

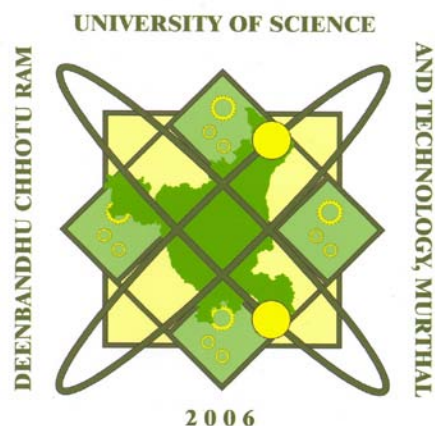
DCRUST: UG-CHE:01-2009

**ORDINANCE
SCHEME OF STUDIES & EXAMINATION
SYLLABUS**

BACHELOR OF TECHNOLOGY
(4 Year Degree Programme)

CHEMICAL ENGINEERING

(w.e.f. Session 2009-10)



**DEENBANDHU CHHOTU RAM
UNIVERSITY OF SCIENCE AND TECHNOLOGY
MURTHAL (SONIPAT) HARYANA-131039
MAY 2010**

Information in this book and more details are available at Deenbandhu Chhotu Ram University of Science and Technology (DCRUST) website:

<http://www.dcrustm.org>

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DCRUST: UG-CHE: 01-2009

First published: May, 2010

Copies printed: 500

Price: Rs. 100/-

Printed at Logic Printers, Sonipat

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ORDINANCE

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (Sonapat)
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 ordinance 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)

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

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

5 th semester	if passed all papers of 3 rd semester.
6 th semester	if passed all papers of 3 rd and 4 th 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-ordinator 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:

<u>Range of Marks (%)</u>	<u>Grade</u>
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:

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

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

$$SGPA = \frac{\text{Points secured in passed courses}}{\text{Credits earned}} = \frac{130}{18.5} = 7.0$$

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

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

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 | 2 nd Division |
| (iii) | 6.32 ≤ CGPA < 7.9 | 1 st Division |
| (iv) | CGPA of 7.9 or more | 1 st 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:

- GROUP A** will study the subjects ME-101, ME-103, CSE-101, ME-107, CSE-103 and ME-109
GROUP B will study the subjects ME-105, CH-101, EE-101, CH-103, EE-103, GES-101 and GES-103
- GROUP A** includes students of disciplines BME, BT, CSE, ECE.
GROUP B includes students of discipline CE, CHE, EE, ME.
- Environmental Studies (GES-101) and Environmental Studies Field Work (GES-103) are qualifying courses.
- Students will be allowed to use nonprogrammable 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
	BT -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	400/375	600/500	100/175	1100/1050	34/31	

* Not included in total marks.

Note:

- GROUP A** will study the subjects ME-105, CH-101, EE-101, CH-103, EE-103, GES-101 and GES-103.
GROUP B will study the subjects ME-101, ME-103, CSE-101, ME-107, CSE-103 and ME-109.
- GROUP A** includes students of disciplines BME, BT, CSE, and ECE.
GROUP B includes students of disciplines CE, CHE, EE, ME.
- Environmental Studies (GES-101) and Environmental Studies Field Work (GES-103) are qualifying courses.
- 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) (CHEMICAL 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-201	ECONOMICS (COMMON FOR ALL BRANCHES)	3	1	-	4	50	100	-	150	4	3
2	MATH-201	MATHEMATICS -III (COMMON FOR ALL BRANCHES)	3	2	-	5	50	100	-	150	5	3
3	ECE-211	ELECTRONICS ENGINEERING (CE, CHE, ME)	3	1	-	4	50	100	-	150	4	3
4	CHE-201	CHEMICAL ENGINEERING PROCESS CALCULATIONS	3	1	-	4	50	100	-	150	4	3
5	CHE-203	FLUID FLOW	3	1	-	4	50	100	-	150	4	3
6	CH-201	ORGANIC CHEMISTRY	3	1	-	4	50	100	-	150	4	3
7	CHE-205	FLUID FLOW LAB	-	-	2	2	25	-	25	50	2	3
8	CH-203	ORGANIC CHEMISTRY LAB	-	-	3	3	25	-	25	50	3	3
9	EE-231	ELECTRICAL WORKSHOP (CHE,EE,ECE)	-	-	2	2	25	-	25	50	2	3
10	ECE-231	ELECTRONIC ENGINEERING LAB (CE, CHE, ME)	-	-	2	2	25	-	25	50	2	3
TOTAL			18	7	9	34	400	600	100	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.

DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY, MURTHAL (SONEPAT)
SCHEME OF STUDIES & EXAMINATIONS
B. Tech. 2nd YEAR (SEMESTER - IV) (CHEMICAL 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, ECE, ME)	3	1	-	4	50	100	-	150	4	3
2	MATH-202	NUMERICAL METHODS (CHE,EE,ECE)	3	1	-	4	50	100	-	150	4	3
3	CHE-202	TRANSPORT PHENOMENA	4	2	-	6	100	100	-	200	6	3
4	CHE-204	MECHANICAL OPERATIONS	3	2	-	5	75	100	-	175	5	3
5	CHE-206	MATERIAL TECHNOLOGY	4	1	-	5	75	100	-	175	5	3
6	CH-202	UNIT PROCESSES	3	1	-	4	50	100	-	150	4	3
7	CHE-208	MECHANICAL OPERATIONS LAB	-	-	3	3	50	-	50	100	3	3
8	MATH-204	NUMERICAL METHODS LAB (CHE ,EE,ECE)	-	-	2	2	25	-	25	50	2	3
9	GPCHE-202	GENERAL PROFICIENCY	-	-	-	-	50	-	-	50	2	-
TOTAL			20	8	5	33	525	600	75	1200	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) (CHEMICAL 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	CHE-301	CHEMICAL REACTION ENGINEERING-I	3	1	-	4	50	100	-	150	4	3
2	CHE-303	CHEMICAL TECHNOLOGY-I	3	1	-	4	50	100	-	150	4	3
3	CHE-305	EQUIPMENT DESIGN	3	1	-	4	50	100	-	150	4	3
4	CHE-307	MASS TRANSFER-I	3	1	-	4	50	100	-	150	4	3
5	CHE-309	HEAT TRANSFER	3	1	-	4	50	100	-	150	4	3
6	CHE-311	CHEMICAL ENGINEERING THERMODYNAMICS	3	1	-	4	50	100	-	150	4	3
7	CHE-313	CHEMICAL TECHNOLOGY-I LAB	-	-	3	3	25	-	25	50	3	3
8	CHE-315	MASS TRANSFER-I LAB.	-	-	2	2	25	-	25	50	2	3
9	CHE-317	HEAT TRANSFER LAB	-	-	2	2	25	-	25	50	2	3
10	CHE-319	PROFESSIONAL TRAINING-I	-	-	2	2	50	-	-	50	2	-
TOTAL			18	6	9	33	425	600	75	1100	33	

- 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 centre etc.

DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY, MURTHAL (SONEPAT)
SCHEME OF STUDIES & EXAMINATIONS
B. Tech. 3rd YEAR (SEMESTER - VI) (CHEMICAL 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	CHE-302	CHEMICAL REACTION ENGINEERING-II	3	1	-	4	50	100	-	150	4	3
2	CHE-304	CHEMICAL TECHNOLOGY-II	3	1	-	4	50	100	-	150	4	3
3	CHE-306	PROCESS UTILITIES	3	1	-	4	50	100	-	150	4	3
4	CHE-308	MASS TRANSFER-II	3	1	-	4	50	100	-	150	4	3
5	CHE-310	PROCESS INSTRUMENTATION	3	1	-	4	50	100	-	150	4	3
6	CHE-312	PROCESS EQUIPMENT DESIGN	3	1	-	4	50	100	-	150	4	3
7	CHE-314	CHEMICAL TECHNOLOGY-II LAB	-	-	3	3	25	-	25	50	3	3
8	CHE-316	MASS TRANSFER-II LAB	-	-	3	3	50	-	50	100	3	3
9	CHE-318	CHEMICAL REACTION ENGINEERING-II LAB	-	-	3	3	50	-	50	100	3	3
10	GPCHE-302	GENERAL PROFICIENCY	-	-	-	-	50	-	-	50	2	-
TOTAL			18	6	9	33	475	600	125	1200	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 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. 7th YEAR (SEMESTER - VII) (CHEMICAL 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	CHE-401	PETROLEUM ENGINEERING	3	1	-	4	50	100	-	150	4	3
2	CHE-403	PROCESS DYNAMICS AND CONTROL	3	1	-	4	50	100	-	150	4	3
3	CHE-405	ENERGY TECHNOLOGY	3	1	-	4	50	100	-	150	4	3
4	-	OPEN ELECTIVE*	4	-	-	4	50	100	-	150	4	3
5	CHE-407	POLYMER SCIENCE & ENGINEERING	3	1	-	4	50	100	-	150	4	3
6	CHE-409	PROCESS DYNAMICS AND CONTROL LAB	-	-	3	3	50	-	50	100	3	3
7	CHE-411	ENERGY TECHNOLOGY LAB	-	-	2	2	25	-	25	50	2	3
8	CHE-415	PROFESSIONAL TRAINING-II	-	-	2	2	50	-	-	50	2	-
9	CHE-417	PROJECT	-	-	4	4	50	-	-	50	4	-
TOTAL			16	4	11	31	425	500	75	1000	31	

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 departments will offer those elective for which they have expertise. The choice of the students for any elective shall not be a 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 centre etc.
 4. Project coordinator will be assigned the load of, maximum of 2 hours 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. 8th YEAR (SEMESTER - VIII) (CHEMICAL 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	CHE-402	PROCESS MODELLING & SIMULATION	3	1	-	4	50	100	-	150	4	3
2	CHE-404	PROCESS ENGINEERING ECONOMICS	3	1	-	4	50	100	-	150	4	3
3	-	ELECTIVE-I (DEPARTMENTAL)	4	-	-	4	50	100	-	150	4	3
4	-	ELECTIVE-II (DEPARTMENTAL)	4	-	-	4	50	100	-	150	4	3
5	CHE-408	SEMINAR	-	-	2	2	50	-	-	50	2	-
6	CHE-410	ENVIRONMENTAL POLLUTION&CONTROL LAB			2	2	25	-	25	50	2	3
7	CHE-414	MODELLING AND SIMULATION LAB	-	-	2	2	25	-	25	50	2	3
8	CHE-417	PROJECT	-	-	8	8	50	-	100	150	8	3
9	GFCHE-402	GENERAL FITNESS FOR THE PROFESSION	-	-	-	-	-	-	100	100	4	3
TOTAL			14	2	14	30	350	400	250	1000	34	

Departmental Elective-I

1. CHE-451 ENVIRONMENTAL POLLUTION & CONTROL
2. CHE-453 INTRODUCTION TO BIO-CHEMICAL ENGINEERING.

Departmental Elective-II

1. CHE-452 NOVEL SEPARATION TECHNIQUES
2. CHE-454 DESIGN OF PIPING SYSTEMS.

- 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 2hrs 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 the students in VII semester will be completed in VIII semester
 3. For the course CHE-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 students for his/her General Fitness for the Profession shall be carried out by a team consisting Dean of Faculty, Chairperson of Department and external examiner appointed by University.

SYLLABUS

HUM – 101 ESSENTIALS OF COMMUNICATION

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

L	T	P	Credits	Class Work	: 50 Marks
3	1	--	4	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. Besides, 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, Logarithmic 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, permittivity & 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.

ME - 103 MANUFACTURING PROCESSES
B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits		Class Work	: 50 Marks
4	--	--	4		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.

CH - 101 CHEMISTRY

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

L	T	P	Credits	Class Work	: 50 Marks
3	1	--	4	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 (H₂O 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 composites.
- 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	Class Work	:	50 Marks
3	--	--	3	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	Class Work	: 50 Marks
3	1	--	4	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.

GES - 101 ENVIRONMENTAL STUDIES
B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits	Examination	: 75Marks
3	--	--	0	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:

- Air pollution
 - Water pollution
 - Soil pollution
 - Marine pollution
 - Noise pollution
 - Thermal Pollution
 - 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:

- From unsustainable to sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns, case studies
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies
- Wasteland reclamation
- Consumerism and waste products
- Environment Protection Act
- Air (Prevention and Control of Pollution) Act
- Water (Prevention and Control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- 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 Pollution, 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., Environmental 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 Society, 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.
 1. The awards of this paper shall not be counted in the award of the Degree/DMC.

ME - 101 ELEMENTS OF MECHANICAL ENGINEERING**B. Tech. Semester - I/II (Common for all Branches)**

L	T	P	Credits	Class Work	: 50 Marks
3	1	--	4	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, Poisson'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 - 105 ENGINEERING GRAPHICS AND DRAWING

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

L	T	P	Credits	Class Work	: 50 Marks
--	--	4	4	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:

2. 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.

PHY - 103 PHYSICS LAB. - I
B. Tech. Semester - I (Common for all Branches)

L	T	P	Credits	Class Work	: 25 Marks
--	--	2	2	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.

ME - 107 WORKSHOP PRACTICE
B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits	Class Work	: 25 Marks
--	--	4	4	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.

CH - 103 CHEMISTRY LAB.

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

L	T	P	Credits	Class Work	: 25 Marks
--	--	2	2	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 spectrophotometrically.
11. Determination of strength of HCl solution by titrating it against NaOH solution conductometrically.
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.

CSE - 103 C PROGRAMMING LAB
B. Tech. Semester - I/II (Common for all Branches)

L	T	P	Credits	Class Work	: 25 Marks
--	--	2	2	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 male 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.

EE - 103 ELECTRICAL TECHNOLOGY LAB
B. Tech. Semester – I/II (Common for all Branches)

L	T	P	Credits	Class Work	: 25 Marks
--	--	2	2	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.**

ME - 109 ELEMENTS OF MECHANICAL ENGINEERING LAB.

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

L	T	P	Credits	Class Work	: 25 Marks
--	--	2	2	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 - 103 ENVIRONMENTAL STUDIES FIELD WORK

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

L	T	P	Credits	Field Work	: 25Marks
--	--	--	0	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	Class Work	: 50 Marks
3	1	--	4	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.

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

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

Unit - I:

1. **Cell Structure and Function:** Prokaryotes and Eukaryotes: Cell Wall, Membranes, 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 independence 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 Legendre'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 derivatives, 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	Class Work	: 50 Marks
3	1	--	4	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. Solid 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	Class Work	: 25 Marks
--	--	2	2	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		Class Work	
--	--	--	2		Total	: 50Marks
						: 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.

HUM-201 : ECONOMICS

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

L	T	P	Credits	Class Work	: 50 Marks
3	1	--	4	Examination	: 100 Marks
				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, Oligopoly, Monoplistic Competition (Main features of these markets) Supply and Law of Supply, Role of Demand & Supply in Price Determination 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 at least one question from each unit and the students will have to attempt five questions in all.

MATH-201 : MATHEMATICS-III

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

L	T	P	Credits	Class Work	: 50 Marks
3	2	--	5	Examination	: 100 Marks
				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 cosine 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, Trigonometric and Hyperbolic functions, Logarithmic 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. Zeros 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 questions taking at least one from each unit.

ECE-211 : ELECTRONICS ENGINEERING

B. Tech. Semester - III (CE, CHE, ME)

L	T	P	Credits	Class Work	: 50 Marks
3	1	--	4	Examination	: 100 Marks
				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 and 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.

UNIT - VI: **DIGITAL GATES** - Binary numbers, OR, AND, NAND, NOR, NOT, EX-OR Gates.

TEXT BOOKS:

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.

CHE-201 : CHEMICAL ENGINEERING PROCESS CALCULATIONS

B. Tech. Semester - III (Chemical Engineering)

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

UNIT-I: Brief introduction of chemical engineering unit processes and unit operations, Units and dimensions, Dimensional groups and constants, Stoichiometric relationships, Conservation of mass in chemical reactions, Excess reactants, Degree of completion, Behaviour of ideal gases, Gaseous mixtures, Vapour pressure, Clausius Clapeyron equation, Cox Chart, Duhring's plot, Raoult's law.

