BOOKS:

1. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi
2. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons
3. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons., Delhi.
4. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi

Note: In the semester examination, the examiner will set 8 questions, at least one question from each unit, and students will be required to attempt only 5 questions.

ME - 206 STRENGTH OF MATERIALS- II
B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Strain Energy & Impact Loading: Definitions, expressions for strain energy stored in a body when load is applied (i) gradually, (ii) suddenly and (iii) with impact, strain energy of beams in bending, beam deflections, strain energy of shafts in twisting, energy methods in determining spring deflection, Castigliano's & Maxwell's theorems, Numericals.

Unit II Theories of Elastic Failure: Various theories of elastic failures with derivations and graphical representations, applications to problems of 2- dimensional stress system with (i) Combined direct loading and bending, and (ii) combined torsional and direct loading, Numericals.

Unit III Unsymmetrical Bending: Properties of beam cross section, product of inertia, ellipse of inertia, slope of the neutral axis, stresses & deflections, shear center and the flexural axis Numericals.

Unit IV Thin Walled Vessels : Hoop & Longitudinal stresses & strains in cylindrical & spherical vessels & their derivations under internal pressure, wire would cylinders, Numericals.

Unit V Thick Cylinders & Spheres : Derivation of Lame's equations, radial & hoop stresses and strains in thick, and compound cylinders and spherical shells subjected to internal fluid pressure only, wire wound cylinders, hub shrunk on solid shaft, Numericals.

Unit VI Rotating Rims & Discs: Stresses in uniform rotating rings & discs, rotating discs of uniform strength, stresses in (i) rotating rims, neglecting the effect of spokes, (ii) rotating cylinders, hollow cylinders & solids cylinders, Numericals.

Unit VII Bending of Curved Bars : Stresses in bars of initial large radius of curvature, bars of initial small radius of curvature, stresses in crane hooks, rings of circular & trapezoidal sections, deflection of curved bars & rings, deflection of rings by Castigliano's theorem, stresses in simple chain link, deflection of simple chain links, Problems.

Unit VIII Springs: Stresses in open coiled helical spring subjected to axial loads and twisting couples, leaf springs, flat spiral springs, concentric springs, Numericals.

TEXT BOOKS:

1. Strength of Materials – G. H. Ryder, Third Edition in SI Units 1969 Macmillan, India.
2. Mechanics of Materials– (Metric Edition) : Ferdinand P. Beer and E. Russel Johnston, Jr. Second Edition, McGraw Hill.

REFERENCE BOOKS:

1. Book of Solid Mechanics – Kazmi, Tata Mc Graw Hill
2. Strength of Materials – D.S. Bedi - S. Chand & Co. Ltd.
3. Advanced Mechanics of Solids and Structures – N. Krishan Raju and D.R.Gururaje- Narosa Publishing House.
4. Strength of Materials – Andrew Pytel and Fredinand L. Singer Fourth Edition, Int. Student Ed. Addison – Wesley Longman.

Note: In the semester examination, the examiner will set 8 questions, at least one question from each unit, and students will be required to attempt only 5 questions.

ME - 208 FLUID MECHANICS
B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Fluid Properties and Fluid Statics: Concept of fluid and flow, ideal and real fluids, continuum concept, properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, hydrostatic equation, hydrostatic forces on plane and curved surfaces, stability of floating and submerged bodies, relative equilibrium, Problems.

Unit II Fluid Kinematics: Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net, Problems.

Unit III Fluid Dynamics: Concept of system and control volume, Euler's equation, Bernoulli's equation, venturimeter, orifices, orificemeter, mouthpieces, kinetic and momentum correction factors, Impulse momentum relationship and its applications. Problems.

Unit IV Potential Flow: Uniform and vortex flow, flow past a Rankin half body, source, sink, source-sink pair and doublet, flow past a cylinder with and without circulation, Problems.

Unit V Viscous Flow: Flow regimes and Reynold's number, Relationship between shear stress and pressure gradient, uni-directional flow between stationary and moving parallel plates, movement of piston in a dashpot, power absorbed in bearings, Problems.

Unit VI Flow Through Pipes: Major and minor losses in pipes, Hagen-Poiseuilli law, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes, Problems.

Unit VII Boundary Layer Flow: Boundary layer concept, displacement, momentum and energy thickness, von-karman momentum integral equation, laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control. Streamlined and bluff bodies, lift and drag on a cylinder and an airfoil, Problems.

Unit VIII Turbulent Flow: Shear stress in turbulent flow, Prandtl mixing length hypothesis, hydraulically smooth and rough pipes, velocity distribution in pipes, friction coefficients for smooth and rough pipes, Problems.

TEXT BOOKS:

1. Fluid Mechanics – Streeter V L and Wylie E B, Mc Graw Hill
2. Mechanics of Fluids – I H Shames, Mc Graw Hill

REFERENCES BOOKS:

1. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH
2. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons
3. Fluid Mechanics and Machinery – S.K. Agarwal, TMH, New Delhi

Note: In the semester examination, the examiner will set 8 questions, at least one question from each unit, and students will be required to attempt only 5 questions.

ME - 210 ENERGY CONVERSION
B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I **Fuels and Combustion**: Classification of fuels- solid, liquid & gaseous fuels, Combustion equations, Stochiometric air-fuel ratio, Excess air, Exhaust gas analysis, Orsat apparatus. Enthalpy and internal energy of combustion, Enthalpy of formation, Adiabatic flame temperature, Gibb's and Helmholtz functions, Calorific values of fuel, Problems.

Unit II **Steam Boilers and Draft:** Classification, comparison between fire and water tube boilers, Essentials of a good boiler, Constructional and operational details of Locomotive & Lancashire Boilers, High pressure boilers- Benson, Lamont, Loeffler and Velox boilers, Boiler mountings and accessories, Boiler performance, Natural& Artificial drafts, Chimney height, Maximum draft and chimney efficiency, Boiler heat balance sheet, Problems.

Unit III **Vapour Power Cycles:** Carnot and Rankine vapour cycles, effect of operating conditions on thermal efficiency of Rankine cycle, Rankine cycle with superheat, reheat and regeneration, Binary vapour cycle, Problems..

Unit IV **Flow Through Nozzles:** Velocity and heat drop, mass discharge through a nozzle, critical pressure ratio and its significance, effect of friction and nozzle efficiency, supersaturated flow, design pressure ratio, Problems.

Unit V **Steam Turbines:** Classification, Impulse Turbine- Flow through blades, velocity diagram, power output and efficiency, maximum blade efficiency of single stage impulse turbine, blade friction, compounding of impulse turbine. Reaction Turbine-Flow through impulse reaction blades, degree of reaction, velocity diagram, power output, efficiency and blade height, comparison of impulse and impulse reaction turbines. Losses in steam turbines, stage efficiency, overall efficiency and reheat factor. Governing of steam turbines, Problems.

Unit VI **Steam Condensers:** Elements of a condensing plant, types of condensers, comparison of jet and surface condensers. Condenser vacuum, sources of air leakage & its disadvantages, vacuum efficiency and condenser efficiency, Problems.

Unit VII **Air Compressors:** Working of a single stage reciprocating air compressor; calculation of work input; Volumetric efficiency; Isothermal efficiency; Advantages of multi stage compression; Two stage compressor with Inter-cooling; Perfect Inter cooling; Optimum intercooler pressure, Problems.

TEXT BOOKS:

1. Thermal Engineering – P L Ballaney, Khanna Publishers
2. Thermodynamics and Heat Engines vol. II – R Yadav, Central Publishing House

REFERENCE BOOKS:

1. Applied Thermodynamics for Engineering Technologists – T D Eastop and A McConkey, Pearson Education
2. Heat Engineering – V P Vasandani and D S Kumar, Metropolitan Book Co Pvt Ltd

Note: In the semester examination, the examiner will set 8 questions, at least one question from each unit, and students will be required to attempt only 5 questions.

ME - 212 MATERIAL SCIENCE LAB.

B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To study crystal structures of a given specimen.
2. To study crystal imperfections in a given specimen.
3. To study microstructures of metals/ alloys.
4. To prepare solidification curve for a given specimen.
5. To study heat treatment processes (hardening and tempering) of steel specimen.
6. To study microstructure of heat-treated steel.
7. To study thermo-setting of plastics.
8. To study the creep behavior of a given specimen.
9. To study the mechanism of chemical corrosion and its protection.
10. To study the properties of various types of plastics.
11. To study Bravais lattices with the help of models.
12. To study crystal structures and crystals imperfections using ball models.

Note:

1. **At least ten experiments are to be performed in the semester.**
2. **At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus.**

ME - 214 FLUID MECHANICS LAB.

B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To determine the coefficient of impact for vanes.
2. To determine coefficient of discharge of an orifice meter.
3. To determine the coefficient of discharge of Notch (V and Rectangular types).
4. To determine the friction factor for the pipes.
5. To determine the coefficient of discharge of venturimeter.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To verify the Bernoullis Theorem.
8. To find critical Reynolds number for a pipe flow.
9. To determine the meta-centric height of a floating body.
10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
11. To show the velocity and pressure variation with radius in a forced vertex flow.

Note:

1. **At least ten experiments are to be performed in the semester.**
2. **At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus.**

ME - 216 ENERGY CONVERSION LAB
B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	**Class Work**	:	**25 Marks**
				Examination	:	**25 Marks**
				Total	:	**50 Marks**
				Duration of Examination	:	**3 Hours**

LIST OF EXPERIMENTS:

1. To study low pressure boilers and their accessories and mountings.
2. To study high pressure boilers and their accessories and mountings.
3. To prepare heat balance sheet for given boiler.
4. To study the working of impulse and reaction steam turbines..
5. To find dryness fraction of steam by separating and throttling calorimeter.
6. To find power out put & efficiency of a steam turbine.
7. To find the condenser efficiencies.
8. To study and find volumetric efficiency of a reciprocating air compressor.
9. To study cooling tower and find its efficiency.
10. To find calorific value of a sample of fuel using Bomb calorimeter.
11. Calibration of Thermometers and pressure gauges.

Note:

1. **At least ten experiments are to be performed in the semester.**
2. **At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus.**

ME - 218 MANUFACTURING PRACTICE
B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
--	--	3	3	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To make a pattern for a given casting with all the necessary allowances, parting line, running system details. Prepare the mold and make the casting. Investigate the casting defects and suggest the remedial measures.
2. To make a component involving horizontal and vertical welding and study the welding defects and suggests their remedies.
3. To prepare a job on surface grinder/cylindrical grinder and measure the various parameters of the finished piece.
4. To cut external threads on a lathe.
5. Manufacture and assembly of a unit consisting of 2 to 3 components to have the concept of tolerances and fits (shaft and bush assembly or shaft, key and bush assembly or any suitable assembly).
6. Leveling of machine tools and testing their accuracy.
7. Disassembly and assembly of small assemblies such as tail stock, bench vice, screw jack etc.
8. Development and manufacture of complex sheet-metal components such as funnel etc.
9. Multi slot cutting on milling machine by indexing.
10. Drilling and boring of a bush.
11. Modeling of 3D runner system and creation of drawing for manufacturing of the casting patterns.
12. Development of blank size for complex sheet metal components using CAD/CAE software and compare results with manual calculation method.

Note:

1. **At least ten experiments are to be performed in the semester.**
2. **At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the department as per the scope of the syllabus.**

GPME - 202 GENERAL PROFICIENCY

B. Tech. Semester – IV (Mechanical Engineering)

L	T	P	Credits			
--	--	--	2	Class Work	:	50Marks
				Total	:	50 Marks

The purpose of this course is to inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of his/ her performance / achievements in different walks of life.

The evaluation will be made by the panel of experts/ teachers, preferably interdisciplinary to be appointed by the Vice-Chancellor of the University on recommendation of the Dean Academic Affairs. A Faculty Counselor will be attached to a group of students which will remain associated with him /her during the entire period of the degree program in the University. Each faculty member will serve as a faculty counselor. They will act like a local guardian for the students associated with him / her and will help them in terms of career guidance, personal difficulties.

A. The student will present a written report before the committee with following in view:

The student will present before the committee his/her achievements during the current academic session in the form of a written report highlighting followings:

I.	Academic Performance	--------
II.	Extra Curricular Activities	**(4 Marks)**
III	Technical Activities	**(4 Marks)**
IV	Industrial, Educational tour	**(4 Marks)**
V	Sports/games	**(4 Marks)**
VI	Community Service, Hostel Activities	**(4 Marks)**

Note: Report submitted by the students should be typed on both sides of the paper.

B. A student will support his/her achievement and verbal & communicative skill through presentation before the committee. **(20 Marks)**

C. Faculty Counselor Assignment **(10 Marks)**

It will be the duty of the student to get evaluated by respective faculty counselor and to submit the counselor assessment marks in a sealed envelope to the committee.

A counselor will assess the student which reflects his/her learning graph including followings:

1. Discipline throughout the year
2. Sincerity towards study
3. How quickly the student assimilates professional value system etc.

ME - 301 KINEMATICS OF MACHINES
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Introduction: mechanism and machines, kinematic links, kinematic pairs, kinematic chains, plane and space mechanism, kinematic inversion, equivalent linkages, four link planar mechanisms, mobility and range of movement, straight line mechanisms, steering mechanisms, pantograph, problems.

Unit II Kinematic Analysis of Plane Mechanisms: displacement analysis, general plane motion, instantaneous center of velocity, graphical and analytical methods of velocity and acceleration analysis, problems.

Unit III Cams: classification of cams and followers, disc cam nomenclature, construction of displacement, velocity and acceleration diagrams for different types of follower motions, analysis of follower motions, determination of basic dimension, synthesis of cam profile by graphical and analytical approaches, cams with specified contours, tangent and circular arc cams, problems.

Unit IV Gears: fundamental law of gearing, involute spur gears, characteristics of involute action, Interference and undercutting, center distance variation, involutometry, non standard gear teeth, helical, spiral bevel and worm gears, problems.

Unit V Gear Trains: synthesis of simple, compound and reverted gear trains, analysis of epicylic gear trains, problems.

Unit VI Kinematic synthesis of Mechanisms. Type, number and dimensional synthesis, function generation, path generation and body guidance two and three position synthesis of four bar and slider crank mechanisms by graphical and analytical methods, Freudenstein's equation, precision positions, structural error; Chebychev spacing, transmission angle, problems.

Unit VII Kinematics of Spatial Mechanisms: introduction, link coordinate system, homogeneous transformation matrix, loop closure equation, kinematics of robotic manipulators, problems.

TEXT BOOKS:

1. Theory of Mechanisms and Machines: Amitabha Ghosh and Ashok Kumar Mallik, 3rd Ed. Affiliated East-West Press.
2. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Second Edition, MGH, NY.

REFERENCE BOOKS:

1. Mechanism and Machine Theory: J.S. Rao and R.V. Dukkipati Second Edition New age International.
2. Theory and Machines : S.S. Rattan, Tata McGraw Hill.

Note: In the semester examination the examiner will set 8 questions, at least one question from each unit. Students will be required to attempt 5 questions.

ME - 303 MACHINE DESIGN - I
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
3	2	--	5	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Design Philosophy: Problem identification- problem statement, specifications, constraints, Feasibility study-technical feasibility, economic & financial feasibility, societal & environmental feasibility, Generation of solution field (solution variants), Brain storming, Preliminary design, Selection of best possible solution, Detailed design, Selection of Fits and tolerances.

Unit II Selection of Materials: Classification of Engg. Materials, Mechanical properties of the commonly used engg. Materials, hardness, strength parameters with reference to stress-strain diagram, Factor of safety.

Unit III Mechanical Joints: ISO Metric Screw Threads, Bolted joints in tension, Eccentrically loaded bolted joints in shear and under combined stresses, Design of power screws, Design of various types of welding joints under different static load conditions.

Unit IV Riveted Joints, Cotter & Knuckle Joints: Design of various types of riveted joints under different static loading conditions, eccentrically loaded riveted joints, design of cotter and knuckle joints.

Unit V Belt rope and chain drives: Design of belt drives, Flat & V-belt drives, Condition for Transmission of max. Power, Selection of belt, design of rope drives, design of chain drives with sprockets.

Unit VI Keys, Couplings & Flywheel: Design of Keys – Flat, Kennedy Keys, Splines, Couplings design – Rigid & Flexible coupling, turning Moment diagram, coefficient of fluctuation of energy and speed, design of flywheel – solid disk & rimmed flywheels.

Unit VII Clutches: Various types of clutches in use, Design of friction clutches – Disc, Multidisc, Cone & Centrifugal, Torque transmitting capacity.

Unit VIII Brakes: Various types of Brakes, Self energizing condition of brakes, Design of shoe brakes – Internal & external expanding, band brakes, Thermal Considerations in brake designing.

TEXT BOOKS:

1. Mechanical Engg. Design - First Metric Editions: Joseph Edward Shigley-MGH, New York.
2. Design of Machine Elements – V.B. Bhandari – Tata McGraw Hill, New Delhi.
3. PSG Design Data Book

REFERENCE BOOKS:

1. Engineering design – George Dieter, MGH, New York.
2. Product Design and Manufacturing , A.K.Chitale and R.C.Gupta, PHI.
3. Machine Design An Integrated Approach: Robert L.Norton, Addison Wesley.
4. Machine Design : S.G. Kulkarini - Tata MacGraw Hill.
5. Design of machine elements-C S Sharma, Kamlesh Purohit, PHI.

Note: 1 In the semester examination the examiner will set 8 questions, at least one question from each unit. Students will be required to attempt 5 questions.

2. The paper setter will be required to mention in the note in the question paper that the use of only *PSG Design Data book / Machine Design Data book* by I K International Publication, New Delhi is permitted.