UNIT-II: Humidity and saturation, Relative humidity, Humid heat, Humid volume, Dew point, Humidity chart and its use.

UNIT-III: Crystallization, Dissolution, Solving material balance problems with and without simultaneous equations, Recycle, Bypass and Purge calculations.

UNIT-IV: Heat capacity, Calculation of enthalpy changes, Energy balances with chemical reaction, Heat of vaporization, Heat of formation, Laws of thermochemistry, Heat of combustion, Heat of reaction.

UNIT-V: Case study of selected problems, Aid of Computer in solving problems.

TEXT BOOKS:

1. "Chemical Process Principles, D.A. Hougen & K.M. Watson Vol. I, Asia Publishing House.
2. "Basic Principles and Calculations in Chemical Engineering, D.M. Himmelblau, Prentice Hall.

REFERENCE BOOKS:

1. "Chemical Process Analysis, Mass and Energy Balance", W.L. Luyben and L.A. Wenzel, Prentice Hall.
2. "Stoichiometry", Bhatt, B.I. and Vora, S.M., Tata McGraw Hill.
3. "Chemical Calculations", D.P.Tiwari, Vrinda Publication (Jalgaon).

NOTE: Five out of eight questions are to be attempted. Not more than two questions are to be set from any unit.

CHE-203 : FLUID FLOW
B. Tech. Semester - III (Chemical Engineering)

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

UNIT-I: Properties of fluids, Classification of fluid-forces, Normal forces on fluids, Pressure-depth relation for compressible and incompressible fluids, Forces on submerged bodies, Rigid body motion, Pressure measurement, Kinematics of flow, Description of velocity fields, Angular velocity circulation, Stream function, Irrotational flow, Types of flow.

UNIT-II: Conservation of mass, momentum and energy, Euler's equation, Bernoulli's equation, Navier-Stoke's equation.

UNIT-III: Hagen-Poiseuille equation, Friction factor, Friction factor equations, Reynolds number and its significance, Dimensional analysis to fluid flow problems.

UNIT-IV: Flow of incompressible fluids in conduits, Energy losses in beds, fittings, valves etc. Different fluid flow situations in conduits, series, parallel and networks of pipelines, Economic pipe diameter, Flow through open channels.

UNIT-V: Compressible fluid flow in pipes, Flow measuring devices, Mixing of fluids, Power requirements, Pumps, Blowers, Valves and their characteristics, Selection and specification.

TEXT BOOKS:

1. "Chemical Engineering", J.M. Coulson and J.F. Richardson Vol-I, Pergamon.
2. "Unit Operations of Chemical Engineering", W.L. McCabe and J.C. Smith, McGraw Hill.

REFERENCE BOOKS:

1. "Fluid Mechanics", A.K. Jain, Khanna Publishers, New Delhi.
2. "Hydraulics & Fluid Mechanics", Jagdish Lal, Metropolitan Book Co. Pvt. Ltd. Delhi.

NOTE: Five out of eight questions are to be attempted. At least one question (but not more than two) is to be set from each unit.

CH-201 : ORGANIC CHEMISTRY
B. Tech. Semester - III (Chemical Engineering)

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

Unit-I: Classification of organic reactions- types of Mechanism, types of reactions, Reaction intermediates, the mechanism of the following type of reactions. Substitution- Electrophilic, nucleophilic, free radical. Addition-Electrophilic, nucleophilic, free radical. Elimination- Elimination (E1 & E2 type). Rearrangement, Migration with one electron pair (nucleophilic). Migration with one electron (free radical), migration without electron (electrophilic). Oxidation and reduction.

Unit-II: Chemistry of Hydrocarbons: Sources, preparation and uses of alkanes, cycloalknes, alkenes, dienes, alkynes, cracking & reforming, aromatic hydrocarbons, concept of aromaticity (Huckel rule, $4n + 2$ rule) and directive effect.

Unit-III: Chemistry of function groups : Preparation, general properties and uses of organic halides, Grignard reagents and organolithiums, alcohols, poly alcohol (glycols) aldehydes, ketones, carboxylic acids and their derivatives (acylchloride & anhydride), amines, diazonium salts, heterocyclic compounds (pyridine).

Unit-IV: Cheomatography - Introdudation, Classification. Solid-liquid chromatography (LSC) -TLC

Liquid-Liquid chromatography (LLC), Column, GPC, HPLC Gas -Liquid Chromatography (GLC).

Text Books:

1. Advanced Organic Chemistry (Reaction Mechanism and Structure) by Jerry March (Willey Eastern 3rd Edition).
2. Text book of Organic Chemistry by R.K. Bansal, T.M.H.
3. Organic Chemistry by Morrison, Bayd (P.H.L.).
4. Chromatography by B.K. Sharma (Goel publishing, Meerut).

Reference Books:

1. Organic Chemistry Vol. I by I.L. Finar (ELBS).
2. Schaum's Solved Problems Series, Orgnamic Chemistry (T.M.H.).
3. Organic Reaction Mechanism, 3rd Edication (T.M.H.) by R.K. Bansal.

Note: Eight questions will be set, selecting two from each unit. The candidates will be required to attempt five questions selecting at least one from each unit.

CHE-205 : FLUID FLOW LAB
B. Tech. Semester - IV (Chemical Engineering)

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

List of Practicals / Demonstrations:

1. Flow measurement by Venturimeter.
2. Flow measurement by Orificemeter.
3. Calibration of Rotameter.
4. Flow measurement by V-notch.
5. Pressure drop in pipe flow.
6. Verification of Bernoulli's Theorem.
7. Centrifugal pump test rig.
8. Flow measurement by Pitot tube

NOTE: At least six experiments are to be performed out of the above mentioned experiments.

CH-203 : ORGANIC CHEMISTRY LAB
B. Tech. Semester - III (Chemical Engineering)

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

1.(A) Identification of organic compounds:

Preliminary tests (elemental analysis, ignition, colour, odor and determination of Physical constants) Functional group analysis, preparation of derivatives.

List of compounds for identification and analysis:

Organic acids- benzoic, phthalic, oxalic, succinic.

Aldehydes- acetaldehyde, benzaldehyde.

Ketones- acetone, acetophenone, benzophenone.

Amides- acetamide, benzamide.

Phenols- Phenol, Naphthol, α -naphthol, resorcinol, cresols, catechol

Amines- aniline, o-toluidine, and p-naphthyl l-amine

Carbohydrates- glucose, fructose, sucrose, lactose, maltose.

Hydrocarbons- naphthalene, anthracene.

(B) Quantitative organic analysis; Estimation of phenol, aniline, formaldehyde.

(C) Preparation of aspirin, acetanilide, p-nitro acetanilide, p- nitroaniline, methyl-orange,

2. Chromatographic separation:

i) To separate a mixture of fluorescein and methylene blue by column chromatography.

ii) To separate & identify the component of a mixture of phenols (o-nitrophenols, M-cresols & resorcinol).

BOOKS:

1. Qualitative Organic analysis by A.I. Vogel (ELBS) Longmans
2. Quantitative Organic Analysis by A.I. Vogel (ELBS) Longmans
3. Advanced Organic Analysis BY Satish Aggarwal & R.C. Aggarwal (Pragati Prakashan)
4. Practical Organic Chemistry by G. Mann, Longmans.

EE-231 : ELECTRICAL WORKSHOP
B. Tech. Semester - III (CHE, EE, ECE)

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

List of Practicals / Demonstrations:

1. Introduction of tools, electrical materials, symbols and abbreviations.
2. To study stair case wiring.
3. To study house wiring i.e., batten, cleat, casing-caping and conduit wirings.
4. To study fluorescent tube light.
5. To study high pressure mercury vapour lamp (H.P.M.V).
6. To study Sodium lamp.
7. To study repairing of home appliances such as heater, electric iron, fans etc.
8. To study construction of moving iron, moving coil, electrodynamic & induction type meters.
9. To design & fabricate single phase transformer.
10. To study fuses, relays, contactors, MCBs and circuit breakers.
11. Insulation testing of electrical equipments.
12. To design, fabricate a PCB for a circuit, wire-up and test.

NOTE: Ten experiments are to be performed, out of which 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 concerned institution.

ECE-231 : ELECTRONICS ENGINEERING LAB

B. Tech. Semester - III (CE, CHE, ME)

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

List of Practicals / Demonstrations:

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.

HUM-202 : FUNDAMENTALS OF MANAGEMENT

B. Tech. Semester - IV (CE, CHE, EE, ECE, ME)

L	T	P	Credits	Class Work	: 50 Marks
3	1	-	4	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. Organization 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.

MATH-202 : NUMERICAL METHODS

B. Tech. Semester - IV (EE, ECE, CHE)

L	T	P	Credits
3	1	-	4

Class Work	: 50 Marks
Examination	: 100 Marks
Total	: 150 Marks
Duration of Examination	: 3 Hours

Part-A

Interpolation and curve fitting : Interpolation problem, Lagrangian polynomials, Divided differences, Interpolating with a cubic spline, Bezier curves and B-spline curves, Least square approximations.

Non-Linear Equations: Bisection method, Linear Interpolation methods, Newton's method, Muller's method, fixed-point method.

Simultaneous Linear Equations: Elimination method, Gauss and Gauss-Jordan method, Jacobi's method, Gauss-Seidal method, Relaxation method.

Numerical Differentiation and Integration: Derivatives from differences tables, Higher order derivatives, Extrapolation techniques, Newton-cotes integration formula, Trapezoidal rule, Simpson's rules, Boole's rule and Weddle's rule, Romberg's Integration.

Part-B

Numerical Solution of Ordinary Differential Equations: Taylor series method, Euler and modified Euler method, Runge-Kutta methods, Milne's method, Adams-Moulton method, Power method for Eigen values by iteration.

Numerical Solution of Partial Differential Equations : Finite difference approximations of partial derivatives, solution of Laplace equation (Standard 5-point formula only), one-dimensional heat equation (Schmidt method, Crank-Nicolson method, Dufort and Frankel method) and wave equation.

TEXT BOOKS:

1. Applied Numerical Analysis: Curtis F. Gerald and Patrick G. Wheatley-Pearson, Education Ltd.
2. Numerical Method: E. Balagurusamy T.M.H.

REFERENCE BOOKS:

1. Numerical Methods for Scientific and Engg. Computations: M.K. Jain, S.R.K. Iyenger and R.K. Jain-iley Eastern Ltd.
2. Introductory Methods of Numerical Analysis S.S. Sastry, P.H.I.
3. Numerical Methods in Engg. & Science: B.S. Grewal.

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 Unit.

CHE-202 : TRANSPORT PHENOMENA
B. Tech. Semester - IV (Chemical Engineering)

L	T	P	Credits	Class Work	: 100 Marks
4	2	-	6	Examination	: 100 Marks
				Total	: 200 Marks
				Duration of Examination	: 3 Hours

UNIT-I: Similarity between momentum, heat and mass transfer, The continuum hypothesis, Basic laws of fluid motion, Newton's second law of motion, Principle of balance of momentum, Principle of conservation of energy, Newton's law of viscosity, Science of Rheology, Prediction of viscosity, Boundary conditions, Shell balance approach for stress distribution and velocity profile, Equation of continuity and equation of motion and their application in fluid flow problems, Unsteady state momentum transport, Flow near a wall suddenly set in motion, Momentum transport phenomena in turbulent flows.

UNIT-II: Fourier's law of heat conduction, Thermal conductivities, Boundary conditions, Shell balance approach for energy transfer problem, Heat sources, Principle of extended surface, Types of cooling fins, Free and forced convection, Unsteady state heat transport, Unsteady heat conduction in solids, Heating of semi-infinite slab, Heating of a finite slab.

UNIT-III: Concentration, velocities and mass fluxes, Fick's law of diffusion, Boundary conditions, Shell balance approach for mass transfer problems, Problems of diffusion with chemical reaction in porous catalyst, The effectiveness factor, Equation of continuity for multicomponent mixtures.

TEXT BOOKS:

1. "Transport Phenomena", R.B.Bird, W.E. Stewart and E.N.Lightfoot, John Wiley & Sons.
2. "Transport Processes and Unit Operations", C.J. Geankoplis, Prentice Hall of India.

REFERENCE BOOKS:

1. "Transport Phenomena-A unified approach", R.S. Brodkey & H.C. Hershey, McGraw Hill.
2. "Unit Operations of Chemical Engineering", W.L. McCabe & J.C.Smith, McGraw Hill.

NOTE: Five out of eight questions are to be attempted. At least two questions and not more than three are to be set from any unit.

CHE-204 : MECHANICAL OPERATIONS
B. Tech. Semester - IV (Chemical Engineering)

L	T	P	Credits	Class Work	: 75 Marks
3	2	-	5	Examination	: 100 Marks
				Total	: 175 Marks
				Duration of Examination	: 3 Hours

UNIT-I: Particle size and shape, Particulate mass, Size and shape distributions, Measurement and analysis, Concept of average diameter, Size reduction, Crushing, Grinding and ultrafine grinding, Grindability and selection of equipment, Laws of grinding, Agglomeration and compaction, Screening, Design of screens.

UNIT-II: Flow around a single particle, Drag force and drag coefficient, settling velocity of a particle in a fluid, Concept of relative velocity.

UNIT-III: Packed beds, Bed porosity, Flow through a bed of particles, Ergun's equation, Application to filtration, Hindered & free settling of particles, Thickeners, Gravity separation, Fluidised beds and transport of particles.

UNIT-IV: Storage of Solids, Flow of solids by gravity, Transport of solids by screw/belt conveyors, Cyclones, Bag filters, Electrostatic precipitators, Particle collection systems.

TEXT BOOKS:

1. "Chemical Engineering", J.M. Coulson & J.F. Richardson Vol. II, Pergamum Press.
2. "Unit Operations", G.G. Brown, Asia Publishing House.

REFERENCE BOOKS:

1. "Principles of Unit Operations", A.S. Foust et al., John Wiley.
2. "Unit Operations of Chemical Engineering", W.L.McCabe & J.C.Smith, McGraw Hill.
3. "Mechanical Operations for Chemical Engineers", B.C.Bhattacharya & C.M. Narayanan, Khanna Publishers.

NOTE: Five out of eight questions are to be attempted. At least one question (but not more than two) is to be set from each unit.

CHE-206 : MATERIAL TECHNOLOGY
B. Tech. Semester - IV (Chemical Engineering)

L	T	P	Credits	Class Work	: 75 Marks
4	1	-	5	Examination	: 100 Marks
				Total	: 175 Marks
				Duration of Examination	: 3 Hours

UNIT-I: Factors affecting the selection of material for constructional purposes in chemical industries, Metallic and Non-Metallic materials of construction, Ferrous and Non-Ferrous metals.

UNIT-II: Mechanical properties of various materials, Various modes of deformation, Crystal defects, Cold and hot working of metals and their effects on mechanical properties, Structure of solid phases, Different types of structure B.C.C., F.C.C. and H.C.P., Binary equilibria involving solid solution, Eutectic and peritectic systems, Cu-Ni, Cu-Zn, Fe-C diagrams, Heat treatment, General principles, TTT-curves, Annealing, normalizing, hardening, tempering and age hardening.

UNIT-III: Corrosion, Various types, Mechanism, Methods of prevention and control.

UNIT-IV: Ferrous Metals, Grey and white cast iron, Malleable, Mechanite and nodular cast iron, Plain Carbon Steels: Classification, properties and applications, Alloy Steels: Stainless steels, ferritic, austenitic and martensitic, mechanism of development of corrosion resistance in austenitic stainless steels, applications of stainless steels in chemical industries, Alloy tool steels, ultra high strength steels.

UNIT-V: Non-Ferrous metals, Copper Brass, Bronze, Aluminium and their mechanical properties, Workability and applications, Corrosion resistance.

UNIT-VI: Non-Metallic materials of construction: (a) Ceramics: Various types, Speciality glasses and refractories, properties and applications. (b) Polymers: Classifications, Comparison and properties of various polymers and their relationship with chain structure, Some application in chemical industries.