ME - 305 FLUID MACHINES
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Impact of free jets: Impulse – momentum principle, jet impingement - on a stationary flat plate, inclined plate and a hinged plate, at the center of a stationary vane, on a moving flat plate, inclined plate, a moving vane and a series of vanes, Jet striking tangentially at the tip of a stationary vane and moving vane(s), jet propulsion of ships. Problems

Unit II Impulse Turbines: Classification – impulse and reaction turbines, water wheels, component parts, construction, operation and governing mechanism of a Pelton wheel, work done, effective head, available head and efficiency of a Pelton wheel, design aspects, speed ratio, flow ratio, jet ratio, number of jets, number of buckets and working proportions, Performance Characteristics, governing of impulse turbines. Problems

Unit III Francis Turbines: Component parts, construction and operation of a Francis turbine, governing mechanism, work done by the turbine runner, working proportions and design parameters, slow, medium and fast runners, degree of reaction, inward/outward flow reaction turbines, Performance Characteristics, Problems.

Unit IV Propeller and Kaplan turbines: Component parts, construction and operation of a Propeller, Kaplan turbine, differences between the Francis and Kaplan turbines, draft tube - its function and different forms, Performance Characteristics, Governing of reaction turbine, Introduction to new types of turbine, Deriaz (Diagonal), Bulb, Tubular turbines, Problems.

Unit V Dimensional Analysis and Model Similitude: Dimensional homogeneity, Rayleigh's method and Buckingham's π-theorem, model studies and similitude, dimensionless numbers and their significance. Unit quantities, specific speed and model relationships for turbines, scale effect, cavitations – its causes, harmful effects and prevention, Thomas cavitation factor, permissible installation height, Problems.

Unit VI Centrifugal Pumps: Classification, velocity vector diagrams and work done, manometric efficiency, vane shape, head capacity relationship and pump losses, pressure rise in impeller, minimum starting speed, design considerations, multi-stage pumps. Similarity relations and specific speed, net positive suction head, cavitation and maximum suction lift, performance characteristics. Brief introduction to axial flow, mixed flow and submersible pumps, Problems.

Unit VII Reciprocating Pumps: Construction and operational details, discharge coefficient, volumetric efficiency and slip, work and power input, effect of acceleration and friction on indicator diagram (pressure – stroke length plot), separation, air vessels and their utility, rate of flow into or from the air vessel, maximum speed of the rotating crank, characteristic curves, centrifugal vs reciprocating pumps, brief introduction to screw, gear, vane and radial piston pumps, Problems.

Unit VIII Hydraulic systems: Function, construction and operation of Hydraulic accumulator, hydraulic intensifier, hydraulic crane, hydraulic lift and hydraulic press, Fluid coupling and torque converter, Hydraulic ram, Problems.

TEXT BOOKS:

1. Hydraulics & Fluid Mechanics – Modi & Seth, Pub. - Standard Book House, N.Delhi
2. Hydraulic Machines – Jagdish Lal, Metropolitan

REFERENCE BOOKS:

1. Fluid Mechanics and Hydraulic Machines – S S Rattan, Khanna Publishers
2. Introduction to Fluid Mechanics and Fluid Machines – S K Som and G Biswas, Tata McGraw Hill
3. Fluid Mechanics and Fluid Power Engineering – D S Kumar, S K Kataria and Sons

Note: In the semester examination the examiner will set 8 questions, at least one question from each unit. Students will be required to attempt 5 questions.

ME - 307 INTERNAL COMBUSTION ENGINES & GAS TURBINES
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

UNIT–I **Air Standard Cycles:** Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines, Wankel Engines, Assumptions made in air standard cycle; Otto cycle; diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles; sterling and Ericsson cycles; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure; deviation of actual engine cycle from ideal cycle. Problems.

UNIT–II **Carburetion, fuel Injection and Ignition systems:** Mixture requirements for various operating conditions in S.I. Engines; elementary carburetor, Requirements of a diesel injection system; types of inject systems; petrol injection, Requirements of ignition system; types of ignition systems ignition timing; spark plugs. Problems.

UNIT–III **Combustion in I.C. Engines :** S.I. engines; Ignition limits; stages of combustion in S.I. Engines; Ignition lag; velocity of flame propagation; detonation; effects of engine variables on detonation; theories of detonation; octane rating of fuels; pre-ignition; S.I. engine combustion chambers, Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; C.I. engine combustion chambers.

UNIT–IV **Lubrication and Cooling Systems:** Functions of a lubricating system, Types of lubrication system; mist, wet sump and dry sump systems; properties of lubricating oil; SAE rating of lubricants, engine performance and lubrication, Necessity of engine cooling; disadvantages of overcooling; cooling systems; air-cooling, water cooling; radiators.

UNIT–V **Engine Testing and Performance:** Performance parameters: BHP, IHP, mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, ISFC), thermal efficiency; heat balance; Basic engine measurements; fuel and air consumption, brake power, indicated power and friction power, heat lost to coolant and exhaust gases; performance curves. Problems.

UNIT–VI **Air pollution from I.C. Engine and Its remedies:** Pollutants from S.I. and C.I. Engines, Methods of emission control; alternative fuels for I.C. Engines; the current scenario on the pollution front.

UNIT–VII **Rotary Compressors:** Root and vane blowers; Static and total head values; Centrifugal compressors- Velocity diagrams, slip factor, ratio of compression, pressure coefficient, pre-whirl; Axial flow compressor- Degree of reaction, polytropic efficincy, surging, choking and stalling, performance characteristics, Problems.

UNIT–VIII **Gas Turbines**: Brayton cycle; Components of a gas turbine plant; open and closed types of gas turbine plants; Optimum pressure ratio; Improvements of the basic gas turbine cycle; multi stage compression with inter-cooling; multi stage expansion with reheating between stages; exhaust gas heat exchanger, Applications of gas turbines. Problems.

TEXT BOOKS:

1. Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.
2. Gas Turbines - V. Ganesan, Pub.- Tata McGraw Hill.
3. Engineering fundamental of the I.C.Engine – Willard W. Pulkrabek Pub.-PHI,India

REFERENCE BOOKS:

1. Internal Combustion Engines & Air pollution- Obert E.F, Pub.-Hopper & Row Pub., New York
2. Internal Combustion Engines Fundamentals- John B. Heywood, Pub.-McGraw Hill, New York

Note: In the semester examination the examiner will set 8 questions, at least one question from each unit. Students will be required to attempt 5 questions.

ME - 309 MANUFACTURING SCIENCE
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Mechanism of Metal Cutting: Deformation of metal during machining, nomenclature of lathe, milling tools, mechanics of chip formation, built-up edges, mechanics of orthogonal and oblique cutting, Merchant cutting force circle and shear angle relationship in orthogonal cutting, factors affecting tool forces. Cutting speed, feed and depth of cut, surface finish. Temperature distribution at tool chip interface. Numericals on cutting forces and Merchant circle.

Unit II Cutting Tool Materials & Cutting Fluids: Characteristics of tool materials, various types of cutting tool materials, coated tools, cutting tool selection, Purpose and types of cutting fluids, basic actions of cutting fluids, effect of cutting fluid on tool life, selections of cutting fluid.

Unit III Tool Wear and Machinability: Types of tool wear, tool life, factors governing tool life, Machinability: Definition and evaluation. Economics of machining. Numericals on tool life.

Unit IV Gear Manufacturing: Introduction, methods of manufacture. Gear generation and forming: Gear cutting by milling, single point form tool, gear hobbing and shaping. Gear finishing operations: Gear shaving, gear burnishing, gear grinding, lapping.

Unit V Unconventional Machining Processes: Abrasive jet machining: Principles, applications, process parameters. Ultrasonic machining: Principles, applications, analysis of process parameters. Electro-chemical machining and grinding: Principles, classifications, choice of electrolytes, applications. Electric discharge machining: Principles, selection of tools materials and dielectric fluid. Electron beam machining: Generation of electron beam, relative merits and demerits. Laser beam machining: Principles and applications.

Unit VI Jigs & Fixtures: Introduction, location and location devices, clamping and clamping devises, Drill Jigs, Milling Fixtures.

Unit VII Manufacturing Accuracy: Product cycle in manufacturing, part print analysis, location principles, tolerance stacking, accuracy of machining, operation selection, tolerance analysis.

Unit VIII Metrology & Machine Tools Testing: Tolerances, limits and fits, methods of linear measurement and angular measurement, Go and No Go gauges. Introduction to Machine tools testing, measuring instruments used for testing, test procedures, acceptance tests of machine tools.

TEXT BOOKS:

1. Manufacturing Technology – Metal cutting and machine Tools: P.N. Rao, T.M.H, New Delhi
2. Introduction to Jig and Tool Design: Kempster M.H.A, Hodder & Stoughton, England

REFERENCE BOOKS:

1. Principles of Machine Tools – G.C. Sen & A. Bhattacharya, Tata McGraw Hill, New Delhi
2. Manufacturing Engg.& Tech, Kalpakian, Serope Addison -Wisly Publishing Co. New York.
3. Modern Machining Processes: P.C. Pandey & H.S. Shan, T.M.H. Company, New Delhi
4. Text Book of Production Engineering: P.C. Sharma, S.Chand & Sons.

Note: In the semester examination the examiner will set 8 questions, at least one question from each unit. Students will be required to attempt 5 questions.

ME - 311 APPLIED NUMERICAL TECHNIQUES AND COMPUTING
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

UNIT – I **ERRORS IN NUMERICAL CALCULATIONS:** Introduction, Numbers and their accuracy, Absolute, relative and percentage errors and their analysis, General error formula.

UNIT – II **INTERPOLATION AND CURVE FITTING:** Taylor series and calculation of functions, Introduction to interpolation, Lagrange approximation, Newton Polynomials, Chebyshev Polynomials, Least squares line, curve fitting, Interpolation by spline functions.

UNIT – III **NUMERICAL DIFFERENTIATION AND INTEGRATION:** Approximating the derivative, Numerical differentiation formulas, Introduction to Numerical quadrature, Newton-Cotes formula, Gaussion Quadrature.

UNIT – IV **SOLUTION OF NONLINEAR EQUATIONS:** Bracketing methods for locating a root, Initial approximations and convergence criteria, Newton- Raphson and Secant methods, Solution of problems through a structural programming language such as C or Pascal.

UNIT – V **SOLUTION OF LINEAR SYSTEMS:** Direct Methods, Gaussian elimination and pivoting, Matrix inversion, UV factorization, iterative methods for linear systems, Solution of problems through a structured programming language such as C or Pascal.

UNIT – VI **EIGEN VALUE PROBLEMS:** Jacobi, Given's and Householder's methods for symmetric matrices, Rutishauser method for general matrices, Power and inverse power methods.

UNIT – VII **SOLUTION OF DIFFERENTIAL EQUATIONS:** Introduction to differential equations, Initial value problems, Euler's methods, Heun's method, Runge-Kutta methods, Taylor series method, Predictor-Corrector methods, Systems of differential equations, Boundary valve problems, Finite-difference method, Solution of problems through a structured programming language such as C or Pascal.

UNIT – VIII **PARTIAL DIFFERENTIAL EQUATIONS, EIGENVALUES AND EIGENVECTORS:** Solution of hyperbolic, parabolic and elliptic equations, The eigenvalue problem, The power method and the Jacobi's method for eigen value problems, Solution of problems through a structural programming language such as C or Pascal.

TEXT BOOKS:

1. Numerical Methods for Mathematics, Science and Engineering by John H.Mathews, PHI New Delhi.
2. Applied Numerical Methods – Carnahan, B.H., Luthar, H.A. and Wilkes, J.O., Pub.- J. Wiley, New York

REFERENCE BOOKS:

1. Numerical Solution of Differential Equations, by M.K. Jain, Published by Wiley Eastern, New York.
2. Introductory Methods of Numerical Analysis by S.D. Sastry, Published by Prentice Hall of India.
3. Numerical Methods – Hornbeck, R.W., Pub.- Prentice Hall, Englewood Cliffs, N.J.

Note:

1. **Programming exercises may be done in MATLAB.**
2. **The Instructor of the course may cover the use of software MATHEMATICA in the tutorial class.**
3. **In the semester examination, the examiner will set eight questions, at least one question from each unit. The students will be required to attend only 5 questions.**

ME - 313 KINEMATICS OF MACHINES LAB
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To study various types of Kinematic links, pairs, chains and Mechanisms.
2. To study inversions of 4 Bar Mechanisms, Single and double slider crank mechanisms.
3. To plot slider displacement, velocity and acceleration against crank rotation for single slider crank mechanism.
4. To find coefficient of friction between belt and pulley.
5. To study various type of cam and follower arrangements.
6. To plot follower displacement vs cam rotation for various Cam Follower systems.
7. To generate spur gear involute tooth profile using simulated gear shaping process.
8. To study various types of gears – Helical , cross helical worm, bevel gear.
9. To study various types of gear trains – simple, compound, reverted, epicyclic and differential.
10. To study the working of Screw Jack and determine its efficiency.
11. Create various types of linkage mechanism in CAD and simulate for motion outputs and study the relevant effects.
12. Creation of various joints like revolute, planes, spherical, cam follower and study the degree of freedom and motion patterns available.
13. To design a cam profile by using the requirement graph using on-line engineering handbook and verify the same using a 3D mechanism on CAD.

Note: **1. At least Ten experiments are to be performed in the Semester.**

2. At least eight experiments should be performed from the above list. However these experiments should include experiments at Sr. No. 11, 12 and 13. Remaining two experiments may either be performed from the above list or as designed & set by the department as per the scope of the syllabus.

ME - 315 FLUID MACHINES LAB
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To study the constructional details of a Pelton turbine and draw its fluid flow circuit.
2. To draw the following performance characteristics of Pelton turbine-constant head, constant-speed and constant efficiency curves.
3. To study the constructional details of a Francis turbine and draw its fluid flow circuit.
4. To draw the constant head, constant speed and constant efficiency performance characteristics of Francis turbine.
5. To study the construction details of a Kaplan turbine and draw its fluid flow circuit.
6. To draw the constant head, speed and efficiency curves for a Kaplan turbine.
7. To study the constructional details of a Centrifugal Pump and draw its characteristic curves.
8. To study the constructional details of a Reciprocating Pump and draw its characteristics curves.
9. To study the construction details of a Gear oil pump and its performance curves.
10. To study the constructional details of a Hydraulic Ram and determine its various efficiencies..
11. To study the model of Hydro power plant and draw its layout.

Note: **1. At least Ten experiments are to be performed in the Semester.**

2. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or as designed & set by the department as per the scope of the syllabus.

ME - 317 I. C. ENGINES & GAS TURBINES LAB
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To study the constructional details & working principles of two-stroke/ four stroke petrol engine.
2. To study the constructional detail & working of two-stroke/ four stroke diesel engine.
3. Analysis of exhaust gases from single cylinder/multi cylinder diesel/petrol engine by Orsat Apparatus.
4. To prepare heat balance sheet on multi-cylinder diesel engine/petrol engine.
5. To find the indicated horse power (IHP) on multi-cylinder petrol engine/diesel engine by Morse Test.
6. To prepare variable speed performance test of a multi-cylinder/single cylinder petrol engine/diesel engine and prepare the curves (i) bhp, ihp,fhp, vs speed (ii) volumetric efficiency & indicated specific fuel consumption vs speed.
7. To find fhp of a multi-cylinder diesel engine/petrol engine by Willian's line method & by motoring method.
8. To perform constant speed performance test on a single cylinder/multi-cylinder diesel engine & draw curves of (i) bhp vs fuel rate, air rate and A/F and (ii) bhp vs mep, mech efficiency & sfc.
9. To measure CO & Hydrocarbons in the exhaust of 2- stroke / 4-stroke petrol engine.
10. To find intensity of smoke from a single cylinder / multi-cylinder diesel engine.
11. To draw the scavenging characteristic curves of single cylinder petrol engine.
12. To study the effects of secondary air flow on bhp, sfc, Mech. Efficiency & emission of a two-stroke petrol engine.

Note: **1. At least Ten experiments are to be performed in the Semester.**

2. At least eight experiments should be performed from the above list. However these experiments should include experiments at Sr. No. 12, 13 and 14. Remaining two experiments may either be performed from the above list or as designed & set by the department as per the scope of the syllabus.

ME - 319 APPLIED NUMERICAL TECHNIQUES AND COMPUTING LAB
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

The students will be required to carry out the following exercises, that are based on the theory course ME-311: Numerical Methods and Computing, with the help of MATLAB software / Pascal / C / C++ on personal computer.

1. Solution of Non-linear equation in single variable using the method of successive bisection.
2. Solution of Non-Linear equation in single variable using the Newton Raphson, Secant, Bi – Section and Modified Euler's, method.
3. Solution of a system of simultaneous algebraic equations using the Gaussian elimination procedure.
4. Solution of a system of simultaneous algebraic equations using the Gauss-Seidel iterative method.
5. Solution of a system of simultaneous algebraic equations using the Gauss-Seidel iterative method employing the technique of successive relaxation.
6. Numerical solution of an ordinary differential equation using the Euler's method.
7. Numerical solution of an ordinary differential equation using the Runge - Kutta 4^{th} order method.
8. Numerical solution of an ordinary differential equation using the Predictor – corrector method.
9. Numerical solution of a system of two ordinary differential equation using Numerical intergration.
10. Numerical solution of an elleptic boundary value problem using the method of Finite Differences.

ME - 321 PROFESSIONAL TRAINING
B. Tech. Semester – V (Mechanical Engineering)

L	T	P	Credits			
				Class Work	:	50 Marks
--	--	2	2	Total	:	50 Marks

At the end of 4th semester each student would undergo four weeks Professional Training in an Industry/ Institute/ Professional Organization/ Research Laboratory etc. with the prior approval of the Training and Placement Officer of the University and submit in the department a typed report along with a certificate from the organization.

The typed report should be in a prescribed format.

The report will be evaluated in the V Semester by a Committee consisting of three teachers from different specialization to be constituted by the Chairperson of the department. The basis of evaluation will primarily be the knowledge and exposure of the student towards different processes and the functioning of the organization.