TEXT BOOKS:

1. "Material Science & Engineering", V.Raghvan, Prentice Hall.
2. "Engineering Materials: Properties & Selection", Budinski, Prentice Hall (V Edition)

REFERENCE BOOK:

1. "Engineering Materials", Longman Vol.I & II.
2. "Materials of Engineering: Concepts and Applications", Van Vlack, L., Addison-Wesley.

NOTE: Five out of eight questions are to be attempted. At least one question (not more than two) is to be set from each unit.

CH-202 : UNIT PROCESSES

B. Tech. Semester - IV (Chemical Engineering)

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

-
- Unit-I:** Halogenation - Products derived by halogenation, types of halogenation, mechanism of dehalogenation, Design and construction of equipment for halogenation, flow sheets for manufacture of chloroacetic acid, monochloroacetic acid and Chloral.
- Unit-II:** Oxidation - Types of oxidative reactions, oxidizing agents. Liquid phase oxidation of xyleness, oxidation of methanol, oxidation of low molecular weight paraffin hydrocarbons, styrene from ethyl benzene, mechanism of oxidation, apparatus for oxidations.
- Unit- III:** Alkylation - Products derived from alkylation, types of alkylation, factors controlling alkylation, flow sheet for alkyl aryl sulfonates, sulfuric acid alkylation for petroleum industry, equipment for alkylation-kellogg cascade alkylator.
- Unit-IV:** Hydrogenation - Products derived from hydrogenation, types of hydrogenation factors controlling hydrogenation, equipment for hydrogenation, apparatus and material of construction, high pressure autoclave, shaking autoclave, flow sheet for synthesis of methanol from carbon monoxide and hydrogen, hydrogenation of oil.
- Unit -V:** Sulfonation and Sulfonating agents, physical and chemical factors in sulfonation, mechanism of de-sulfonation, Industrial equipment and techniques, batch sulfonation kettle, ball mill sulfonator, flowsheet for manufacturing of anthraquinone sulfonate, ethanol form ethylene.
- Unit- VI:** Nitration products derived from nitration, types of nitration, process equipment for nitration, batch nitration, continuous nitration, Schmidt nitrator, nitration of propane.

Books Recommended:

1. Unit Processes in Organic Synthesis by P.H. Groggins (MGH).
2. Chemical Technology by Merk and Hahn (MGH)
3. Chemical Engg. Dev., IIT, Madras (Organic)-II Centre

Note: In all eight questions will be set taking at least one question from each unit. The candidate will be required to attempt any five questions.

CHE-208 : MECHANICAL OPERATIONS LAB
B. Tech. Semester - IV (Chemical Engineering)

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

List of Practicals / Demonstrations:

1. Settling of single particle.
2. Sedimentation.
3. Size reduction by Jaw Crusher & Pulverizer.
4. Grinding in a Ball Mill.
5. Screen analysis.
6. Separation of dust particles from air.
7. Determination of pressure drop across a fluidized bed and a packed bed.
8. Filtration of slurry.

NOTE: At least six experiments are to be performed out of above mentioned experiments.

MATH-204 : NUMERICAL METHODS LAB

B. Tech. Semester - IV (EE,ECE,CHE)

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

WRITE DOWN AND EXECUTE THE FOLLOWING PROGRAMS USING C++/MATLAB:

1. To find the roots of non-linear equation using Bisection method.
2. To find the roots of non-linear equation using Newton's method.
3. Curve fitting by least - square approximations.
4. To solve the system of linear equations using Gauss- Elimination method.
5. To solve the system of linear equations using Gauss-Seidal iteration method.
6. To solve the system of linear equations using Gauss-Jorden method.
7. To Integrate numerically using Trapezoidal rule.
8. To Integrate numerically using Simpson's rules.
9. To find the largest eigen value of a matrix by power-method.
10. To find numerical solution of ordinary differential equations by Euler's method.
11. To find numerical solution of ordinary differential equations by Runge-Kutta method.
12. To find numerical solution of ordinary differential equations by Milne's method.
13. To find the numerical solution of Laplace equation.
14. To find numerical solution of wave equation.
15. To find numerical solution of heat equation.

BOOKS SUGGESTED:

1. Applied Numerical Analysis by Curtis F. Gerald and Patrick G. Wheatley-Pearson, Education Ltd.
2. Numerical Methods: E. Balagurusamy T.M.H.

Note: Ten experiments are to be performed out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed by the concerned institution as per the scope of the syllabus.

GPCHE-202 : GENERAL PROFICIENCY
B. Tech. Semester - IV (Chemical Engineering)

L	T	P	Credits	Class Work	: 50 Marks
-	-	-	2	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: **(20 Marks)**

- | | | | |
|-----|--------------------------------------|-------|------------------|
| 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:

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.

(10 Marks)

CHE-301 : CHEMICAL REACTION ENGINEERING-I

B. Tech. Semester - V (Chemical Engineering)

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

- Unit-I:** Kinetics of homogeneous reaction: concepts of reaction rate, rate equation, order and molecularity.
- Unit-II:** Material balance equation of batch reactor and its use for kinetic interpretation of data and isothermal reactor design for single reactions (simple and complex rate equations).
- Unit-III:** Material balance for CSTR and plug flow reactors, their use for kinetic interpretation and design, Comparison of batch reactor, CSTR and PFR, Multiple reactions in batch reactor, CSTR and PFR, Concept of yield and selectivity.
- Unit-IV:** Concept of adiabatic and non-isothermal operations, Energy balance equations for batch, CSTR and PFR and their applications to design of reactors. Multiplicity and stability of CSTR, Optimal temperature and temperature profile.
- Unit-V:** Design equations for semi-batch reactor, Concepts of non-ideality, Age distribution function and inter-relationship, Models for non-ideal flow patterns, estimation of parameters, Use of models for reactor performance.

TEXT BOOKS:

1. Chemical Reaction Engineering: Octave Levenspiel-Wiley Eastern Limited, New Delhi.
2. Elements of Chemical Reaction Engineering: H.Scott Fogler-Prentice-Hall of India Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. Kinetics and Mechanisms of Chemical Transformation: J.Rajaram and J.C.Kuriacose-Macmillan India Ltd.New Delhi.
2. Chemical Engineering Kinetics: J.M.Smith-Mcgraw-Hill Book Company, New Delhi.

Note: Eight questions are to be set by taking at least one question from each unit but not more than two from anyunit. Students have to attempt five questions in all.

CHE-303 : CHEMICAL TECHNOLOGY-I
B. Tech. Semester - V (Chemical Engineering)

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

A comprehensive study of the following chemical industries involving process technology, availability of raw materials, production trend, preparation of flow sheet, engineering problems involving material of construction, environmental pollution, waste utilization and disposal, energy conservation and economic aspects.

Unit-I: Industrial gases: Oxygen, hydrogen, producer gas, nitrogen and carbon dioxide.

Unit-II: Nitrogen industries: Ammonia, nitric acid, nitrogenous and mixed fertilizers

Unit-III: Chlor-Alkali industries: Common salt, caustic soda, chlorine, hydrochloric acid, soda ash and bleaching powder.

Unit-IV: Sulphur industries: Sulphuric acid and oleum.

Unit-V: Ceramic industries: Portland cement, glass refractories.

Unit-VI: Phosphorous industries: Phosphorous, phosphoric acid, super- phosphates

Unit-VII: Miscellaneous industries: Sodium, potassium, calcium and magnesium.

Unit-VIII: Miscellaneous topics: Water, air, steam, nuclear materials, photographic products, fuel gases, cryogenics and electrochemistry.

TEXT BOOKS:

1. Outlines of Chemical Technology: C.E. Dryden - East - West Press Pvt. Ltd., New Delhi.
2. Shreve's Chemical Process Industries: G.T. Austin McGraw- Hill Book Company, New Delhi.

REFERENCE BOOKS:

1. A text Book of Chemical Technology Vol.-I: S.D. Shukla and G.N. Pandey - Vikas Publishing House Pvt.Ltd., New Delhi.
2. Industrial Chemicals: W.L. Faith, D.B. Keyes and R.L. Clark - John Wiley.
3. Chemtech I, II, III, IV - Indian Institute of Technology, Madras.

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

CHE-305 : EQUIPMENT DESIGN

B. Tech. Semester - V (Chemical Engineering)

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

- Unit-I:** Mechanics of Materials: Stress, strain, Biaxial and tri-axial stress, Stress-strain relationship for elastic bodies, Theories of failure, Thermal stresses, Torsion of solid and hollow cylindrical shafts, Thin and thick cylinders.
- Unit-II:** Pressure Vessel: Introduction of codes for pressure vessel design, classification of pressure vessels, Design of cylindrical and spherical shells under internal and external pressure, selection and design of closures, optimum length of diameter ratio of pressure vessel using common types of closures.
- Unit-III:** Design of jacketed portion of vessels, Selection and design of nozzles, Elementary idea of compensation for openings, Selection of gaskets, selection and design of flanges, pipe thickness calculation under internal and external pressure.
- Unit-IV:** Introduction to inspection and non-destructive testing, Complete design calculations and shop drawing for at least one pressure vessel using heads and flanges as per code specifications.
- Unit-V:** Tall Tower Design: Design of shell, skirt, bearing plate and anchor bolts used at high wind and seismic conditions.
- Unit-VI:** Supports: Design of lug support and saddle support including bearing plates and anchor bolts.
- Unit-VII:** Storage Tanks: Filling and breathing losses, classification of storage tanks, Design of liquid and gas storage tanks.

TEXT BOOKS:

1. Process Equipment Design: L.E. Brownell and H.E. Loung- John Wiley, New Delhi.
2. Introduction of Chemical Equipment Design: B.C. Bhattacharya -Chemical Engineering Education Development Centre, IIT, Madras.

REFERENCE BOOKS:

1. Code for unfired pressure vessels: IS: 2825-1969-ISI, New Delhi.
2. Process Equipment Design: M.V. Joshi and V.V. Mahagani Macmillan India Ltd.

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

CHE-307 : MASS TRANSFER-I
B. Tech. Semester - V (Chemical Engineering)

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

Unit-I: Diffusion in gases and liquids, Equation of continuity.

Unit-II: Theories of mass transfer, Individual and overall mass transfer coefficients, Mass, heat and momentum transfer analogies. Simultaneous heat and mass transfer.

Unit-III: Mass balance in co-current and counter-current continuous contact equipments. Concept of operating line. Multistage countercurrent operations. Concept of ideal stage. Stage efficiencies. Continuous contact equipments. HTU and NTU concepts.

Unit-IV: Gas absorption: Design of plate and packed absorption columns. Non isothermal absorption.

Unit-V: Humidification, Design of cooling towers.

Unit-VI: Drying of solids. Rate of drying curves, Through circulation drying, Continuous drying, Types of driers.

TEXT BOOKS:

1. Mass Transfer Operations: R.E. Treybal-Mcgraw-Hill Book Company New Delhi.
2. Introduction to Chemical Engineering: W.L. Badger and J.T. Banchero-Mc-graw-Hill Book Company, New Delhi.

REFERENCE BOOKS:

1. Unit Operations of Chemical Engineering: W.L. McCabe & J.C. Smith- Mc-graw Hill, New Delhi.
2. Chemical Engineering: J.M. Coulson and J.F. Richardson Vol-I- Pergamon, New York.

Note: Eight questions are to be set by taking at least one question from each unit but not more than two from any unit. Students have to attempt five questions in all.

CHE-309 : HEAT TRANSFER

B. Tech. Semester - V (Chemical Engineering)

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

UNIT-I: Conduction: Basic equation-one dimensional, two dimensional and three dimensional, Steady-state conduction in slab, cylinder and sphere, Critical thickness of insulation. Finned surfaces,

Transient conduction Analytical solution for slabs, Use of transient temperature charts for slabs, cylinders and spheres and lumped system analysis.

UNIT-II: Convection: Equation of motion, Equation of energy, Solution of Boundary layer flow over flat plate, Forced convection inside tubes under laminar and turbulent flow conditions, Forced convection over cylinders and spheres. Natural convection: dimensionless parameters of natural convections, Empirical correlations for free convection for various shapes.

UNIT-III: Boiling and condensation heat transfer, Heat Exchangers: Basic types of heat exchanges, Overall heat transfer coefficient, log mean temperature difference, Effectiveness and NTU methods for heat exchanger analysis.

UNIT-IV: Radiation: Black body radiation, Concept of shape factor, Methods of determination of shape factor, Radiation exchange in enclosure with black surface.

UNIT-V: Evaporators: Types of Evaporators, Single and multiple effect evaporators, Calculations for surface area requirements.

TEXT BOOKS:

1. Unit operations of chemical Engineering: W.L. McCabe and J.C. Smith-McGraw Hill Book Company, New Delhi.
2. Heat Transfer: D.P. Tiwari- Umesh publications (Edition-2000), New Delhi.

REFERENCE BOOKS:

1. Heat Transfer: M. N. Ozisik- Mcgraw Hill International Editions
2. Heat Transfer: J. P. Holman- Mcgraw Hill Book Company

Note: Eight questions are to be set by taking at least one question from each unit but not more than two from any unit. Students have to attempt five questions in all.

CHE-311 : CHEMICAL ENGINEERING THERMODYNAMICS

B. Tech. Semester - V (Chemical Engineering)

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

-
- UNIT-I:** P-V-T Behaviour of Pure Fluids - Virial equations, cubic equations, generalised correlations and acentric factor, behaviour of liquids.
- UNIT-II:** Laws of Thermodynamics - Review, their applications to real processes, concept of entropy macroscopically and microscopically.
- UNIT-III:** Thermodynamic Properties of Pure Fluids - Relationship among thermodynamic properties, concept of residual properties. Thermodynamic properties of single and two-phase systems. Generalized correlations for thermodynamics properties of gases.
- UNIT-IV:** Thermodynamics of Flow Processes - Metering and throttling processes, thermodynamic analysis of flow through nozzles, compression of gases in single as well as multistage compressors their volumetric and isentropic efficiencies.
- UNIT-V:** Refrigeration & Liquefaction - Ideal refrigeration cycle, air, vapor compression and absorption refrigeration cycles, C.O.P., choice of refrigerants, Liquefaction processes and estimation of minimum work requirements.
- UNIT-VI:** Thermodynamic Properties of Homogeneous Mixtures - Property relationships for systems of variable composition, partial molar properties, fugacity and fugacity coefficients, fugacity in ideal solutions, property changes of mixing activity, heat effects in mixing processes, excess properties, activity coefficients, gaseous mixtures.
- UNIT-VII:** Phase Equilibria - Importance of phase equilibria in process industries, vapour - Liquid equilibria (VLE) miscible, partially miscible and immiscible systems, their phase diagrams, Azeotropes, VLE calculations at low and high pressures, Analysis of multicomponent multiphase systems, Activity coefficients from experimental data - Margules, van-laar, Wilson Equations.
- UNIT-VIII:** Chemical Reaction Equilibria, Reaction coordinate, application of equilibrium criteria to chemical reactions, standard Gibbs free energy change and the equilibrium constant, effect of Temperature on equilibrium constant, evaluation of equilibrium constants and composition, calculation of equilibrium compositions for single reactions, phase rule and Duhem's theorem for reacting systems, introduction of multi reaction equilibria.

TEXT BOOKS:

1. Introduction to Chemical Engineering Thermodynamics: J .M. Smith and H.C. Van Ness - McGraw-Hill Book Company, New Delhi.
2. Chemical Engineering Thermodynamics: Y.V.C. Rao Universities Press (India) Ltd., Hyderabad, India

REFERENCE BOOKS:

1. Chemical and Process Thermodynamics: B.G. Kyle - Prentice Hall of India Pvt. Ltd., New Delhi.
2. Chemical Engineering Thermodynamics: T.E. Daubert - McGraw Hill, New Delhi.
3. Chemical Process Principles Vol-II: O.A. Haugen, K.M. Waston and R.A. Regatz - Wiley.