The student will interact with the committee through presentation to demonstrate his/her learning.

Teachers associated with evaluation work will be assigned 2 periods per week load.

ME - 302 DYNAMICS OF MACHINES
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Static and Dynamic Force Analysis: Static force analysis of planer mechanisms, dynamic force analysis including inertia and frictional forces of planer mechanisms.

Unit II Dynamics of Reciprocating Engines: engine types, indicator diagrams, gas forces, equivalent masses, inertia forces, bearing loads in a single cylinder engine, crankshaft torque, engine shaking forces.

Unit III Balancing of Rotating Components: static balance, dynamic balance, balancing of rotating masses, two plane balancing, graphical and analytical methods, balancing of rotors, balancing machines, field balancing.

Unit IV Balancing of Reciprocating Parts: Balancing of single cylinder engine, balancing of multi cylinder; inline, radial and V type engines, firing order.

Unit V Governors: introduction, types of governors, characteristics of centrifugal governors, gravity controlled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors.

Unit VI Dynamometers: types of dynamometers, Prony brake, rope brake and band brake dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer.

Unit VII Gyroscope: gyroscopes, gyroscopic forces and couples, gyroscopic stabilization, ship stabilization, stability of four wheel and two wheel vehicles moving on curved paths.

TEXT BOOKS:

1. Theory of Mechanisms and Machines: Amitabha Ghosh and Ashok kumar Mallik, Third Edition Affiliated East-West Press.
2. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Second Edition Mc Graw Hill, Inc

REFERENCE BOOKS:

1. Mechanism and Machine Theory: J.S. Rao and R.V. Dukkipati, New age International.
2. Theory and Machine (S I units) S. S. Rattan, Tata McGrawHill.

Note: In the semester examination, the examiner will set eight questions in all, at least one question from each unit and the students will be required to attempt only 5 questions.

ME - 304 MACHINE DESIGN –II

B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	2	--	5	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Design for Production ; Erogonomic and value engineering considerations in design, Role of processing in design, Design considerations for casting, forging and machining. Variable Loading : Different types of fluctuating/ variable stresses, Fatigue strength considering stress concentration factor, surface factor, size factor, reliability factor etc., Fatigue design for finite and infinite life against combined variable stresses using Goodman and Soderberg's Criterion, Fatigue design using Miner's equation, Problems.

Unit II Shafts: Detailed design of shafts for static and dynamic loading, Rigidity and deflection consideration.

Unit III Springs: Types of Springs, Design for helical springs against tension and their uses, compression and fluctuating loads, Design of leaf springs, Surging phenomenon in springs, Design Problem.

Unit IV Bearings: design of pivot and collar bearing , Selection of ball and roller bearing based on static and dynamic load carrying capacity using load-life relationship, Selection of Bearings from manufacturer's catalogue, types of lubrication – Boundary, mixed and hydrodynamic lubrication, Design of journal bearings using Raimondi and Boyd's Charts, Lubricants and their properties, Selection of suitable lubricants, Design Problems.

Unit V Gears: Classification, Selection of gears, Terminology of gears, Force analysis, Selection of material for gears, Beam & wear strength of gear tooth, Form or Lewis factor for gear tooth, Dynamic load on gear teeth -Barth equation and Buckingham equation and their comparison, Design of spur, helical, bevel & worm gear including the Consideration for maximum power transmitting capacity, Gear Lubrication, Design Problems.

TEXT BOOKS:

1. Mechanical Engg. Design- Joseph Edward Shigley-Mc Graw Hill Book Co.
2. Design of Machine Elements – V.B. Bhandari – Tata McGraw Hill, New Delhi.

REFERENCE BOOKS :

1. Engineering design – George Dieter, McGraw Hill, New York.
2. Product Design and Manufacturing –: A.K.Chitale and R.C.Gupta, PHI, New Delhi.
3. Machine Design An Integrated Approach: Robert L.Norton,Second Edition –Addison Wisley Longman
4. Machine Design : S.G. Kulkarni , TMH , New Delhi.

Note: 1. In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

2. The paper setter will be required to mention in the note in the question paper that the use of only *PSG Design Data book / Machine Design Data book* by I. K. International Publication, New Delhi is permitted.

ME – 306 HEAT TRANSFER
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

UNIT I Basics and Laws : Definition of Heat Transfer, Reversible and irreversible processes, Modes of heat flow, Combined heat transfer system and law of energy conservation.

UNIT II Steady State Heat Conduction : Introduction, I-D heat conduction through a plane wall, long hollow cylinder, hollow sphere, Conduction equation in Cartesian, polar and spherical co-ordinate systems, Numericals.

UNIT III Steady State Conduction with Heat Generation : Introduction, 1 – D heat conduction with heat sources, Extended surfaces (fins), Fin effectiveness 2-D heat conduction , Numericals.

UNIT IV Transient Heat Conduction : Systems with negligible internal resistance, Transient heat conduction in plane walls, cylinders, spheres with convective boundary conditions, Chart solution, Relaxation Method, Numericals.

UNIT V Convection: Forced convection-Thermal and hydro-dynamic boundary layers, Equation of continuity, Momentum and energy equations, Some results for flow over a flat plate and flow through tube, Fluid friction and heat transfer (Colburn analogy), Free convection from a vertical flat plate, Empirical relations for free convection from vertical and horizontal planes & cylinders, Numericals.

UNIT VI Thermal Radiation: The Stephen-Boltzmann law, The black body radiation, Shape factors and their relationships, Heat exchange between non black bodies, Electrical network for radiative exchange in an enclosure of two or three gray bodies, Radiation shields, Numericals.

UNIT VII Heat Exchangers: Classification, Performance variables, Analysis of a parallel/counter flow heat exchanger, Heat exchanger effectiveness, Numericals.

UNIT VIII Heat Transfer with Change of Phase: Laminar film condensation on a vertical plate, Drop-wise condensation, Boiling regimes, Free convective, Nucleate and film boiling, Numericals.

TEXT BOOKS:

1. Heat Transfer – J.P. Holman, John Wiley & Sons, New York.
2. Fundamentals of Heat & Mass Transfer–Incropera, F.P. & Dewill, D.P –John Willey New York.

REFERENCE BOOKS:

1. Conduction of Heat in Solids – Carslow, H.S. and J.C. Jaeger – Oxford Univ. Press.
2. Conduction Heat Transfer – Arpasi, V.S. – Addison – Wesley.
3. Compact Heat Exchangers – W.M. Keys & A.L. Landon, Mc. Graw Hill.
4. Thermal Radiation Heat Transfer – Siegel, R. and J.R. Howell, Mc. Graw Hill.
5. Heat Transmission – W.M., Mc.Adams , Mc Graw Hill.

Note: 1. In the semester examination, the examiner will set Eight questions, at least one question from each unit. The students will be required to attempt only 5 questions.

2 The paper setter will be required to mention in the note of question paper that the use of Steam tables, Charts, Graphical plots is permitted.

ME – 308 AUTOMATIC CONTROLS
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Introduction And Applications: Types of control systems ; Typical Block Diagram : Performance Analysis; Applications – Machine Tool Control, Boiler Control, Engine Governing, Aerospace Control, Active Vibration Control; Representation of Processes & Control Elements – Mathematical Modeling. Block Diagram Representation, Representation of Systems or Processes, Comparison Elements; Representation of Feedback Control systems – Block Diagram & Transfer Function Representation, Representation of a Temperature, Control System, Signal Flow Graphs, Problems.

Unit II Types of Controllers: Introduction: Types of Control Action; Hydraulic Controllers; Electronic Controllers; Pneumatic Controllers; Problems.

Unit III Transient And Steady State Response: Time Domain Representation; Laplace Transform Representation; System with Proportional Control; Proportional – cum – Derivative control; Proportional – cum – Integral Control; Error Constants; Problems.

Unit IV Frequency Response Analysis: Introduction; Closed and Open Loop Transfer Function; Polar Plots; Rectangular Plots; Nichols Plots: Equivalent Unity Feed Back Systems; Problems.

Unit V Stability Of Control Systems: Introduction; Characteristic Equation; Routh's Criterion; Nyquists Criterion, Gain & Phase Margins: Problems.

Unit VI Root Locus Method : Introduction; Root Ioci of a Second Order System; General Case; Rules for Drawing Forms of Root Ioci; Relation between Root Locus Locations and Transient Response; Parametric Variation; Problems.

Unit VII Digital Control System : Introduction; Representation of Sampled Signal; Hold Device; Pulse Transfer Function; Block Diagrams; Transient Response; Routh's Stability Criterion; Root Locus Method; Nyquists Criterion; Problems.

Unit VIII State Space Analysis Of Control Systems: Introduction; Generalized State Equation; Techniques for Deriving System State – Space Equations; Transfer Function from State Equations; Solution of State Vector Differential Equations; Discrete Systems; Problems.

TEXT BOOKS:

1. Theory & Applications of Automatic Controls by B.C. Nakra, Published by New Age International Pvt. Ltd. Publishers, New Delhi.
2. Modern Control Engg. by Ugata, Prentice Hall of India, New Delhi.

REFERENCE BOOKS:

1. Automatic Control Systems by Kuo' Published by Prentice Hall of India, New Delhi.
2. Control System Engineering, I. J. Nagrath and M. Gopal, New Age , New Delhi.

Note: In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

ME – 310 MEASUREMENTS AND INSTRUMENTATION
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Instruments and Their Representation : Introduction, Typical Applications of Instrument Systems, Functional Elements of a Measurement System, Classification of Instruments, Standards and Calibration.

Unit II Static and Dynamic characteristics of Instruments : Introduction, Accuracy, Precision, Resolution, Threshold, Sensitivity, Linearity, Hysteresis, Dead Band, Backlash, Drift, Formulation of Differential Equations for Dynamic Performance- Zero Order, First Order and Second order systems, Response of First and Second Order Systems to Step, Ramp, Impulse and Harmonic Functions.

Unit III Transducer Elements : Introduction, Analog and Digital Transducers, Electromechanical; Potentiometric, Inductive Self Generating and Non-Self Generating Types, Electromagnetic, Electrodynamic, Eddy Current, Magnetostrictive, Variable Inductance, Linearly Variable Differential Transformer, Variable Capacitance, Piezo-Electric Transducer and Associated Circuits, Unbonded and Bonded Resistance Strain Gages. Strain Gage Bridge circuits, Single Double and Four Active Arm Bridge Arrangements, Temperature Compensation, Balancing and Calibration, Ionisation Transducers, Mechano Electronic Transducers, Opto-Electrical Transducers, Photo Conductive Transducers, Photo Volatic Transducers, Digital Transducers, Frequency Domain Transducer, Vibrating String Transducer, Binary codes, Digital Encoders.

Unit IV Intermediate, Indicating and Recording Elements : Introduction Amplifiers, Mechanical, Hydraulic, Pneumatic, Optical, Electrical Amplifying elements, Compensators, Differentiating and Integrating Elements, Filters, Classification of Filters, A-D and D-A Converters, Digital Voltmeters (DVMs), Cathode Ray Oscillo scopes (CROs), Galvanometric Recorders, Magnetic Tape recorders, Data Acquisition Systems, Data Display and Storage.

Unit V Motion, Force and Torque Measurement : Introduction, Relative motion Measuring Devices, Electromechanical, Optical, Photo Electric, Moire-Fringe, Pneumatic, Absolute Motion Devices, Seismic Devices, Spring Mass & Force Balance Type, Calibration, Hydraulic Load Cell, Pneumatic Load Cell, Elastic Force Devices, Separation of Force Components, Electro Mechanical Methods, Strain Gage, Torque Transducer, Torque Meter.

Unit VI Pressure and Flow Measurement : Pressure & Flow Measurement, Introduction : Moderate Pressure Measurement, Monometers, Elastic Transducer, Dynamic Effects of Connecting Tubing, High Pressure Transducer, Low Pressure Measurement, Calibration and Testing, Quantity Meters, Positive Displacement Meters, Flow Rate Meters, Variable Head Meters, Variable Area Meters, Rotameters, Pitot-Static Tube Meter, Drag Force Flow Meter, Turbine Flow Meter, Electronic Flow Meter, Electro Magnetic Flow meter. Hot-Wire Anemometer.

Unit VII Temperature Measurement : Introduction, Measurement of Temperature, Non Electrical Methods – Solid Rod Thermometer, Bimetallic Thermometer, Liquid-in-Glass thermometer, Pressure Thermometer, Electrical Methods – Electrical Resistance Thermometers, Semiconductor Resistance Sensors (Thermistors), Thermo–Electric Sensors, Thermocouple Materials, Radiation Methods (Pyrometry), Total Radiation Pyrometer, Selective Radiation Pyrometer.

Unit VIII Basic Statistical Concepts : Types of Measured Quantities (Discrete and Continuous), Central Tendency of Data, Mode, Median, Arithmetic Mean, Best Estimate of true Value of Data, Measures of Dispersion, Range, Mean Deviation, Variance, Standard Deviation, Normal Distribution, Central Limit Theorem, Significance Test, Method of Least Squares, Graphical Representation and Curve Fitting of Data.

TEXT BOOKS:

1. Measurement systems Application and Design. Ernest O. Doebelin, Tata McGraw Hill Edition (Fourth Edition) 2002.
2. Measurement and Instrumentation in Engineering, Francis S. Tse and Ivan E. Morse, Marcel Dekker.

REFERENCE BOOKS:

1. Principles of Measurement and Instrumentation – Alan S. Morris Prentice Hall of India.
2. Mechanical Measurements : T.G. Beckwith, W.L. Buck and R.D. Marangoni Addison Wesley.
3. Instrumentation, Measurement and Analysis – B.C. Nakra and K.K. Chaudhary, TMH.
4. Mechanical Measurements by D. S. Kumar, Kataria & Sons.

Note: In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

ME – 312 INDUSTRIAL ENGINEERING
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

UNIT – I Definition of Industrial Engineering: Objectives, Method study, Principle of motion economy, Techniques of method study - Various charts, THERBLIGS, Work measurement - various methods, time study PMTS, determining time, Work sampling, Numericals.

UNIT - II Productivity & Workforce Management :Productivity - Definition, Various methods of measurement, Factors effecting productivity, Strategies for improving productivity, Various methods of Job evaluation & merit rating, Various incentive payment schemes, Behavioural aspects, Financial incentives.

UNIT - III Manufacturing Cost Analysis: Fixed & variable costs, Direct, indirect & overhead costs, & Job costing, Recovery of overheads, Standard costing, Cost control, Cost variance Analysis - Labour, material, overhead in volume, rate & efficiency, Break even Analysis, Marginal costing & contribution, Numericals.

UNIT - IV Materials Management : Strategic importance of materials in manufacturing industries, Relevant costs, Inventory control models - Economic order quantity (EOQ), Economic batch quantity (EBQ) with & without shortage, Purchase discounts, Sensitivity analysis, Inventory control systems - P,Q,Ss Systems, Service level, Stock out risk, determination of order point & safety stock, Selective inventory control - ABC, FSN, SDE, VED and three dimensional, Numericals.

UNIT - V Quality Management: Definition of quality, Various approaches, Concept of quality assurance systems, Costs of quality, Statistical quality Control (SQC), Variables & Attributes, X, R, P & C - charts, Acceptance sampling, OC - curve, Concept of AOQL, Sampling plan - Single, Double & sequential, Introduction to TQM & ISO - 9000.

UNIT - VI Production Planning & Control (PPC) : Introduction to Forecasting - Simple & Weighted moving average methods, Objectives & variables of PPC, Aggregate planning - Basic Concept, its relations with other decision areas, Decision options - Basic & mixed strategies, Master production schedule (MPS), Scheduling Operations Various methods for line & intermittent production systems, Gantt chart, Sequencing - Johnson algorithm for n-Jobs-2 machines, n- Jobs-3 machines, 2 Jobs n-machines, n-Jobs m-machines Various means of measuring effectiveness of PPC, Introduction to JIT, Numericals.

UNIT - VII Management Information Systems (MIS) : What is MIS ? Importance of MIS, Organizational & information system structure, Role of MIS in decision making, Data flow diagram, Introduction to systems analysis & design, Organizing information systems.

UNIT – VIII Product Design and Development: Various Approaches, Product life cycle, Role 3S's – Standardization, Simplification, Specialization, Introduction to value engineering and analysis, Role of Ergonomics in Product Design.

TEXT BOOKS:

1. Production & Operations Management - Chary, TMH, New Delhi.
2. Management Information Systems - Sadagopan, PHI New Delhi.
3. Modern Production Management – S.S. Buffa, Pub.- John Wiley.

REFERENCE BOOKS:

1. Operations Management - Schroeder, McGraw Hill ISE.
2. Operation Management - Monks, McGraw Hill ISE.
3. Production & Operations Management - Martinich, John Wiely SE.
4. Industrial & Systems Engineering - Turner, MIZE, CHASE, Prentice Hall Pub.

Note: In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

ME – 314 DYNAMICS OF MACHINE LAB
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To perform experiment on Watt Governor to prepare performance characteristic Curves, and to find stability & sensitivity.
2. To perform experiment on Porter Governor to prepare performance characteristic Curves, and to find stability & sensitivity.
3. To perform experiment on Proell Governor to prepare performance characteristic curves, and to find stability & sensitivity.
4. To perform experiment on Hartnell Governor to prepare performance characteristic Curves, and to find stability & sensitivity.
5. To study gyroscopic effects through models.
6. To determine gyroscopic couple on Motorized Gyroscope.
7. To perform the experiment for static balancing on static balancing machine.
8. To perform the experiment for dynamic balancing on dynamic balancing machine.
9. Determine the moment of inertia of connecting rod by compound pendulum method and tri-flair suspension pendulum.
10. To study Rope Brake Dynamometer.
11. To study Prony Brake Dynamometer.