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

CHE-313 : CHEMICAL TECHNOLOGY-I LAB
B. Tech. Semester - V (Chemical Engineering)

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

List of Practicals / Demonstrations:

1. Determination of Ammonia or $(\text{NH}_4)_2\text{SO}_4$ in a given compound spectrophotometrically.
2. Determination of water soluble or available phosphate in a sample of superphosphate.
3. Determination of Potassium in a given sample of fertilizer by cobaltinitrite method OR by Flame photometry.
4. Determination of percentage of available chlorine in a given sample of bleaching powder.
5. Determination of dissolved oxygen in a given sample of water.
6. To determine B.O.D. in a given water sample (Wastewater).
7. Determination of percentage of silica in a sample of portland cement.
8. Determination of Na_2CO_3 and NaOH in a given alkali solution.
9. Determination of NaHCO_3 and Na_2CO_3 in a given alkali solution.
10. Estimation of calcium in lime stone.
11. Determination of Iron in a water sample spectrophotometrically.

NOTE: At least eight experiments are to be performed out of above mentioned experiments.

CHE-315 : MASS TRANSFER-I LAB
B. Tech. Semester - V (Chemical Engineering)

L	T	P	Credits
-	-	2	2

Class Work	: 25 Marks
Examination	: 25 Marks
Total	: 50 Marks
Duration of Examination	: 3 Hours

List of Practicals / Demonstrations:

1. Mass Transfer of vapor in air from solid surface.
2. Diffusion of vapor in air from liquid surface.
3. Drying of solids.
4. H.E.T.P. and H.T.U.
5. Liquid hold up.
6. Wetted wall column.
7. Determination of Mass Transfer coefficient.
8. Air-water absorption.

NOTE: Eight experiments are to be performed as per above mentioned list of experiments.

CHE-317 : HEAT TRANSFER LAB
B. Tech. Semester - V (Chemical Engineering)

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

List of Practicals / Demonstrations:

1. Determination of overall heat transfer coefficient.
2. Filmwise & dropwise condensation.
3. Efficiency of a long tube evaporator.
4. Effectiveness of pin-fin.
5. Determination of LMTD.
6. Natural Convection heat transfer.
7. Forced convection heat transfer.
8. Thermal conductivity of insulating powder.
9. Determination of emissivity.

NOTE: At least eight experiments are to be performed out of the above mentioned experiments.

CHE-319 : PROFESSIONAL TRAINING-I
B. Tech. Semester - V (Chemical 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 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.

CHE-302 : CHEMICAL REACTION ENGINEERING-II

B. Tech. Semester - VI (Chemical Engineering)

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

- UNIT-I:** Introduction to catalysis, classification of catalysts, preparation and physical characteristics of solid catalysts, Concepts of physical adsorption and chemisorption.
- UNIT-II:** Kinetics of solid catalysed gas phase reactions, Power law and langmuir hinshelwood rate equations and parameter estimation.
- UNIT-III:** Diffusion of mass and heat in porous solids with and without external diffusional resistances, Effectiveness factor.
- UNIT-IV:** Fixed bed catalytic reactors; single and multibed adiabatic reactors, multitubular fixed bed reactors. Design equations for fixed bed reactors using pseudohomogeneous one and two-dimensional models.
- UNIT-V:** Concepts of heterogeneous models. Parametric sensitivity. Modelling of gas-solid non-catalytic reactions and determination of parameters.
- UNIT-VI:** Fluid-fluid reaction modelling based on film and penetration theory. Enhancement factors. Reactor system and design for gas-liquid and gas-solid non-catalytic systems.

TEXT BOOKS:

1. Chemical Reaction Engineering: Octave Levenspiel-Wiley Eastern Limited, New Delhi.
2. Elements of Chemical Reaction Engineering: H.Scott Fogler-Prentice-Hall of India Pvt. Ltd., New Delhi.

REFERENCE BOOK:

1. Kinetics and Mechanisms of Chemical Transformation: J.Rajaram and J.C.Kuriacose-Macmillan India Ltd.New Delhi.
2. Chemical Engineering Kinetics: J.M.Smith-Mcgraw-Hill Book company, New Delhi.

Note : Eight questions are to be set by taking at least one question from each unit but not more than two from any unit. Students have to attempt five questions in all.

CHE-304 : CHEMICAL TECHNOLOGY-II
B. Tech. Semester - VI (Chemical Engineering)

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

-
- UNIT-I:** Pulp and paper: Pulping processes, recovery of chemicals, stock preparation and paper making. Coal Chemicals: Coal for distillation and recovery of chemicals, feed stock, product profile.
- UNIT-II:** Petrochemicals : An Overview, ethylene oxide, ethylene glycol, acrylonitrile, styrene, butadiene.
- UNIT-III:** Leather Industry- Leather chemistry, manufacturing processes and uses, synthetic leather.
- UNIT-IV:** Food Industries : Food & Food biproducts, fragrances, flavours and food additives oil & Fats Soap & detergents, glycerin, waxes.
- UNIT-V:** Agrochemical Industries: Insecticides, herbicides, pesticides, plant nutrients and regulators. Surface-coating Industries: Paints, pigments, varnishes, lacquers.
- UNIT-VI:** Sugar & Starch: Sugar, starch and related products. Fermentation Industries: Alcohol, beer, wine, liquor, vinegar, citric acid, lactic acid, miscellaneous compounds and enzymes.
- UNIT-VII:** Explosives and toxic chemicals : Nitrocellulose, nitroglycerine, TNT.
- UNIT-VIII:** Pharmaceutical Industries: Alkylation, carboxylation, acetylation, Dehydration, halogenation, oxidation, sulphonation animation, antibiotics, hormones and vitamins.

TEXT BOOKS:

1. Outlines of Chemical Technology: C.E. Dryden - East - West Press Pvt. Ltd., New Delhi.
2. Shreve's Chemical Process Industries: G.T. Austin McGraw- Hill Book Company, New Delhi.

REFERENCE BOOKS:

1. A text Book of Chemical Technology Vol.-II : S.D. Shukla and G.N. Pandey - Vikas Publishing House Pvt.Ltd., New Delhi.
2. Industrial Chemical: W.L. Faith, D.B. Keyes and R.L. Clark - John Wiley.
3. Chemtech I, II, III, IV - Indian Institute of Technology, Madras

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

CHE-306 : PROCESS UTILITIES
B. Tech. Semester - VI (Chemical Engineering)

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

UNIT-I: Heat Transfer Media-Characteristic properties, classification, selection & their industrial applications. Steam System - Applications, design of efficient steam heating systems, condensate utilization and flash steam, steam Traps.

UNIT-II: Water, its characteristics and conditioning for process industries, e.g. boiler feed, cooling etc. Recycling aspects of water.

UNIT-III: Air, Reciprocating air compressors, vacuum pumps, air receivers, different types of ejectors and barometric condensers, piping networks for water, steam condensate and air.

UNIT-IV: Hazards - Introduction, hazards due to fire explosion, toxicity and radiation, chemical hazards, maximum allowable concentration and threshold limiting values, protective and preventive measures in hazard control.

UNIT-V: Disaster management - Scale of disaster, vapour cloud explosion, relief system emergency plans, standard safety programmes for disaster control, HAZOP analysis of plants. Indian legislation for safety and hazards, safety codes.

TEXT BOOK:

1. Chemical Process Safety Fundamentals with Applications: D.A. Crowl and J.F. Louvar - Prentice Hall.

REFERENCE BOOKS:

1. Loss Prevention in process Industry: F.P. Lees Vol I, II, III - Butterworths.
2. Safety in Process Design: G.C. Wells - John Wiley.

Note: Eight questions are to be set by taking at least one question from each unit but not more than two from any unit. Students have to attempt five questions in all.

CHE-308 : MASS TRANSFER-II
B. Tech. Semester - VI (Chemical Engineering)

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

UNIT-I: Distillation: Raoult's Law, ideal solutions, x-y and H-x-y diagrams. Flash vaporization and condensation. Differential distillation. Steam distillation.

UNIT-II: Binary distillation, McCabe Thiele and Ponchon-Savarit Method, Total reflux, minimum and optimum reflux ratios, multi-component distillation.