Note: 1. Ten experiments are to be performed in the Semester.

2. At least seven experiments should be performed from the above list. Remaining three experiments should be performed as designed & set by the department as per the scope of the syllabus.

ME – 316 HEAT TRANSFER LAB
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To determine the thermal conductivity of a metallic rod.
2. To determine the thermal conductivity of an insulating power.
3. To determine the thermal conductivity of a solid by the guarded hot plate method.
4. To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.
5. To find the effectiveness of a pin fin in a rectangular duct under forced convective and plot temperature distribution along its length.
6. To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.
7. To determine average heat transfer coefficient for a externally heated horizontal pipe under forced convection & plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.
8. To measure the emmisivity of the gray body (plate) at different temperature and plot the variation of emmisivity with surface temperature.
9. To find overall heat transfer coefficient and effectiveness of a heat exchange under parallel and counter flow conditions. Also plot the temperature distribution in both the cases along the length of heat of heat exchanger.
10. To verify the Stefen-Boltzmann constant for thermal radiation.
11. To demonstrate the super thermal conducting heat pipe and compare its working with that of the best conductor i.e. copper pipe. Also plot temperature variation along the length with time or three pipes.
12. To study the two phases heat transfer unit.
13. To determine the water side overall heat transfer coefficient on a cross-flow heat exchanger.
14. Design of Heat exchanger using CAD and verification using thermal analysis package e.g. I-Deas etc.

Note: 1. Ten experiments are to be performed in the Semester.

2. At least seven experiments should be performed from the above list. Remaining three experiments should be performed as designed & set by the department as per the scope of the syllabus.

ME – 318 MEASUREMENT AND INSTRUMENTATION LAB
B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To Study various Temperature Measuring Instruments and to Estimate their Response times.
   - (a) Mercury – in glass thermometer
   - (b) Thermocouple
   - (c) Electrical resistance thermometer
   - (d) Bio-metallic strip
2. To study the working of Bourdon Pressure Gauge and to check the calibration of the gauge in a dead-weight pressure gauge calibration set up.
3. To study a Linear Variable Differential Transformer (LVDT) and use it in a simple experimental set up to measure a small displacement.
4. To study the characteristics of a pneumatic displacement gauge.
5. To measure load (tensile/compressive) using load cell on a tutor.
6. To measure torque of a rotating shaft using torsion meter/strain gauge torque transducer.
7. To measure the speed of a motor shaft with the help of non-contact type pick-ups (magnetic or photoelectric).
8. To measure the stress & strain using strain gauges mounted on simply supported beam/cantilever beam.
9. To measure static/dynamic pressure of fluid in pipe/tube using pressure transducer/pressure cell.
10. To test experimental data for Normal Distribution using Chi Square test.
11. To learn the methodology of pictorial representation of experimental data and subsequent calculations for obtaining various measures of true value and the precision of measurement using Data acquisition system/ calculator.
12. Vibration measurement by Dual Trace Digital storage Oscilloscope.
13. To find out transmission losses by a given transmission line by applying capacitive /inductive load.
14. Process Simulator.

Note:

1. **At least ten experiments are to be performed in the Semester.**
2. **At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the department as per the scope of the Syllabus.**

GPME - 302 GENERAL PROFICIENCY

B. Tech. Semester – VI (Mechanical Engineering)

L	T	P	Credits			
--	--	--	2	Class Work	:	50Marks
				Total	:	50 Marks

The purpose of this course is to inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of his/ her performance / achievements in different walks of life.

The evaluation will be made by the panel of experts/ teachers, preferably interdisciplinary to be appointed by the Vice-Chancellor of the University on recommendation of the Dean Academic Affairs. A Faculty Counselor will be attached to a group of students which will remain associated with him /her during the entire period of the degree program in the University. Each faculty member will serve as a faculty counselor. They will act like a local guardian for the students associated with him / her and will help them in terms of career guidance, personal difficulties.

C. The student will present a written report before the committee with following in view:

The student will present before the committee his/her achievements during the current academic session in the form of a written report highlighting followings:

I.	Academic Performance	--------
II.	Extra Curricular Activities	**(4 Marks)**
III	Technical Activities	**(4 Marks)**
IV	Industrial, Educational tour	**(4 Marks)**
V	Sports/games	**(4 Marks)**
VI	Community Service, Hostel Activities	**(4 Marks)**

Note: Report submitted by the students should be typed on both sides of the paper.

D. A student will support his/her achievement and verbal & communicative skill through presentation before the committee. **(20 Marks)**

C. Faculty Counselor Assignment **(10 Marks)**

It will be the duty of the student to get evaluated by respective faculty counselor and to submit the counselor assessment marks in a sealed envelope to the committee.

A counselor will assess the student which reflects his/her learning graph including followings:

1. Discipline throughout the year
2. Sincerity towards study
3. How quickly the student assimilates professional value system etc.

ME – 401 AUTOMOBILE ENGINEERING
B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Introduction to Automobiles : Classification, Components, Requirements of Automobile Body; Vehicle Frame, Separate Body & Frame, Unitised Body, Car Body Styles, Bus Body & Commercial Vehicle Body Types; Front Engine Rear Drive & Front Engine Front Drive Vehicles, Four Wheel Drive Vehicles, Safety considerations; Safety features of latest vehicle; Future trends in automobiles.

Unit II Clutches : Requirement of Clutches – Principle of Friction Clutch – Wet Type & Dry Types; Cone Clutch, Single Plate Clutch, Diaphragm Spring Clutch, Multi plate Clutch, Centrifugal Clutches, Electromagnetic Clutch, Over Running Clutch; Clutch Linkages.

Unit III Power Transmission : Requirements of transmission system; General Arrangement of Power Transmission system; Object of the Gear Box; Different types of Gear Boxes; Sliding Mesh, Constant Mesh, Synchro- mesh Gear Boxes; Epi-cyclic Gear Box, Freewheel Unit. Overdrive unit-Principle of Overdrive, Advantage of overdrive, Transaxle, Transfer cases.

Unit IV Drive Lines, Universal Joint, Differential and Drive Axles: Effect of driving thrust and torque reactions; Hotchkiss Drive, Torque Tube Drive and radius Rods; Propeller Shaft, Universal Joints, Slip Joint; Constant Velocity Universal Joints; Front Wheel Drive; Principle, Function, Construction & Operation of Differential; Rear Axles, Types of load on Rear Axles, Full Floating, three quarter Floating and Semi Floating Rear Axles.

Unit V Suspension Systems: Need of Suspension System, Types of Suspension; factors influencing ride comfort, Suspension Spring; Constructional details and characteristics of leaf springs.

Unit VI Steering System : Front Wheel geometry & Wheel alignment viz. Caster, Camber, King pin Inclination, Toe-in/Toe-out; Conditions for true rolling motions of Wheels during steering; Different types of Steering Gear Boxes; Steering linkages and layout; Power steering – Rack & Pinion Power Steering Gear, Electronics steering.

Unit VII Automotive Brakes, Tyres & Wheels : Classification of Brakes; Principle and constructional details of Drum Brakes, Disc Brakes; Brake actuating systems; Mechanical, Hydraulic, Pneumatic Brakes; Factors affecting Brake performance, Power & Power Assisted Brakes; Tyres of Wheels; Types of Tyre & their constructional details, Wheel Balancing, Tyre Rotation; Types of Tyre wear & their causes.

Unit VIII Emission Control System & Automotive Electrical : Sources of Atmospheric Pollution from the automobile, Emission Control Systems – Construction and Operation of Positive Crank Case Ventilation (PVC) Systems, Evaporative Emission Control, Heated Air Intake System, Exhaust Gas Recirculation (ECR) Systems, Air Injection System and Catalytic Converters; Purpose construction & operation of lead acid Battery, Capacity Rating & Maintenance of Batteries; Purpose and Operation of Charging Systems, Purpose and Operations of the Starting System; Vehicle Lighting System.

TEXT BOOKS:

1. Automobile Engineering by Anil Chhikara, Satya Prakashan, New Delhi.
2. Automobile Engineering by Dr. Kirpal Singh, Standard Publishers Distributors.

REFERENCE BOOKS:

1. Automotive Mechanics – Crouse / Anglin, TMH.
2. Automotive Technology – H.M. Sethi, TMH, New Delhi.
3. Automotive Mechanics – S.Srinivasan, TMH, New Delhi.
4. Automotive Mechanics – Joseph Heitner, EWP.
5. Motor Automotive Technology by Anthony E. Schwaller – Delmer Publishers, Inc.
6. The Motor Vehicle – Newton steeds Garrett, Butter Worths.

Note: In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

ME – 403 REFRIGERATION & AIR CONDITIONING

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Introduction: Definition of refrigeration & air conditioning; Necessity; Methods of refrigeration; Unit of refrigeration; Coefficient of performance (COP), Fundamentals of air-conditioning system; Refrigerants-Definition, Classification, Nomenclature, Desirable properties, Comparative study, secondary refrigerants, Introduction to eco-friendly Refrigerants; Introduction to Cryogenics.

Unit II Air Refrigeration System: Carnot refrigeration cycle. Temperature. Limitations; Brayton refrigeration or the Bell Coleman air refrigeration cycle; Necessity of cooling the aeroplane; Air craft refrigeration systems, Simple cooling and Simple evaporative types, Boot strap and Boot strap evaporative types, Regenerative type and Reduced Ambient type system, Comparison of different systems, problems.

Unit III Vapour Compression (VC) Refrigeration Systems: (A) Simple Vapour Compression (VC) Refrigeration systems-Limitations of Reversed Carnot cycle with vapour as the refrigerant; Analysis of VC cycle considering degrees of sub cooling and superheating; VC cycle on p-v, t-s and p-h diagrams; Effects of operating conditions on COP; Comparison of VC cycle with Air Refrigeration cycle.

(B) Multistage Ref. Systems- Necessity of compound compression, Compound VC cycle , Inter-cooling with liquid sub –cooling and / or water inter cooler: Multistage compression with flash inter-cooling and / or water inter-cooling; systems with individual or multiple expansion valves; Individual compression system with individual or multiple expansion valves; Individual compression systems with individual or multiple expansion valves but with and without intercoolers.

Unit IV Other Refrigeration Systems: **(A)** Vapour Absorption Refrigeration Systems – Basic Systems, Actual COP of the System, Performance, Relative merits and demerits; Properties of aqua ammonia; Electrolux Refrigeration; Problems. **(B)** Steam Jet Refrigerating System- Introduction, Analysis, Relative merits and demerits, Performance Applications, Problems. **(C)** Cascade Refrigerating Systems-Necessity Selection of Pairs of refrigerants for the system, Concept of cascade temperature, Analysis, Multistaging, Comparison with VC systems, Applications, Problems.

Unit V Psychrometry of Air & Air Conditioning Processes: properties of moist Air, Gibbs Dalton law, Sp. humidity, Dew point temperature, Degree of saturation, Relative humidity, Enthalpy, Humid specific heat, Wet bulb temp., Thermodynamics wet bulb temp., Psychrometric chart; Psychrometry of air-conditioning processes, Mixing Process, Basic processes in conditioning of air; Psychrometric processes in air washer, Problems.

Unit VI Air- Conditioning Load Calculations: Outside and inside design conditions; Sources of heating load; Sources of cooling load; Heat transfer through structure, Solar radiation, Electrical applications, Infiltration and ventilation, Heat generation inside conditioned space; Apparatus selection; Comfort chart, Problems.

Unit VII Air Conditioning Systems with Controls & Accessories: Classifications, Layout of plants; Equipment selection; Air distribution system; Duct systems Design; Filters; Refrigerant piping; Design of summer air-conditioning and Winter air conditioning systems; Temperature sensors, Pressure sensors, Humidity sensors, Actuators, Safety controls; Accessories; Problems.

Unit VIII Refrigeration and Air Conditioning Equipments: Type of compressors and their performance curves; Types of Condensers, Heat transfer in condensers; Types of expansion devices; types of evaporators, Cooling and Dehumidifying coils, Problems.

TEXT BOOKS:

1. Refrigeration & Air conditioning –R.C. Jordan and G.B. Priester, Prentice Hall of India.
2. Refrigeration & Air conditioning –C.P. Arora, TMH, New Delhi.

REFERENCE BOOKS:

1. A course in Refrigeration & Air Conditioning – Arora & Domkundwar, Dhanpat Rai & Sons.
2. Refrigeration & Air conditioning –W.F. Stocker and J.W. Jones, TMH, New Delhi.
3. Refrigeration & Air conditioning- Manohar Prasad Wiley Estern limited, New Delhi.

Note: In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

ME – 405 OPERATIONS RESEARCH
B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Introduction: Definition, role of operations research in decision-making, applications in industry. Concept on O.R. model building –Types & methods.

Unit II Linear Programming (LP): Programming definition, formulation, solution- graphical, simplex Gauss-Jordan reduction process in simplex methods, BIG-M methods computational, problems.

Unit III Deterministic Model: Transportation model-balanced & unbalanced, north west rule, Vogel's Method, least cost or matrix minimum Stepping stone method, MODI methods, degeneracy, assignment, traveling salesman, problems.

Unit IV Advanced Topic of LP: Duality, PRIMAL-DUAL relations-its solution, shadow price, economic interpretation, dual-simplex, post-optimality & sensitivity analysis, problems.

Unit V Waiting Line Models: Introduction, queue parameters, M/M/1 queue, performance of queuing systems, applications in industries, problems.

Unit VI Project Line Models: Network diagram, event, activity, defects in network, PERT & CPM, float in network, variance and probability of completion time, project cost- direct, indirect, total, optimal project cost by crashing of network, resources leveling in project, problems.

Unit VII Simulation: Introduction, design of simulation, models & experiments, model validation, process generation, time flow mechanism, Monte Carlo methods- its applications in industries, problems.

Unit VIII Decision Theory: Decision process, SIMON model types of decision making environment- certainty, risk, uncertainty, decision making with utilities, problems.

TEXT BOOKS:

1. Operation Research – TAHA, PHI, New Delhi.
2. Principle of Operations Research – Ackoff, Churchaman, arnoff, Oxford IBH, Delhi.

REFERENCE BOOKS:

1. Operation Research- Gupta & Sharma, National Publishers, New Delhi.
2. Quantitative Techniques- Vohra, TMH, New Delhi
3. Principles of operation Research (with Applications to Managerial Decisions) by H. M. Wagner, Prentice Hall of India, New Delhi.
4. Operation Research – Sharma, Gupta, Wiley Eastern, New Delhi.
5. Operation Research – Philips, Revindran, Solgeberg, Wiley ISE.

Note: Paper setter will set eight questions, at least one from each unit. Students are required to answer five questions.

ME – 407 MECHANICAL VIBRATION

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Fundamentals : Importance of Study of Vibrations, Classifications of Vibrations, Free and Forced, Undamped and Damped, Linear and Non-linear, Deterministic and Random, Harmonic Motion, Vector and Complex Number Representations, Definitions and Terminology, Periodic Functions, Harmonic Analysis, Fourier Series Expansion.

Unit II Free and Damped Vibrations : Single Degree of Freedom system, D'Alemberts Principal, Energy Methods, Rayleighs Method, Application of these Methods, Damped Free Vibrations, Logarithmic Decrement, Under Damping, Critical and Over Damping, Coulomb Damping.

Unit III Harmonically Excited Vibrations : Forced Damped Harmonic Vibration of Single Degree of Freedom Systems, Rotating Unbalance, Rotor Unbalance, Critical Speeds and Whirling of Rotating Shafts, Support Motion, Vibration Isolation, Energy Dissipated by Damping, Equivalent, Viscous Damping, Structural Damping Sharpness of Resonance, Vibration Measuring Instruments.

Unit IV Transient Vibrations: Impulse Excitation, Arbitrary Excitation, Response to Step Excitation, Base Excitation Solution by Laplace Transforms, Response Spectrum, Runge-Kutta Method.

Unit V Two Degrees of Freedom Systems : Introduction to Multi-Degree of Freedom Systems, Normal Mode Vibrations, Coordinate Coupling, Principal Coordinates, Free Vibrations in Terms of Initial Conditions, Forced Harmonic Vibrations, Vibration Absorber, Centrifugal Vibration Absorber, Vibration Damper.

Unit VI Multi degrees of Freedom Systems and Numerical Methods; Introduction, Influence Coefficients, Stiffness Matrix, Flexibility Matrix, Natural Frequencies and Normal Modes, Orthogonality of Normal Modes, Dunkerley's Equation, Method of Matrix Iteration, The Holzer Type Problem, Geared and Branched Systems, Beams.

Unit VII Normal Mode Vibration of Continuous System: Vibrating String, Longitudinal Vibrations of Rod, Torsional Vibrations of Rod, Lateral Vibrations of Beam.

TEXT BOOKS:

1. Theory of Vibrations with Applications - W.T. Thomson, Prentice Hall of India.
2. Mechanical Vibration - G.K. Grover and S.P. Nigam, Nem Chand and Sons

REFERENCE BOOKS:

1. Theory and Practice of Mechanical Vibrations - J.S. Rao and K. Gupta, Wiley Eastern Ltd.
2. Mechanical Vibrations S.S. Rao, Addison – Wesely Publishing Company

Note: In the semester examination, the examiner will set eight questions in all, at least one question from each unit & students will be required to attempt only 5 questions.

ME – 409 AUTOMOBILE ENGINEERING LAB

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To study and prepare report on the constructional details, working principles and operation of the following Automotive Engine Systems & Sub Systems.

(a) Multi-cylinder: Diesel and Petrol Engines.
(b) Engine cooling & lubricating Systems.
(c) Engine starting Systems.
(d) Contact Point & Electronic Ignition Systems.

2. To study and prepare report on the constructional details, working principles and operation of the following Fuel supply systems:

(a) Carburetors (b) Diesel Fuel Injection Systems (c) Gasoline Fuel Injection Systems.

3. To study and prepare report on the constructional details, working principles and operation of the following Automotive Clutches.

(a) Coil-Spring Clutch (b) Diaphragm – Spring Clutch. (c) Double Disk Clutch.

4. To study and prepare report on the constructional details, working principles and operation of the following Automotive Transmission systems.

(a) Synchromesh – Four speed Range.
(b) Transaxle with Dual Speed Range.
(c) Four Wheel Drive and Transfer Case.
(d) Steering Column and Floor – Shift levers.

5. To study and prepare report on the constructional details, working principles and operation of the following Automotive Drive Lines & Differentials.

(a) Rear Wheel Drive Line. (b) Front Wheel Drive Line. (c) Differentials, Drive Axles and 4 Wheel Drive Line.

6. To study and prepare report on the constructional details, working principles and operation of the following Automotive Suspension Systems.

(a) Front Suspension System. (b) Rear Suspension System.

7. To study and prepare report on the constructional details, working principles and operation of the following Automotive Steering Systems.

(a) Manual Steering Systems, e.g. Pitman –arm steering, Rack & Pinion steering. (b) Power steering Systems, e.g. Rack and Pinion Power Steering System. (c) Steering Wheels and Columns e.g. Tilt & Telescopic steering Wheels, Collapsible Steering Columns.

8. To study and prepare report on the constructional details, working principles and operation of the following Automotive Tyres & wheels.

(a) Various Types of Bias & Radial Tyres. (b) Various Types of wheels.

9. To study & prepare report on constructional details, working principles and operation of Automotive Brake systems.

(a) Hydraulic & Pneumatic Brake systems. (c) Drum Brake System. (e) Disk Brake System.
(b) Antilock Brake System. (d) System Packing & Other Brakes.

10. To study and prepare report on the constructional details, working principles and operation of Automotive Emission / Pollution control systems.

11. Modeling of any two automotive systems on 3D CAD using educational softwares (eg. 3D modeling package/Pro Engineer/I-Deas/ Solid Edge etc.)

12. Crash worthiness of the designed frame using Hypermesh and LS-Dyna solver or other software.

Note: 1. At least ten experiments are to be performed in the Semester.
2. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or as designed & set by the deptt. as per the scope of the syllabus.

ME – 411 REFERIGERATION AND AIR CONDITIONING LAB

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	25 Marks
				Examination	:	25 Marks
				Total	:	50 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

1. To study the vapour compression Refrigeration System and determine its C.O.P. and draw P-H and T-S diagrams.
2. To Study the Mechanical heat pump and find its C.O.P.
3. To study the Air and Water heat pump and find its C.O.P.
4. To study the cut- sectional models of Reciprocating and Rotary Refrigerant compressor.
5. To study the various controls used in Refrigerating & Air Conditioning systems.
6. To study the Ice- plant, its working cycle and determine its C.O.P and capacity.
7. To study the humidification, heating, cooling and dehumidification processes and plot them on Psychrometric charts.
8. To determine the By-pass factor of Heating & Cooling coils and plot them on Psychrometric charts on different inlet conditions.
9. To determine sensible heat factor of Air on re-circulated air-conditioning set up.
10. To study the chilling plant and its working cycle.

Note : 1. At least ten experiments are to be performed in the semester.

2. At least seven experiments should be performed form the above list. Remaining three experiments may either be performed from the above list or as designed & set by the department as per the scope of the syllabus.

ME – 413 PROJECT

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
--	--	4	4	Class Work	:	50 Marks
				Total	:	50 Marks

The primary objective of this course is to develop in students the professional quality of synthesis employing technical knowledge obtained in the field of Engineering & Technology through a project work involving design, analysis augmented with creativity, innovation and ingenuity.

Project involving design/ fabrication/ testing/ computer simulation/ case studies etc. which commences in the VII Semester will be completed in VIII Semester and will be evaluated through a panel of examiners consisting of the following:

Chairman of Department	: Chairperson
Project coordinator	: Member Secretary
Respective project supervisor	: Member

The student will be required to submit two copies of his/her project report to the department for record (one copy each for the department and participating teacher).

Project coordinator will be assigned the project load of maximum of 2 hrs. per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.

The format of the cover page and the organization of the body of the report for all the B.Tech. will be finalized and circulated by the Dean, Faculty of Engineering and Technology.

ME – 415 PROFESSIONAL TRAINING -II

B. Tech. Semester – VII (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	50 Marks
				Total	:	50 Marks

- At the end of 6th semester each student would undergo four weeks Professional Training in an Industry/ Institute/ Professional / Organization/ Research Laboratory etc. with the prior approval of the Training and Placement Officer of the University and submit in the department a typed report along with a certificate from the organization.
- The typed report should be in a prescribed format.
- The report will be evaluated in the VII Semester by a Committee consisting of three teachers from different specialization to be constituted by the Chairperson of the department. The basis of evaluation will primarily be the knowledge and exposure of the student towards different processes and the functioning of the organization.
- The student will interact with the committee through presentation to demonstrate his/her learning.
- Teachers associated with evaluation work will be assigned 2 periods per week load.

ME – 402 COMPUTER AIDED DESIGN

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

UNIT I **Introduction**: Introduction to CAD/CAM, Historical developments, Industrial look at CAD/CAM, Introduction to CIM; Basics of geometric and solid modelling, explicit, Implicit, intrinsic and parametric equations coordinate systems.

UNIT II **Transformations:** Introduction, transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates, 3-D scaling, shearing, rotation, reflection and translation, combined transformations, orthographic and perspective projections, reconstruction of 3-D objects.

UNIT III **Curves**: Algebraic and geometric forms, tangents and normal, blending functions re-parametrization, straight lines, conics, cubic splines, Bezier curves and B-spline curves.

UNIT IV **Surfaces**: Algebraic and geometric forms, tangents and normal, blending functions, reparametrization, sixteen point form, four curve form, plane surface, ruled surface Surface of revolution, tabulated cylinder, bi-cubic surface, bezier surface, B-spline Surface.

UNIT V **Solids:** Solid models and representation scheme, boundary representation, constructive Solid geometry, sweep representation, cell decomposition, spatial occupancy Enumeration

UNIT VI **Finite Element Modelling:** Type of FE analysis; Degree of freedom; Influence coefficient; Element and stiffness equations; Application of FE analysis to 1-D problem; Assembly procedure; General structure of FE analysis procedure.

TEXT BOOKS:

1. CAD/ CAM by Groover and Zimmer, Prantice Hall.
2. CAD/ CAM Theory and Practice by Zeid, McGraw Hill
3. Mathematical Elements for computer Graphics by David F. Rogers and J. Alan Adams, Published by Mc Graw Hill, New York

REFERENCE BOOKS:

1. CAD/CAM (Principles, Practice & Manufacturing Management) by Chirs Mc Mohan & Jimmie Browne, Published by Addison- Wesley.

Note: **In the semester examination, the examiner will set eight questions in all, at least one question from each unit. The students will be required to attempt only 5 questions**

ME – 404 POWER PLANT ENGINEERING
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
3	1	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Introduction: Energy resources and their availability, types of power plants, selection of the plants, review of basic thermodynamic cycles used in power plants.

Unit II Hydro Electric Power Plants : Rainfall and run-off measurements and plotting of various curves for estimating stream flow and size of reservoir, power plants design, construction and operation of different components of hydro-electric power plants, site selection, comparison with other types of power plants.

Unit III Steam Power Plants: Flow sheet and working of modern-thermal power plants, super critical pressure steam stations, site selection, coal storage, preparation, coal handling systems, feeding and burning of pulverized fuel, ash handling systems, dust collection-mechanical dust collector and electrostatic precipitator.

Unit IV Combined Cycles: Constant pressure gas turbine power plants, Arrangements of combined plants (steam & gas turbine power plants), re-powering systems with gas production from coal, using PFBC systems, with organic fluids, parameters affecting thermodynamic efficiency of combined cycles. Problems.

Unit V Nuclear Power Plants: Principles of nuclear energy, basic nuclear reactions, nuclear reactors-PWR, BWR, CANDU, Sodium graphite, fast breeder, homogeneous; gas cooled. Advantages and limitations, nuclear power station, waste disposal.

Unit VI Power Plant Economics: load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants- incremental rate theory, input-out put curves, efficiency, heat rate, economic load sharing, Problems.

Unit VII Non-Conventional Power Generation: Solar radiation estimation, solar energy collectors, low, medium & high temperature power plants, OTEC, wind power plants, tidal power plants, geothermal power plants.

Unit VIII Direct Energy Conversion Systems: Fuel cell, MHD power generation-principle, open & closed cycles systems, thermoelectric power generation, thermionic power generation.

TEXT BOOKS:

1. Power station Engineering and Economy by Bernhardt G.A. skrotzki and William A. Vopat – Tata Mc Graw Hill Publishing Campany Ltd., New Delhi

2. Power Plant Engineering : P.K. Nag Tata McGraw Hill second Edition 2001.

REFERENCE BOOKS:

1. Power Plant Engg. : M.M. El-Wakil McGraw Hill 1985.

Note: In the semester examination, the examiner will set eight questions in all, at least one question from each unit. The students will be required to attempt only 5 questions

ME – 406 COMPUTER AIDED DESGN LAB

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
--	--	3	3	Class Work	:	50 Marks
				Examination	:	50 Marks
				Total	:	100 Marks
				Duration of Examination	:	3 Hours

LIST OF EXPERIMENTS:

The students are required to practice at least Ten exercises of 3-D surface and solid modeling of Mechanical and Automobile components and their assemblies on any one of available CAD software like Auto-CAD, CATIA, I-dea, Pro-Engineer, Solid Edge etc.,

ME – 408 SEMINAR

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
--	--	2	2	Class Work	:	50 Marks
				Total	:	50 Marks

The objectives of the course remains

- To learn how to carry out literature search
- To learn the art of technical report writing
- To learn the art of verbal communication with the help of modern presentation techniques

A student will select a topic in emerging areas of Engineering & Technology and will carry out the task under the observation of a teacher assigned by the department.

He/ She will give a seminar talk on the same before a committee constituted by the chairperson of the department. The committee should comprise of three faculty members from different specializations. The teacher associated in the committee will be assigned 2 hours teaching load per week.

However, guiding students' seminar will not be considered towards teaching load.

The format of the cover page and the organization of the body of the seminar report for all the undergraduate programs will be finalized and circulated by the Dean, Faculty of Engineering and Technology.

ME – 413 PROJECT

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
--	--	8	8	**Class Work**	**:**	**50 Marks**
				Examination	**:**	**100 Marks**
				Total	**:**	**150 Marks**

The project started in VII Semester will be completed in VIII Semester and will be evaluated through a panel of examiners consisting of the following:

Chairperson of Department	: Chairperson
Project coordinator	: Member
External expert	: To be appointed by the University

The student will be required to submit two copies of his/her project report to the department for record (one copy each for the department and participating teacher).

Project coordinator will be assigned the project load of, maximum of 2 hrs. per week including his own guiding load of one hr. However, the guiding teacher will be assigned maximum of one period of teaching load irrespective of number of students/groups under him/her.

The format of the cover page and the organization of the body of the report for all the B. Tech. will be finalized and circulated by the Dean, Faculty of Engineering and Technology.

GFME – 402 GENERAL FITNESS FOR THE PROFESSION

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
--	--	--	4	Examination	:	100 Marks
				Total	:	100 Marks

The purpose of this course is to inculcate a sense of professionalism in a student along with personality development in terms of quality such as receiving, responding, temperament, attitude and outlook. The student efforts will be evaluated on the basis of his/ her performance / achievements in different walks of life.

The evaluation will be made by the committee of examiners constituted as under:

1. Dean, Faculty of Engineering & Technology : Chairperson
2. Chairperson of the department : Member
3. External expert : Appointed by the university

A. The student will present a written report before the committee with following in view:

The student will present before the committee his/her achievements during the current academic session in the form of a written report highlighting followings:

I.	Academic Performance	--------
II.	Extra Curricular Activities	**(8 Marks)**
III	Technical Activities	**(8 Marks)**
IV	Industrial, Educational tour	**(8 Marks)**
V	Sports/games	**(8 Marks)**
VI	Community Service, Hostel Activities	**(8 Marks)**

Note: Report submitted by the students should be typed on both sides of the paper.

B. A student will support his/her achievement and verbal & communicative skill through presentation before the examiners. **(40 Marks)**

C. Faculty Counselor Assignment **(20 Marks)**

It will be the duty of the student to get evaluated by respective faculty counselor and to submit the counselor assessment marks in a sealed envelope to the committee.

A counselor will assess the student which reflects his/her learning graph including followings:

1. Discipline throughout the year
2. Sincerity towards study
3. How quickly the student assimilates professional value system etc.

ME – 432 OPTIMIZATION METHODS FOR ENGINEERING SYSTEMS

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
4	--	--	4	**Class Work**	:	**50 Marks**
				Examination	:	**100 Marks**
				Total	:	**150 Marks**
				Duration of Examination	:	**3 Hours**

Unit I Introduction: Engineering Applications; Statement of the Optimal Problem: Classification; Optimization Techniques.

Unit II Classical Methods: Single Variable Optimization; Multivariable Optimization without any Constraints with Equality and Inequality Constraints.

Unit III One-Dimensional Minimization Methods: Uni-model Function; Elimination Methods – Dichotomous Search, Fibonacce and Golden Section Methods; Interpolation Methods – Quadratic and Cubic Interpolation Methods.

Unit IV Unconstrained Minimization Methods: Univariate, Conjugate Directions, Gradient and Variable Metric Methods.

Unit V Constrained Minimization Methods: Characteristics of a constrained problem; Direct Methods of feasible directions; Indirect Methods of interior and exterior penalty functions.

Unit VI Geometric Programming : Formulation and Solutions of Unconstrained and Constrained geometric programming problems.

Unit VII Dynamic Programming: Concept of Sub-optimization and the principle of optimality; Calculus, Tabular and Computational Methods in Dynamic Programming; An Introduction to Continuous Dynamic Programming.

Unit VIII Integer Programming : Gomory's Cutting Plane Method for Integer Linear Programming; Formulation & Solution of Integer Polynomial and Non-linear problems.

TEXT BOOKS:

1. Optimization (Theory & Applications) – S.S. Rao, Wiley Eastern Ltd., New Delhi.
2. Optimization Concepts and Applications in Engineering - Ashok D.Belegundu and Tirupathi R Chandrupatla -- Pearson Education.

REFERENCE BOOKS:

1. Optimization: Theory and Practice, C.S.G. Beveridge and R.S. Schechter, MGH, New York.

Note: In the semester examination, the examiner will set eight questions, at least one question from each unit. The students will be required to attempt only 5 questions.

ME – 434 AUTOMOBILE DESIGN

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Frame: Study of Loads, Moments and Stresses on Automobile Frame Members. Design of Frame for Passenger and Commercial Vehicles.

Unit II Suspension Springs: Design of Leaf Springs, Coil Springs and Torsion Bar Springs for automobile.

Unit III Front Axle: Analysis of Loads, Moments and Stresses at different sections of Front Axle.

Unit IV Bearings: Determination of Bearing Loads at Kingpin Bearings. Wheel Spindle Bearings, Choice and selection of Bearings

Unit V Steering Systems: Determination of Optimum Dimension and Proportions for Steering Linkages ensuring minimum error in Steering.

Unit VI Drive Line and Read Axle: Design of Propeller Shaft, Design of Final Drive Gearing, Design details of Full-floating, Semi-floating and Three Quarter Floating, Rear Axle Shafts and Rear Axle Housings.

Unit VII Clutch: Type of Clutches, Torque capacity of Clutch. Design of Clutch Components

Unit VIII Gear Box: Design of Three Speed and Four Speed Gear Boxes.

TEXT BOOKS:

1. Dean Averns,Automobile Chassis Design, llliffe Books
2. Heldt, P.M., Automotive Chassis, Chilton Co., New York
3. Automobile Design Problems, K M Aggarwal, Satya Prakashan, New Delhi
4. Auto Design, R B Gupta, Satya Prakashan, New Delhi
5. Automobile Engineering, R B Gupta, Satya Prakashan, New Delhi

REFERENCE BOOKS:

1. Steeds.W., Mechanics of Road Vehicles, llliffee Books Ltd., London
2. Giles, J.G. Steering, Suspension and Tyres, llliffee Books Ltd., London,.
3. Newton, Steeds & Garret, Motor Vehicle, llliffee Books Ltd., London,.
4. Heldt, P.M. Torque Converter, Chilton Book Co., New York,

Note: In the semester examination, the examiner will set eight questions, at least one question from each unit. The students will be required to attempt only 5 questions.

ME – 436 MECHATRONICS

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Introduction and Basics: What is Mechatronics?; A Measurement System with its constituent elements; Open and Closed Loop Systems; Sequential Controllers; Micro-processor Based Controllers; Mechatronic Approach.

Unit II Hardware of Measurement Systems; A review of Displacement, Position Velocity, Motion, Force, Fluid Pressure, Liquid Flow, Liquid Level, Temperature, Light Sensors / alongwith Performance Terminology; Selection of Sensors; Input Data by Switches; Signal Conditioning; Brief Review of Operational Amplifier; Protection; Fitering; Wheat Stone Bridge; Digital Signals; Multiplexers; Data Acqusition; Digital Signal Processing; Pulse Modulation; Data Presentation Systems – Displays; Data Presentation Elements; Magnetic Recording; Data Acquisition Systems; Testing & Calibration; Problems.

Unit III Pneumatic, Hydraulic, Mechanical and Electrical Actuation Systems: Pneumatic and Hydraulic Systems; Directional Control Valves; Valve Symbols; Pressure Control Valves; Cylinder Sequencing; Process Control Valves; Rotary Actuators; Mechanical Systems – Types of Motion, Kinematic Chains, Cams, Gear Trains, Ratchet & Pawl, Belt & Chain Drives, Bearings, Mechanical Aspect of Motor Selection; Electrical Systems; Mechanical & Solid State Switches; Solenoids; D.C. & A.C. Motors; Stepper Motors; Problems.

Unit IV System Modeling and Performance: Engg. Systems; Rotational – Translational Systems; Electro-mechanical Systems; Hydraulic – Mechanical Systems; A review of modeling of First and Second Order Systems and Performance Measures; Transfer Functions for first order System, Second Order System, Systems in series & Systems with Feedback Loops; Frequency Response of First Order and Second Order Systems; Bode Plots: Performance Specifications: Stability; Problems.

Unit V Closed Loop Controllers: Continuous and Discrete Processes – Lag, Steady State Error; Control Modes; Two- step Mode; Proportional Mode – Electronic Proportional Controllers; Derivative Control – Proportional plus Derivative Control; Integral Control - Proportional plus Integral Control; PID Controller – Operational Amplifier PID Circuits; Digital Controllers – Implementing Control Modes; Control System Performance; Controller Tuning – Process Reaction Method & Ultimate Cycle Method; Velocity Control; Adaptative Control; Problems.

Unit VI Digital Logic and Programmable Logic Controllers : A Review of Number Systems & Logic Gates; Boolean Algebra; Kanaugh Maps; Sequential Logic; Basic Structure of Programmable Logic Controllers; Input/ Output Processing; Programming; Timers, Internal Relays and Counters; Master & Jump Controls; Data Handling; Analogue Input/ Output; Selection of a PLC; Problems.

Unit VII Microprocessors and Input/Output Systems: Control; Microcomputer Structure; Micro- controllers; Applications; Programming Languages; Instruction Sets; Assembly Language Programs; Subroutines; Why C Language ? A review of Program Structure, Branches, Loops, Arrays, Pointer; Examples of Programs; Interfacing; Input/ Output; Interface Requirements; Peripheral Interface Adaptors; Serial Communication Interface; Examples of Interfacing; Problems.

Unit VIII Design and Mechatronics: Design Process; Traditional and Mechantronics Design; Possible Mechatronics design solutions for Timed Switch, Wind Screen Wiper Motion, Bath Room Scale, A Pick & Place Robot, Automatic Camera, Engine Management System & Bar Code Recorder.

TEXT BOOKS:

1. Mechatronics by W. Bolton, Published by Addition Wesley.
2. Mechatronics System Design – Devdas Shetty and Richard A. Kolx Brooks/ Cole 1997.

REFERENCE BOOKS:

1. Introduction to Mechatronics and Measuring System : david G. Alciation and Michael B. Hist and Tata McGraw Hill
2. Mechtronics – Sensing to Implementation - C.R.Venkataraman, Sapna

Note: In the semester examination, the examiner will set eight questions, at least one question from each unit. The students will be required to attempt only 5 questions.

ME – 438 FLEXIBLE MANUFACTURING SYSTEMS

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Automation: Types of automation, reasons for automating, automation strategies, Detroit-type automation: Automated flow lines, methods of work part transport, Transfer mechanisms, buffer storage, automation for machining operations.

Unit II Automated assembly systems: Design for automated assembly, types of automated assembly systems, part feeding devices, quantitative analysis of the delivery system operation, analysis of a single-station assembly machine, numericals.

Unit III Group Technology: Part families, parts classification and coding, types of classification and coding systems. Machine cell design: The composite part concept, types of cell designs, determining the best machine arrangement, benefits of group technology.

Unit IV Flexible Manufacturing Systems: Components of an FMS, types of systems, where to apply FMS technology, FMS work stations. Material handling and storage system: Functions of the handling system, FMS layout configurations. Material handling equipment. Computer control system: Computer function, FMS data file, system reports. Planning the FMS, analysis methods for FMS, applications and benefits.

Unit V Robotic technology: Joints and links, common robot configurations, work volume, types of robot control, accuracy and repeatability, other specifications, end effectors, sensors in robotics.

Unit VI Robot programming: Types of programming, lead through programming, motion Programming, interlocks, advantages and disadvantages. Robot languages: Motion programming, simulation and off-line programming, work cell control.

Unit VII Robot applications: Characteristics of robot applications, robot cell design, types of robot applications: Material handling, processing operations, assembly and inspection.

TEXT BOOKS:

1. Automation, Production Systems and Computer Integrated Manufacturing. Groover M.P, Prentice Hall of India.

2. CAD/CAM – Groover M.P, Zimmers E.W, Prentice Hall of India.

REFERENCE BOOKS:

1. Approach to Computer Integrated Design and Manufacturing Nanua Singh, John Wiley and Sons, 1998.

2. Production Management Systems: A CIM Perspective Browne J, Harhen J, Shivnan J, Addison Wesley, 2nd Ed. 1996.

Note: In the semester examination the examiner will set 8 questions, at least one question from each unit. Students will be required to attempt five questions.

ME – 440 RELIABILITY ENGINEERING
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Reliability: Definition; Probability Concept; Addition of Probabilities; Complimentary Events; Kolmogorov Axioms.

Unit II Failure Data Analysis: Introduction, Mean Failure Rate, Mean Time to Failure (MTTF), Mean Time between Failures (MTBF), Graphical Plots, MTTF in terms of Failure Density, MTTF in Integral Form.

Unit III Hazard Models: Introduction, Constant Hazard; Linearly Increasing Hazard, the Weibull Model, Density Function and Distribution Function, Reliability Analysis, Important Distributions and their Choice, Standard Deviation and Variance.

Unit IV Conditional Probability: Introduction, Multiplication Rule, Independent Events, Venn Diagram, Hazard Rate as conditional probability, Bayes Theorem.

Unit V System Reliability: Series. Parallel and Mixed Configurations, Complex Systems, Logic Diagrams, Markov Models.

Unit VI Reliability Improvement & Repairable Systems: Redundancy, Element, Unit and standby Redundancy, Optimization; Reliability cost trade- off, Introduction to Repairable Systems, Instantaneous Repair Rate, MTTR, Reliability and Availability Functions, Important Applications.

Unit VII Fault-Tree Analysis and Other Techniques: Fault-tree Construction, Calculation of Reliability, Tie- set and Minimal Tie-set.

Unit VIII Maintainability and Availability: Introduction, Maintenance Planning, Reliability and Maintainability trade off.

TEXT BOOKS:

1. Reliability Engineering, L.S. Srinath, Affiliated East-West Press, New Delhi.
2. Reliability Engineering, A.K.Govil, Tata Mc-Graw Hill, New Delhi.

REFERENCE BOOKS:

1. Reliability Engineering, L.Balagurusamy, Tata Mc-Graw Hill, New Delhi, 1984.
2. Reliability Based Design, S. Rao, Mc-Graw Hill, 1992.
3. Reliability in Engineering Design, K.C. Kapur and L.R. Lamberson, Wiley Publications.
4. Reliability Engineering, D.J. Smith, 1972, E.W. Publications.

Note: In the semester examination, the examiner will set eight questions, at least one question from each unit. The students will be required to attempt only 5 questions.

ME – 442 ROBOTICS ENGINEERING

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Robotic Manipulation: Automation and Robots; Robot Classification – Drive Technologies, Work-Envelope Geometries, Motion Control Methods, Applications; Robot Specifications – No. of Axes, Capacity and Speed, Reach and Stroke, Tool Orientation, Repeatability, Precision, Accuracy, Operating Environment, An Example; Rhino X-3.

Unit II Direct Kinematics: The Arm Equation Homogenous Co-ordinates – Frames, Translations and Rotations, Composite Homogenous Transformations; Screw Transformations; Link Co-ordinates; The Arm Equation; A Five-Axis Articulated Robot; A Four-Axis Scara Robot; A Six-Axis Articulated Robot; Problems.

Unit III Inverse Kinematics: Solving the Arm Equation: The Inverse Kinematics Problem; General Properties of Solutions; Tool Configuration; Inverse Kinematics of a Five-Axis Articulated Robot, Four-Axis Scara Robot, Six-Axis Articulated Robot and Three-Axis Planer Articulated Robot; A Robotic Work Cell; Problems.

Unit IV Work Space Analysis and Trajectory Planning : Work Space Analysis; Work Envelope of a Five-Axis Articulated Robot; Work Envelope of a Four Axis Scrara Robot; Work Space Fixtures; The Pick and Place Operation; Continuous Path Motion; Interpolated Motion; Straight Line Motion; Problems.

Unit V Differential Motion and Statics : The Tool Configuration Jacobian Matrix; Joint – Space Singularties; Generalised Inverses; Resolved – Motion Rate Control; $n > 6$; Rate Control of Reduntant Rebots : $n > 6$; Rate Control using (1) – Inverses; The Manipulator Jacobian; Induced Joint Torques and Forces; Problems.

Unit VI Manipulator Dynamics : Lagrange's Equation; Kinetic & Potential Energy; Generalised Force; Lagrange – Euler Dynamic Model; Dynamic Models of a Two-Axis Planer Articulated Robot and A Three-Axis SCARA Robot; Direct & Inverse Dynamics; Recuresive Newton - Euler Formulation; Dynamic Model of a One-Axis Robot; Problems.

Unit VII Robot Control : The Control Problems; State Equations; Constant Solutions; Linear Feedback Systems; Single-Axis PID Control; PD-Gravity Control; Computed –Torque Control; Variable-structure Control; Impedance Control; Problems.

TEXT BOOKS:

1. Fundamental of Robotics (Analysis & Control) by Robert J.Schilling, Published by PHI, Pvt. Ltd., New Delhi.
2. Introduction to Robotics (Mechanics & Control) by John J. Craig, Published by Addition Wesley (Int. Student Edition).

REFERENCE BOOKS:

1. Analysical Robotics & Mechatronics by Wolfram Stadler, Published by Mc-Graw Hill, Inc., New Delhi.
2. Industrial Robotics - Technology, Programming & Applications by Mikell P. Grover, Weiss, Nagel and Ordef , Published by Mc-Graw Hill International Edition.
3. A Robot Engg. Test Book - Mohsen Shahinpoor, Harper & Low, Publishing New York.
4. Robotic Engineering – An Integrated Approach: Richard D.Klafter, Thomas A. Chmielewski and Michael Negin PHI.
5. Foundations of Robotics Analysis and Control - Tsuneo Yashikawa MIT Press 1990, Indian Reprint 1998.
6. Robots and Control - R.K.Mittal and I.J.Nagrath - Tata McGraw Hill 2003.

Note: In the semester examination, the examiner will set eight questions, at least one question from each unit. The students will be required to attempt only 5 questions.

ME – 444 ERGONOMICS AND WORK PLACE DESIGN

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Basic Principles of Ergonomics, Anthropometry, Posture and Health; Anthropometry Practical; Displays, Controls and HMI; Tools and Equipment Design; Workplace Design and Assessment; Task Analysis; Questionnaire and Interview Design; Product Design and Evaluation; Designing for manufacture and maintenance; Health and Safety Legislation and Ergonomics.

Unit II Application of Ergonomics Principles, Cognitive Ergonomics, Human Information Processing; Memory; Reading; Perception; Navigation; Problem Solving; Decision Making, Human-Computer Interaction, Input/Output Technology, Usability; Evaluation; Health problems.

Unit III Future Systems, Job Design, Scientific Management, Enrichment, Enlargement, Rotation, Cells, Shift work, Management Style and Job Design, Change Management. New Technology, Unemployment, Deskilling, Introducing new technology. Questionaire design and assessment. Task analysis techniques. Measurement of human error and risk. Use of simulation and prototypes. Product Evaluation. Experimental Design.

Unit IV Case Studies: A set of case studies will be used to demonstrate how ergnomics has lead to changes in work activity, safety and product design. Case studies will include advanced computer applicatons, workplace assessment and re-design, accident analysis and industrial inspection, and in manufacturing. Students will be required to apply the principles to a real life ergonomic design as applied to a product, service or computer application.

TEXT BOOKS:

1. Work Design: Industrial Ergonomics – Knoz, Stephan A., Johnson, Steven, Holcomb Hathaway, Scottsdale, AZ.
2. Human factors in engineering and design – Sanders, M.S. & McCormick, E.J., 6th ed., McGraw-Hill, New York.

REFERENCE BOOKS:

1. Ergonomics: Man in his working environment- Murrell, K.F.H, Champan & Hall, London.
2. Man – Machine Engineering – Chapanis A: Wordsworth Publishing Co.
3. The Practice and Management of Industrial Ergonomics – Alexander, D.C., Prentice-Hall, Englewood Cliffs, NJ.
4. Textbook of Work Physiology – Astrand, P.O. & Rhodahl, K.– McGraw-Hill, New York.
5. Human Factors in Lighting – Boyce, P.R. Macmillan, New York.
6. The Ergonomics of Workspaces and Machines : A design manual – Clark, T.S. & Corlett, E.N. Taylor & Francis, London.
7. Ergonomics at work. Oborne, D Wiley, London.
8. Bodyspace–Anthropometry, Ergonomics and Design. – Pheasant, S. Taylor & Francis,.

Note: In the semester examination, the examiner will set eight questions in all , taking at least two question from each unit. The students have to attempt 5 questions.

ME – 446 MODERN MANUFACTURING PROCESSES

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Mechanical Processes: Ultrasonic Machining- Elements of process, cutting tool system design, effect of parameters, economic considerations, applications, limitations of the process, advantages and disadvantages. Abrasive Jet Machining- Variables in AJM, metal removal rate in AJM. Water Jet Machining- Jet cutting equipments, process details, advantages and applications.

Unit II Electrochemical and Chemical Metal Removal Processes: Electrochemical Machining- Elements of ECM process, tool work gap, chemistry of the process, metal removal rate, accuracy, surface finish and other work material characteristics, economics, advantages, applications, limitations. Electrochemical Grinding - Material removal, surface finish, accuracy, advantages, applications.

Unit III Thermal Metal Removal Processes: Electric Discharge Machining (EDM) or spark erosion machining processes, mechanism of metal removal, spark erosion generators, electrode feed control, dielectric fluids, flushing, electrodes for spark erosion, selection of electrode material, tool electrode design, surface finish, machining accuracy, machine tool selection, applications. Wire cut EDM. Laser beam machining (LBM)- Apparatus, material removal, cutting speed and accuracy of cut, metallurgical effects, advantages and limitations.

Unit IV Plasma Arc Machining (PAM): Plasma, non thermal generation of plasma, mechanism of metal removal, PAM parameters, equipments for D.C. plasma torch unit, safety precautions, economics, other applications of plasma jets. Electron Beam Machining (EBM) - Generation and control of electron beam, theory of electron beam machining, process capabilities and limitations.

TEXT BOOKS:

1. Modern Machining Processes – P.C.Pandey, H.S.Shan, Tata McGraw Hill
2. Machining Science- Ghosh and Malik, Affiliated East-West Press

REFERENCE BOOKS:

1. Non Traditional Manufacturing Processes- Benedict G.F, Marcel Dekker
2. Advanced Methods of Machining- Mc Geongh J.A, Chapman and Hall

Note: In the semester examination, the examiner will set eight questions in all , taking at least 2 questions from each unit. The students will be required to attempt only five questions.

ME – 448 EMERGING AUTOMOTIVE TECHNOLOGIES

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

UNIT I The Future Of The Automotive Industry : Challenges and Concepts for the 21st century. Crucial issues facing the industry and approaches to meet these challenges.

UNIT II Fuel Cell Technology For Vehicles : What is fuel cell, Type of fuel cell, Advantages of fuel cell. Current state of the technology. Potential and challenges. Advantages and disadvantages of hydrogen fuel.

UNIT III Latest Engine Technology Features : Advances in diesel engine technology. Direct fuel injection Gasoline engine. Diesel particulate emission control. Throttling by wire. Variable Valve Timing, Method used to effect variable Valve Timing. Electromagnetic Valves, Camless engine actuation.

UNIT IV 42 Volt System : Need, benefits, potentials and challenges. Technology Implications for the Automotive Industry. Technological evolution that will occur as a result of the adoption of 42 volt systems.

UNIT V Electrical And Hybrid Vehicles : Types of hybrid systems, Objective and Advantages of hybrid systems. Current status, Future developments and Prospects of Hybrid Vehicles

UNIT VI Integrated Starter Alternator: Starts stop operation, Power Assist, Regenerative Braking. Advanced lead acid batteries, Alkaline batteries, Lithium batteries, Development of new energy storage systems, Deep discharge and rapid charging ultra capacitors.

UNIT VII X-By Wire Technology : What is X-By Wire, Advantage over hydraulic systems. Use of Automotive micro controllers. Types of censors. Use of actuators in an automobile environment.

UNIT VIII Vehicles Systems : Constantly Variable Transmission, Benefits, Brake by wire, Advantages over power Braking System. Electrical assist steering, Steering by wire, Advantages of Steering by wire. Semi-active and fully-active suspension system. Advantages of fully active suspension system.

TEXT & REFERENCE BOOKS:

1. Advanced Vehicle Technologies by Heinz Heisler-SAE International Publication.
2. Electric and Hybrid Electric vehicles by Ronald K. Jurgen.- SAE International Publication
3. Electronic Braking, Traction and Stability control-SAE Hardbound papers.
4. Electronics steering and suspension systems- SAE Hardbound papers.
5. 42 Volt system by Daniel J. Holt- SAE International Publication
6. Diesel Particulate Emission by J.H. Johnson- SAE Hardbound papers.
7. Fuel Cell Technologies for vehicles by Richard Stobart- SAE Hardbound papers.

Note: In the semester examination the examiner will set 8 questions, at least one question from each unit. Students will be required to attempt five questions.

ME – 450 MANUFACTURING MANAGEMENT
B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I Manufacturing Systems Designs: Definition, Systems, Subsystems, Systems Approach Fundamentals, Systems Approach for designing, Manufacturing Systems, Systematic Layout Planning (SLP),Computerized Plant Layout- CRAFT, ALDEP, CORELAP, Assembly Line balancing, Problems and solutions of assembly lines, Group Technology & Cellular Systems, Classification & Grouping, overview of FMS. Strategic consideration for comparison of various systems.

Unit II Manufacturing Systems Economics: Concept of time value of money, Preparation of time profile of project, Single payment, Equal Series payment, various machine and project selection & evaluation techniques: Payback period, Present worth, Equivalent annual cost, Cost- benefit ratio, Evaluation for both equal & unequal life. Depreciation concept various methods-straight line, declining balance, Sum of the digits, Sinking fund.

Unit III New Product Development (NPD): Product Development, Customer Need, Strategies for New Product Development, Product life cycle, Product status. Corporate Design Strategies, Japanese Approach to NPD. PUGH total Design approach, PAHL & BEITZ Approach, Project Approach, Cross functional Integration – Design, manufacturing, Marketing, Concurrent Engineering, Modular Design, Standardization Value Engineering & Analysis.

Unit IV Manufacturing Planning & Control Systems: Overview of Aggregate Planning Models, Linear Decision Rules, Management Coefficient, Direct Search Methods, Master Production Schedule, Modular Bill and Materials, Capacity planning & control, language, medium range, short range capacity planning, Just- in Time (JIT), Manufacturing –Philosophy, Elements, KANBAK, effects on layout, workers & vendors, optimized production technology (OPT).

Unit V Forecasting Methods: Forecasting Framework, Forecasting cost and accuracy, Forecasting Uses and Methods – Delphi, Exponential Smoothing, Forecasting Errors – MAD, Regression Methods _ Linear Model for single & multiple variables, Brief idea of computerized forecasting systems.

Unit VI Material Requirements Planning (MRP): Definition of MRP systems. MRP versus Order point, MRP Elements, Types of MRP – MRP I & II. Structured Bill of Materials. Regenerative & Net change MRP, Operating an MRP, Integration of Production & Inventory Control.

Unit VII Maintenance & Reliability: Concept of preventive & breakdown maintenance, maintenance cost, optimal preventive maintenance simple replacement models- individual and group replacement, MAPI - methods, reliability definitions, failure analysis and curve, systems reliability- series parallel, redundancy, methods of improving reliability, MTBF, MTTR, Maintainability, availability, brief concept of tero-technology.

TEXT BOOKS:

1. Operations Management – SCHOROEDER, MGH, New York.
2. Production Operations Management – CHARY, TMH, New Delhi.

REFERENCE BOOKS:

1. Production Operations Management – ADAM & EBERT, PHL, New Delhi
2. Operational Management –MONKS, McGraw Hill, Int.
3. Production & Operations Management – I. Hill, Prentice Hall, Int.
4. Production Planning & Inventory Control – NARASIMHAM etal, PHL, New Delhi
5. Production & Operation Management- Panneerselvam, PHI, New Delhi
6. Managing for total Quality-LOGOTHETIS, PHI, New Delhi
7. Concept of Reliability Engineering –L.S. Srinath, Affiliated East West.
8. Revolutionizing Product Development – WHEELWRIGHT & CLARK, Free Press.
9. Management in Engineering – FREEMAN-BALL & BALKWILL, PHI, New Delhi.
10. Production & Operations Management – MARTINICH, John Wiely SE, New Delhi.

Note: In the semester examination the examiner will set 8 questions, at least one question from each unit. Students will be required to attempt five questions.

ME – 452 QUALITY ENGINEERING

B. Tech. Semester – VIII (Mechanical Engineering)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit I **Introduction:** Definition of quality and its meaning and importance in industry, concept and scope of total quality control, quality systems, quality assurance and ISO 9000 Quality system standards, Quality costs and economics of quality

Unit II **Control charts:** causes of variation, statistical aspect of control charting, concept of rational sub-grouping and detecting patterns on the control charts, control charts for variables and attributes: X and R, X and s, p, np, c and u charts; specification and tolerances, natural tolerance limits, specification limits, process capability ratio and analysis and narrow limit gauging

Unit III **Basic Statistical concepts:** Descriptions of Binomial, Poissons, and Normal distribution with practical examples, basics of sampling distribution.

Unit IV **Acceptance Sampling:** Principle of acceptance sampling, Acceptance sampling by attributes: single, multiple and sequential sampling plans, lot quality protection and average outgoing quality protection, Acceptance sampling by variables: variable sampling plans for process parameters,

Unit V **Total quality Management:** Basic concepts of TQM, historical review, leadership: concepts, role of senior management, quality council, quality statements, strategic planning, Deming philosophy, barriers to TQM implementation, TQM principles,.

Unit VI **Modern Quality Management Techniques:** TQM tools: Benchmarking, QFD, Taguchi quality loss function, TPM, FMEA, Lean Manufacturing, continuous improvement techniques, JIT systems, pareto diagrams, cause and effect diagrams, scatter diagram, run charts, affinity diagrams, inter-relationship diagram, process decision program charts

TEXT BOOKS:

1. Fundamentals of quality control and improvement, A Mitra, Mcmillan pub. Company, NY
2. Introduction to SQC, Montgomery DC, 3e, Wiley, New Delhi.

REFERENCE BOOKS:

1. Fundamentals of Applied Statistics, Gupta and Kapoor, Sultan Chand and Sons, New Delhi.
2. Quality planning and Analysis, Juran and Gryna, TMH, New Delhi

Note: **In the semester examination the examiner will set 8 questions, at least one question from each unit. Students will be required to attempt five questions.**

HUM – 451 LANGUAGE SKILLS FOR ENGINEERS

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

The real challenge before the students starts when they cross the threshold of the college after completing their degree. They, all of a sudden, find themselves competing for job/ P.G. Degrees, through various entrance tests and interviews. Verbal ability forms a major portion of these tests. Without sound language skills and its semantic-syntactic know-how, the students with engineering background find themselves almost under- prepared for such tests. With this difficulty of students in mind, this course is proposed to make them technically proficient in handling the language skills required in competitive exams. The course would expose students to almost all variety of items, the common run of such tests as CAT, GMAT etc. And in the context of LPG, this cutting edge competence becomes imperative, and no professional education can afford to overlook this aspect.

UNIT I **Remedial English**: Parts of speech; Gerunds, participles and infinitives; Clauses; Sentence-constructions (unity; avoidance of choppy and rambling sentences, logic and consistency, conciseness, sequencing of ideas); Sentence errors - agreement between verb and subject, pronoun and antecedents, sequence of tenses, problems involving modifiers (dangling and misplaced modifiers); Shifts in point of view - consistency of number and person, tense, mood, voice and subject; Parallelism; Omissions and mixed constructions.

UNIT II **Vocabulary**: Methods of building vocabulary - etymological roots, prefixes and suffixes; Commonly used foreign words and phrases; spelling; words often confused; synonyms and homonyms; one word substitutes; verbal idioms.

UNIT III **Punctuation and Mechanics**: End Punctuation; Internal Punctuation; Word Punctuation.

UNIT IV **Comprehension:** Abstracting; Summarising; Observations, Findings and Conclusions; Illustration and Inductive Logic; Deduction and Analogy.

UNIT V **Presentation:** Oral presentation - Extempore, discussion on topics of contemporary relevance, interviews.

Note: Eight questions will be set and students will be required to attempt five questions in all.

SUGGESTED READING:

1. Working with Words by R.Gairns and S.Redman, Cambridge University Press, London.
2. Meanings into Words – Upper Intermediate Students Book, Doff/jones, Foundation Books (Cambridge university Press), Delhi.
3. A Practical English Grammar by A.J. Thomson and A.V. Martinet, OUP, Delhi.
4. Examine your English by Margaret M. Maison, Orient Longman, New Delhi.
5. A Practical Guide to Colloquial Idiom by W.J. Ball, Longman.
6. A guide to Correct English by L.A. Hill, Oxford.
7. Structural Essentials of English by H. Whitehall, Longman.
8. Advanced English Practice by B.D. Graver, OUP. Delhi.
9. Public Speaking, Sudha Publication Pvt. Ltd., New Delhi.
10. Group Discussion, Sudha Publication Pvt. Ltd., New Delhi.

HUM – 453 HUMAN RESOURCE MANAGEMENT

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit-I **Understanding Organisational Behaviour:** Definition, Goals of Organisational behaviour. Key forces affecting Organisational Behaviour. Fundamental Concepts of Organisational Behaviour.

Unit-II **Motivation:** Meaning, Objectives and importance of motivation. Theories of Motivation, Maslow's theory, Mc Greger's Theory, Herzberg's theory.

Morale : Meaning; Factors affecting morale, types of morale, morale and productivity, Evaluation of morale, improving morale.

Unit-III **Communication:** Definition & importance of Communcation; Formal & informal communication, Barriers in communication.

Unit-IV **Leadership:** Definition & importance, Nature of leadership various approaches to leadership styles.

Unit-V Importance of human resources in industry, Definition of human resource management, mechanical approach towards personnel, Paternalism, Social system approach.

Unit-VI Need for human resource planning, process of human resource planning, Methods of recruitment, Psychological tests and interviewing, Meaning and importance of placement, Meaning and techniques of induction. Training and development : Concepts of training and development, Importance of training and development, Management development its nature, purpose and method.

Unit-VII Significant factors affecting compensation, Methods of wage payment, Wage differentials, Causes of difference in Wages, Types of wage differentials, Wage incentives, Meaning, Objectives, types of incentive plans.

TEXT BOOKS:

1. Human Resource and Personnel Management – K. Aswathappa – Tata McGraw Hill Publishing Company Ltd.
2. Personnel Management : C.B. Mamoria, Himalaya Publishing House.
3. Organisational Behaviour – Dr. L.M. Prasad (Sultan Chand & Sons).

REFERENCE BOOKS:

1. Personnel Management & Industrial Relations : Dr. T.N. Bhagoliwal: Sahitya Bhawan Agra.
2. Personnel Management : V.G. Karnik, Jaico Publishing House.
3. Personnel management & Industrial Relation: Tripathi: Sultan Chand & Sons.
4. Personnel Management – Arun Monappa & Mirza Saiyadain – Tata McGraw Hill Publishing Co. Ltd.
5. Personnel Management and Industrial Relations – D.C. Sharma & R.C. Sharma S.J. Publications.
6. Principles of Personnel Management – Edwin B. Flippo (McGraw Hill).
7. Organisational Behaviour – K. Adwathappa.
8. Organizational Behaviour – John W. Newsstorn & Keith Davis, Tata McGraw Hill Publishing Company Limited, ND

Note: Eight questions are to be set at least one question from each unit and the students will have to attempt five questions in all.

HUM – 455 ENTREPRENEURSHIP
B. Tech. Semester – VII (Open Elective)

L	T	P	Credits
4	--	--	4

Class Work	**:**	**50 Marks**
Examination	**:**	**100 Marks**
Total	**:**	**150 Marks**
Duration of Examination	**:**	**3 Hours**

UNIT-I **Promotion of Entrepreneurship:** Meaning, definition and functions of an entrepreneur, qualities of a good entrepreneur; Role of Entrepreneur in economic development; Government measures for the promotion of small scale industries with special reference to Haryana; Cultural factors in developing entrepreneurship.

UNIT-II **Ownership and Location of Industrial Units:** Different forms of Industrial Organisation. Theories of Industrial location. Process of preparing project reports.

UNIT-III **Size of Firm and Pricing:** Concept of optimum firm, factors determining Optimum size. Technical, Managerial, Marketing Uncertainties and risk. Pricing Methods, Policies and procedures.

UNIT-IV **Financing of Small Industries:** Importance and need : Commercial Banks and term lending in India; Banks and under-writing of capital issues; Brief description about the role of other financial agencies viz; Industrial Finance Corporation of India. State Financial Corporation, Industrial Development Bank of India; Unit Trust of India.

UNIT-V **Problems Faced by Small Enterprises:** Problems connected with Marketing, Management of New Products; Power; Finance; Raw Material; Under-utilization of capacity; Causes of under – utilization; Rehabilitation of Sick Mills.

UNIT-VI **Government and Business:**(a) Highlights of Industrial Policy and Licensing Policy. (b) International Marketing with special reference to export documentation.

RECOMMENDED BOOKS:

1. Entrepreneurship of Small Scale Industries – Deshpande Manohar D. (Asian Publishers, New Delhi)
2. Environment and Entrepreneur – Tandon B.C. (Asian Publishers, New Delhi).
3. The Industrial Economy of India – Kuchhal S.C. (Chaitanya, Allahabad).
4. Emerging Trends in Entrepreneurship Development Theories & Practices – Singh P. Narendra (Int. Founder, ND)
5. Entrepreneur, Banker & Small Scale Industries – Bhattacharya Hrisnikes.
6. Entrepreneurship & Growth of Enterprise in Industrial Estates – Rao Gangadhara N.

Note: Eight questions are to be set atleast one question from each unit and the students will have to attempt five questions in all.

HUM – 457 BUSINESS COMMUNICATION

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

The course proposes to help students develop business and technical communication competence. It focuses on writing skills and strategies for specific purposes. The inevitability of introducing this course to Engineering students is embodied in that it has comparatively a high concentration of certain complex writing techniques and procedures.

COURSE CONTENT:

Unit-I **Business correspondence**: Characteristics and Formats of Business letter; Quotations, Orders, Tenders, Sales letters, claim and adjustment letters, Credit and Collection letters, Application Letters for vacant situations with emphasis on Resumes and Curriculum Vitae; E-mail and Netiquette – format, style and tone.

Unit-II **Business Reports and Proposals**: Importance, Function, Pattern and formats of Reports, Typical Business Reports, Report Organisation and Presentation, and Formal Reports; Proposal Formats, Writing problem-Solving Proposals, Executive Summary Proposals and project Proposals.

Unit-III **Meetings**: Writing of Memorandum, Notes, Agenda and Minutes of Meeting.

Unit-IV **Public Relations and Advertising Documents:** Press Releases, Public Service Announcements, Advertising Strategy and its objective, Designing of Classified and Display Advertising copies.

SUGGESTED READING:

1. Business Communication: Process & Product by Hary Ellen Guffey, IV Edition, South-Western College Publishing, Cincinnati.
2. Business Correspondence and Report Writing by R.C. Sharma & Krishna Mohan, Tata Macgraw Hill Publication, New Delhi.
3. Effective Business English and Correspondence by M.S. Ramesh and C.C. Pattanshetti, R. Chand & Co., New Delhi.
4. Effective Letters in Business by Robert by C. Shruter, Tata Macgraw Hill, New Delhi.
5. English Business Letters by F.W. Wing & D. Anncree, Orient Longman.
6. Written Communication in English by Sarah Freeman, Orient Longman.
7. International Business English by Leo Jones & Richard Alexander, Cambridge University Press.
8. General and Business English by Sweet Stephen, Sir Issac Pitman & Sons Ltd., London.
9. How to Write and Present Technical Information, Charles H. Sides, Cambridge University Press, U.K.
10. Strategies for Engineering communication, Susan Stevenson/Steve Whitmore, John Wiley and Sons, Inc. Printed in India by Replika Press Pvt. Ltd., Delhi.

Note: Eight questions will be set and students will be required to attempt five questions in all.

PHY – 451 NANO TECHNOLOGY

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

UNIT 1 INTRODUCTION TO NANOTECH

Crystalline-Non crystalline materials, Fundamental of Nanotechnology and Nanomaterials in Metals, other Materials, & Biosystem, Molecular Recognition, Quantum Mechanics and Quantum Ideas in Nanotechnology. Semiconductor Nanoparticles.

UNIT 2 PREPARATION AND CHARACTERIZATION OF NANOPARTICLES

Nanoscale Lithography, Dip Pen Lithography, E-Beam Llthography, Nanosphere Life off, Llthography; Molecular Synthesis, Nanoscale Crystal Growth, Polymerization Nanobricks and Building blocks:

Tools for Measuring Nanostructures – Scanning Probe Instrument, Spectroscopy, Electrochemistry, Election Microscope Tools to Make Nanostructure.

UNIT 3 PROPERTIES & APPLICATION OF NANO CRYSTALLINE MATERIALS

Application in Sensors, Nanoscale Biostructure Electronics, Magnets, Optics, Fabrication Biomedical Applications, Smart Materials – Self Healing Structures, Heterogenous Nanostructure and composites En Capsulation, Carbon Nanotubes.

UNIT 4 Synthesis of semiconductor Nanoclusters, Processing of Nanomaterials, Nanobusiness – Boom, Bust and Nano Tech. NanoEthics

REFERENCE BOOKS:

1. Camarata, R.C. Nanomaterials synthesis, properties and application Institute of Physics Publication
2. Madou, Fundamentals of microfabrication, Mcgraw Hill.
3. Sibelia, J.P., A Guide to material characterization, Prentice Hall.
4. Mark Ratner, Daniel Ratner – NanoTechnology – A Gentle Introduction to the Next Big Idea.

Note: The question paper will contain 8 questions in all. The student will be required to answer any five. At the most one question will be set from each section.

PHY – 453 LASER TECHNOLOGY

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Conditions for Producing Laser, Concept of coherence – Special and temporal,Population Inversions, Einstein coefficient, Gain and Gain saturation, Saturation intensity, Development and Growth of a Laser Beam, Exponential Growth factor, Threshold Requirement for a Laser.

Inversions and two-level systems, steady-state inversions and three and four-level systems. Transient Population Inversions, Factors effecting population inversion, Laser Amplifiers.

Excitation or Pumping Threshold Requirements, Pumping Pathways, Specific Excitation Parameters Associated with Optical and particle Pumping.

Helium-Neon Laser, Co_2 Laser, Ruby Laser, Semiconductor Diode Laser.

RECOMMENDED BOOKS:

1. Laser Fundamentals by William T. Silfvast Cambridge University, Press.
2. Introductory University Optics by John Beynon, (PHI)
3. Laser – B.B. Laud.
4. Optics – A.K. Ghatak (TMH)

Note: Eight questions will be set and students will be required to attempt any five questions in all. All questions will carry equal marks.

ME – 451 MECHATRONIC SYSTEMS
B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

UNIT 1 Introduction to Mechatronics. Integrated design issues in Mechatronics, Conceptual design. Possible design solutions. Integrated approach for combining sensors, actuators, computer and the product. Some examples - like auto focus camera, engine combustion control, washing machine, vehicle suspensions, electro-mechanical brakes, manufacturing machine, industrial robots, air conditioning systems, etc..

UNIT 2 Classification of sensors of various type, resistive, strain gage, themistor, inductive, capacitive, piezoelectric, optical, photodetectors, encoders, ultrasonic types Silicon sensors, Micro-sensors for various measurements. Consideration for choice of sensors for a given application.

UNIT 3 Signal conditioning and data acquisition using computers. AD and DA converters. Use of plus-in-cards and software for acquiring data from several sensors.

UNIT 4 Mechanical actuation systems – kinematic chains, cams, gear trains, belt and chains drive, ratchet and prawl, bearing, guideways, ball screw and nut, etc. Electrical actuation systems: Operational characteristic and application of electrical actuation components for application like, AC/DC motors, stepper motors, relays, push buttons, switches, solenoids etc.

UNIT 5 Introduction to semiconductor electronics, junction diode, bipolar junction transistor, field effect transistors, digital logic. Number systems. Logic gates Boolean algebra. Application of logic gates. Combinational and sequential logic.

UNIT 6 Sequence control, relay ladder diagrams for sequence control in processes and machines. Programmable Logic Controlllers and applications: PLC structures, PLC languages, programming of PLC using Mnemonics, Interfacing PLC with actuators, Sequencing of cylinders. Timers, internal relays and counters. Open loop and closed loop control using PLC.

UNIT 7 Architecture of microprocessors and microcontrollers. Use of suitable software languages for micro controllers and their applications in mechatronic systems. Real time interfacing between computers and measurement or control systems. Introduction to modeling and computer control of process and mechanical systems.

UNIT 8 Communication systems Protocols, Open systems interconnection models. Smart transducers and transmitters. Field buses.

TEXT BOOKS:

1. Mechatronics – Electronic control in mechanical & electrical engineering by W.Bolton, Longman Indian Edn. 1999.
2. Mechatronic system design, by D.Shetty and R.A. Kolk – Mechatronic system design, PWS Publ. Co., Boston, 1997.
3. Mechatronics and Measurement Systems by D.G.Alciatore and M.B. Histand, TMH Publ. 2nd Edn. 2003.

Note: In the semester examination, the examiner will set 8 questions in all, and students will be required to attempt only 5 questions.

CSE – 409 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

1. Introduction to Artificial intelligence: Scope, history & applications: AI as representation and search the predicate calculus inference rules. Logic based financial advisor, structures and strategies for state space search graph theory, strategies for space search, using state space to represent reasoning with the predicate calculus.
2. Heuristic Search: An algorithm for heuristic search, admissibility monotonicity and informed ness heuristics in games, complexity issues, control and implementation of state space search recursion based search, pattern directed search. Production systems, predicate calculus and planning the black board architecture for problems solving.
3. LISP and PROLOG: Knowledge representation languages issues in knowledge representation, network representation language, structured representations, introduction to LISP, Search in LISP: a functional approach to the farmer, Wolf, Goat and cabbage problem, higher order functions & procedural abstraction, search strategies in LISP.
4. Expert systems: Introduction, History basic concepts, structure of expert systems, the human element in ES how ES works, problem areas addressed by ES, ES success factors, types of expert systems, ES and the internet interacts web, knowledge engineering, scope of knowledge, difficulties, in knowledge acquisition methods of knowledge acquisition, machine learning, intelligent agents, selecting an appropriate knowledge acquisition method, knowledge acquisition form multiple experts validation and verification of the knowledge base, analyzing coding, documenting & diagramming.
5. Expert systems- II, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty probabilities and related approaches, theory of certainty (certainty factors) Qualitative reasoning, the development life cycle, phases I, II, III, IV, V, VI the future of expert system development process societal impacts.

TEXT books

1. Efrain Turban and Jay E Aranson: Decision support systems & intelligent systems (5th Edn.) Prentice hall, 1998.
2. Donald A Waterman: A Guide to expert Systems, Addison -Wesley 1995
3. G.F. Luger & W.A Stubble Field -Artificial Intelligence structures and Strategies for complex problem solving, 3rd Ed. Addision Wesley 1998.
4. E.Rich and Knight, Artificial Intelligence, Second Edn, Tata Mc. Graw Hill Publishing, 1981.

Note: Eight questions will be set and students will be required to attempt five questions in all.

CSE – 301 PRINCIPLES OF OPERATING SYSTEMS

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit-1: **Introduction:** Introduction to Operating System Concepts (including Multitasking, multiprogramming, multi user, Multithreading etc)., Types of Operating Systems: Batch operating system, Time-sharing systems, Distributed OS, Network OS, Real Time OS; Various Operating system services, architecture, System programs and calls.

Unit–2: **Process Management:** Process concept, process scheduling, operation on processes; CPU scheduling, scheduling criteria, scheduling algorithms -First Come First Serve (FCFS), Shortest-Job-First (SJF), Priority Scheduling, Round Robin(RR), Multilevel Queue Scheduling.

Unit–3: **Memory Management:** Logical & Physical Address Space, swapping, contiguous memory allocation, non-contiguous memory allocation paging and segmentation techniques, segmentation with paging; virtual memory management - Demand Paging & Page-Replacement Algorithms; Demand Segmentation.

Unit–4: **File System:** Different types of files and their access methods, directory structures, various allocation methods, disk scheduling and management and its associated algorithms, Introduction to distributed file system.

Unit–5: **Process-Synchronization & Deadlocks:** Critical Section Problems, semaphores; methods for handling deadlocks-deadlock prevention, avoidance & detection; deadlock recovery.

Unit-6: **I/O Systems:** I/O Hardware, Application I/O Interface, Kernel, Transforming I/O requests, Performance Issues.

Unit–7: **Unix System And Windows NT Overview:** Unix system call for processes and file system management, Shell interpreter, Windows NT architecture overview, Windows NT file system.

TEXT Books:

1. Operating System Concepts by Silberchatz et al, 5th edition, 1998, Addison-Wesley.
2. Modern Operating Systems by A. Tanenbaum, 1992, Prentice-Hall.
3. Operating Systems Internals and Design Principles by William Stallings,4th edition, 2001, Prentice-Hall

REFERENCE BOOKS:

1. Operating System by Peterson, 1985, AW.
2. Operating System by Milankovic, 1990, TMH.
3. Operating System Incorporating With Unix & Windows By Colin Ritche, 1974, TMH.
4. Operating Systems by Mandrik & Donovan, TMH
5. Operating Systems By Deitel, 1990, AWL.
6. Operating Systems – Advanced Concepts By Mukesh Singhal , N.G. Shivaratri, 2003, T.M.H

Note: Eight questions will be set in all by the examiners taking at least one question from each unit. Students will be required to attempt five questions in all.

EE – 455 INTELLIGENT INSTRUMENTATION FOR ENGINEERS

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

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1. INTRODUCTION: Intelligence, features characterizing intelligence, intelligent instrumentation system; features of intelligent instrumentation; components of intelligent instrumentation system; Block diagram of an intelligent instrumentation system.

2. SIGNAL PROCESSING, MANIPULATION AND TRANSMISSION: Signal amplification & attenuation (OP-AMP based); Instrumentation Amplifier (circuit diagram, high CMRR & other features); Signal Linearization (different types such as Diode-resistor combination, OP-AMP based, etc.); Bias Removal, Signal filtering (outputs from ideal filters, outputs from constant-k filters, matching of filter sections, active analog filters); OP-AMP based Voltage-to-current converter, Current-to-voltage conversion, Signal integration, Voltage follower (pre-amplifier), voltage comparator, Phase-locked loop, Signal addition, Signal multiplication, Signal Transmission (Signal amplification, Shielding, Current loop transmission, Voltage-to-frequency conversion, Fiber optic transmission); Description of Spike Filter (software-based).

3. SMART SENSORS: Primary sensors; Excitation; Compensation (Nonlinearty**:** look up table method**,** polygon interpolation, polynomial interpolation**,** cubic spline interpolation, Approximation & regression; Noise & interference**;** Response time**;** Drift; Cross-sensitivity)**;** Information Coding/ Processing**;** Data Communication**;** Standards for smart sensor interface**.**.

4. INTERFACING INSTRUMENTS & COMPUTERS: Basic issues of interfacing; Address decoding; Data transfer control; A/D converter; D/A converter; Sample & hold circuit; Other interface considerations.

5. RECENT TRENDS IN SENSOR TECHNOLOGIES: Introduction**;** Film sensors (Thick film sensors, Thin film sensors)**;** Semiconductor IC technology – standard methods; Microelectro-mechanical systems (Micro-machining, some application examples)**;** Nano-sensors**.**

TEXT BOOK:

1. Barney, G.C., *Intelligent Instruments.* Hemel Hempstead: Prentice Hall, 1985.
2. Alan S. Morris, *Principles of Measurement & Instrumentation.* N. Delhi: PHI Pvt. Ltd., 1999..

REFERENCE BOOK:

1. D. Patranabis, *Sensors & Transducers.* N. Delhi: PHI, 2003.
2. Roman Kuc, *Introduction to Digital Signal Processing.* N. York: McGraw-Hill Pub. Co.

Notes: 1. In the semester examination, the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.

2. Use of scientific calculator will be allowed in the Exam. However, pager, programmable calculator & cellular phone etc. will not be allowed.

ECE – 403 EMBEDDED SYSTEMS DESIGN

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

UNIT 1: **INTRODUCTION:** Different types of microcontrollers: Embedded microcontrollers, External memory microcontrollers; Processor Architectures: Harvard V/S Princeton, CISC V/S RISC; microcontrollers memory types; microcontrollers features : clocking, i/o pins, interrupts, timers, peripherals.

UNIT 2: **MICROCONTROLLER ARCHITECTURE:** Introduction to PIC microcontrollers, Architecture and pipelining, program memory considerations, Addressing modes, CPU registers, Instruction set, simple operations.

UNIT 3: **INTERRUPTS AND I/O PORTS:** Interrupt logic, Timer2 scalar initialization, IntService Interrupt service routine, loop time subroutine, External interrupts and timers, Synchronous serial port module, Serial pheriphal device, O/p port Expansion, I/p port expansion, UART.

UNIT 4: **SOFTWARE:** Development tools/ environments, Assembly language programming style, Interpreters, High level languages, Intel hex format object files, Debugging.

UNIT 5: **PROGRAMMING WITH MICROCONTROLLERS:** Arithmetic operations, Bit addressing, Loop control, Stack operation, Subroutines, RAM direct addressing, state machines, Oscillators, Timer Interrupts, Memory mapped I/O.

UNIT 6: **DESINING USING MICROCONTROLLERS:** Music box, Mouse wheel turning, PWM motor control, Aircraft Demonstration, ultra sonic distance measuring, Temperature Sensor, Pressure Sensor, Magnetic Field Sensor.

TEXT BOOK:

1. Design with PIC Microcontrollers by John B. Peatman , Pearson.

REFERENCE BOOKS:

1. Programming and Customizing the 8051 Microcontroller: Predko ; TMH.
2. Designing Embedded Hardware : John Catsoulis ; SHROFF PUB. & DISTR. ND.
3. Programming Embedded Systems in C and C++ : Michael Barr; SHROFF PUB. & DISTR. ND.

Note: **Eight questions will be set and students will be required to attempt five questions in all.**

CH - 453 POLLUTION AND CONTROL

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

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1 **Waster Water & its treatment Processes:** Waster-water characteristics, effiuent standards, primary treatment, secondary treatment – aerobic (activated sludge, aerated lagoons, trickling filter, roughing filter, rotating biological contactor) anaerobic (contact process, UASB).

2 **Air Pollution:** Classification of air polluants

Particulates: Physical characteristics, mode of formation, setting properties, Control measures.

3 **Hydrocarbons:** Nature; sources, control

Carbon Monoxide: Source, harmful effects on human health, control measures.

Oxides of Sulphur and Nitrogen Sources, effects on human health and plants. Control measure.

4 **Solid Waste:** Types, sources and properties of solid waste, solid waste management – Generation, Collection and techniques for ultimate disposal, Elementary discussion on resource and energy recovery.

5 Elementary treatment of nuclear pollution, metal pollution, noise pollution their effects & control.

BOOKS SUGGESTED:

1. Environmental Engg.: by Howard s. Peavy & Others, MGH International.
2. Metacaf – EDDY – Waste-water engineering revised by George Teholonobus (TMH)
3. Environmental Chemistry by B.K. Sharma, Goel Publishing, Meerut.
4. Environmental Chemistry, A.K.DE, Wiley Eastern.
5. Air Pollution: H.C. Perking – Mc Graw Hill.

Note: **Eight questions will be set and students will be required to attempt five questions in all.**

CSE- 411 MANAGEMENT INFORMATION SYSTEM

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit-1: **Foundation of Information System:** Introduction to Information System and MIS, Decision support and decision making systems, systems approach, the systems view of business, MIS organization within company, Management information and the systems approach.

Unit-2: **Information Technology:** A manager's overview, managerial overviews, computer hardware & software, DBMS, RDBMS and Telecommunication.

Unit-3: **Conceptual system design:** Define the problems, set systems objective, establish system constraints, determine information needs determine information sources, develop alternative conceptual design and select one document the system concept, prepare the conceptual design report.

Unit-4: **Detailed system design: I**nform and involve the organization, aim of detailed design, project management of MIS detailed design , identify dominant and trade of criteria, define the sub systems, sketch the detailed operating sub systems and information flow, determine the degree of automation of each operation, inform and involve the organization again, inputs outputs and processing, early system testing, software, hardware and tools propose an organization to operate the system, document the detailed design revisit the manager user.

Unit-5: **Implementation evaluation and maintenance of the MIS:** Plan the implementation, acquire floor space and plan space layouts, organize for implementation, develop procedures for implementation, train the operating personnel, computer related acquisitions, develop forms for data collection and information dissemination, develop the files test the system, cut-over, document the system, evaluate the MIS control and maintain the system. Pitfalls in MIS development.

Unit-6: **Advanced Concepts in Information Systems:** Enterprise Resources Management (ERP), **S**upply Chain Management, C R M , Procurement Management System.

TEXT BOOKS:

1. Management Information System by W. S. Jawadekar, 2002, Tata McGraw Hill.

2. Information System for Modern Management (3rd edition)- Robert G. Murdick, Loel E. Ross & James R. Claggett. PHI

REFERENCE BOOKS:

1. Management Information System; O Brian; TMH
2. Management Information System by Davis Olson Mac Graw Hill
3. Management Information System by Stasllings,(Maxwell Mc Millman Publishers)
4. Information System; a Management Perspective; Alter Addison Wesley
5. Introduction to Information System; McGraw Hill

Note: **Eight questions will be set in all by the examiners taking at least one question from each unit. Students will be required to attempt five questions in all.**

CSE - 308 MULTIMEDIA TECHNOLOGIES

B. Tech. Semester – VII (Open Elective)

L	T	P	Credits			
4	--	--	4	Class Work	:	50 Marks
				Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

Unit-1: **Basics of Multimedia Technology:** Computers, communication and entertainment; multimedia an introduction; framework for multimedia systems; multimedia devices; CD- Audio, CD-ROM, CD-I, presentation devices and the user interface; multimedia presentation and authoring; professional development tools; LANs and multimedia; internet, World Wide Web & multimedia distribution network-ATM & ADSL; multimedia servers & databases; vector graphics; 3D graphics programs; animation techniques; shading; anti aliasing; morphing; video on demand.

Unit-2: **Image Compression & Standards:** Making still images; editing and capturing images; scanning images; computer color models; color palettes; vector drawing; 3D drawing and rendering; JPEG-objectives and architecture; JPEG-DCT encoding and quantization, JPEG statistical coding, JPEG predictive lossless coding; JPEG performance; overview of other image file formats as GIF, TIFF, BMP, PNG etc.

Unit-3: **Audio & Video:** Digital representation of sound; time domain sampled representation; method of encoding the analog signals; subband coding; fourier method; transmission of digital sound; digital audio signal processing; stereophonic & quadraphonic signal processing; editing sampled sound; MPEG Audio; audio compression & decompression; brief survey of speech recognition and generation; audio synthesis; musical instrument digital interface; digital video and image compression; MPEG motion video compression standard; DVI technology; time base media representation and delivery.

Unit-4: **Virtual Reality:** Applications of multimedia, intelligent multimedia system, desktop virtual reality, VR operating system, virtual environment displays and orientation making; visually coupled system requirements; intelligent VR software systems. Applications of environment in various fields.

TEXT BOOKS:

1. An introduction, Villamil & Molina, Multimedia Mc Milan, 1997
2. multimedia: Sound & Video, Lozano, 1997, PHI, (Que)

REFERENCE BOOKS:

1. Multimedia: Production, planning and delivery, Villamil & Molina,Que, 1997
2. Multimedia on the PC, Sinclair,BPB
3. Multimedia: Making it work, Tay Vaughan, fifth edition, 1994, TMH.
4. Multimedia in Action by James E Shuman, 1997, Wadsworth Publ.,
5. Multimedia in Practice by Jeff coate Judith, 1995,PHI.
6. Multimedia Systems by Koegel, AWL
7. Multimedia Making it Work by Vaughar, etl.
8. Multimedia Systems by John .F. Koegel, 2001, Buford.
9. Multimedia Communications by Halsall & Fred, 2001,AW.

Note: **Eight questions will be set in all by the examiners taking at least one question from each unit. Students will be required to attempt five questions in all.**