UNIT-III: Liquid-Liquid extraction: Extraction equipment, Equilibrium diagram. Choice of solvent, Single stage and multistage countercurrent extraction with and without reflux, Continuous contact extractors.

UNIT-IV: Leaching: Leaching equipment and equilibrium. Single stage and multistage cross current and counter current leaching.

UNIT-V: Adsorption: Adsorption equilibria, Adsorption column sizing.

TEXT BOOKS:

1. Mass Transfer Operations: R.E. Treybal-Mcgraw-Hill Book Company New Delhi.
2. Introduction to Chemical Engineering: W.L. Badger and J.T. Banchero-Mcgraw-Hill Book Company, New Delhi.

REFERENCE BOOKS:

1. Unit Operations of Chemical Engineering: W.L. McCabe & J.C. Smith- Mcgraw Hill, New Delhi.
2. Chemical Engineering: J.M. Coulson and J.F. Richardson Vol-II- Pergamon Press.

Note: Eight questions are to be set by taking at least one question from each unit but not more than two from any unit. Students have to attempt five questions in all.

CHE-310 : PROCESS INSTRUMENTATION
B. Tech. Semester - VI (Chemical Engineering)

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

UNIT-I: General principles of measurement, Static and Dynamic characteristics of instruments, sensors & transducers. Process instruments, Recording instruments, indicator and signaling instruments transmission of instrument reading, control centre, instrumentation diagram, online instrumentation in modern plants.

UNIT-II: Temperature measurement, Thermocouples, resistance thermometers, bimetallic thermometers, thermistors, optical and radiation pyrometer.

UNIT-III: Pressure measurement, Use of manometer, Bourdon gauge, Bellows type gauge, measurement of vacuum, pressure transducers.

UNIT-IV: Flow measurement, Use of obstruction type meters, variable area meters, pressure probes, positive displacement type meters, electromagnetic flowmeters and mass flow meters.

UNIT-V: Liquid level measurement, Direct and differential method for the measurement in open pressure vessels.

UNIT-VI: Miscellaneous measurements, Composition measurement, measurement of viscosity, conductivity, humidity, pH and nuclear radiations. Instrument for gas analysis, gas chromatography mass spectroscopy.

TEXT BOOKS:

1. Industrial Instrumentation: D.P. Eckmen - John Wiley.
2. Instrumentation in Process Control: W.J. Wightmen - Butterworth.

REFERENCE BOOKS:

1. Applied Instrumentation in the Process Industries Vol-I & II: W.G. Andrew - Gulf Publishing Company.
2. Process Instrumentation and Control Hand Book : J.M. Douglas - McGraw Hill.
3. Hand Book of Measurement Science: P.H. Sydenham - John Wiley.

Note: Eight questions are to be set by taking at least one question from each unit but not more than two from any unit. Students have to attempt five questions in all.

CHE-312 : PROCESS EQUIPMENT DESIGN
B. Tech. Semester - VI (Chemical Engineering)

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

UNIT-I: Heat Exchangers - Auxiliary calculations, Review of kern method, Bell's method and HTRI method of shell and tube heat exchanger design.

UNIT-II: Reboilers - Design of kettle and thermosyphon reboilers.

UNIT-III: Evaporators-sizing of drum, central core pipe size and number of tubes for short-and long-tube evaporators.

UNIT-IV: Crystallizers - Design of crystallizers.

UNIT-V: Extractors - Design of solid-liquid, Liquid-Liquid extraction systems.

UNIT-VI: Gas-Liquid Contact systems - Distillation column, Tray hydraulics of sieve and valve trays, Design of packed bed columns.

TEXT BOOKS:

1. Chemical Engineering Vol-6: J.M. Coulson and J.F. Reardon - Pergamon Press.
2. Process Equipment Design: M.V. Joshi and V.V. Mahajani - Macmillan India Ltd.

REFERENCE BOOKS:

1. Process Heat Transfer: D.Q. Kern - McGraw Hill.
2. Design of Equilibrium Stage Processes: B.D. Smith- Mc-Graw Hill, New Delhi.
3. Applied Process Design for Chemical & Petrochemical Plants Vol-I, II, III: E.E. Ludwig- Gulf Publishing Company, Houston.

Note: Eight questions are to be set by taking at least one question from each unit but not more than two from any unit. Students have to attempt five questions in all.

CHE-314 : CHEMICAL TECHNOLOGY-II LAB
B. Tech. Semester - VI (Chemical Engineering)

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

List of Practicals / Demonstrations:

1. Determination of acid value of oil.
2. To extract Caffiene from tea leaves.
3. To estimate the percentage of sucrose in a given sample of cane sugar.
4. Estimation of non-reducing sugar.
5. Preparation of azodye from aniline.
6. To prepare fluorescein dye and Eosin dye.
7. Determination of Tannin in fruit juice.
8. Determination of DDT by hydrolysis.
9. Determination of gamma - isomer of B.H.C. by hydrolysis.
10. Estimation of starch from plant material.
11. Analysis of cane juice.

NOTE: At least eight experiments are to be performed out of above mentioned experiments.

CHE-316 : MASS TRANSFER-II LAB
B. Tech. Semester - VI (Chemical Engineering)

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

List of Practicals / Demonstrations:

1. Batch distillation.
2. Solid liquid extraction.
3. Vapour liquid equilibrium.
4. Liquid - Liquid extraction.
5. Batch distillation with reflux.
6. Adsorption isotherms.

NOTE: At least five experiments are to be performed out of above mentioned experiments.

CHE-318 : CHEMICAL REACTION ENGINEERING-II LAB

B. Tech. Semester - VI (Chemical Engineering)

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

List of Practicals / Demonstrations:

1. Adsorption isotherms.
2. Inversion of cane sugar.
3. Flow analogy for series and parallel reactions.
4. Rate constant of saponification reaction in PFR.
5. Rate constant of esterification reaction in batch reactor.
6. Rate constant of saponification reaction in batch reactor.
7. Rate constant of saponification reaction in CSTR.

NOTE: At least five experiments are to be performed out of above mentioned experiments.

GPCHE-302 : GENERAL PROFICIENCY
B. Tech. Semester - VI (Chemical Engineering)

L	T	P	Credits	Class Work	: 50 Marks
-	-	-	2	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: **(20 Marks)**

- | | | | |
|-----|--------------------------------------|-------|------------------|
| 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:

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.

(10 Marks)

CHE-401 : PETROLEUM ENGINEERING
B. Tech. Semester - VII (Chemical Engineering)

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

Unit-I: Origin, composition, classification and constituents of petroleum, processing of crude oil - distillation.

Unit-I: Cracking - Thermal & catalytic, Reforming - Thermal & catalytic, Hydrocracking.

Unit-III: Polymerization, Alkylation and Isomerization.

Unit-IV: Purification of Petroleum products - Sweetening processes, Dewaxing, Deasphalting etc.

Unit-V: Properties of Petroleum products - Viscosity index, flash and fire point, cloud and pour point, octane and cetane number etc.

Unit-VI: Gasoline, diesel and fuel oil, storage and handling of fuel oils.

TEXT BOOK:

1. Petroleum Refinery Engineering: W.L. Nelson, Mc Graw Hill.
2. Elements of Fuels, Furnaces and Refractories: O.P. Gupta - Khanna Publishers.

REFERENCE BOOKS:

1. Modern petroleum Technology Vol. I and II: G.D. Hopson- John wiley & Sons
2. Chemical Technology of Petroleum: W.A. Gruse and D.R. Stevens- Mc Graw Hill
3. American Petroleum Refinery: H.S. Bell Van Nostrand Co.
4. Advances in petroleum chemistry and Refining: Kobe, K.A., McKetta, J.J.-Interscience.
5. Modern Petroleum Refinery Processes - B.K. Bhaskar Rao.

Note: Five out of eight questions are to be attempted. At least one question (but not more than two) is to be set from each unit.

CHE-403 : PROCESS DYNAMICS & CONTROL
B. Tech. Semester - VII (Chemical Engineering)

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

Unit-I: Laplace Transform, Inversion by Partial fractions, Properties of Transform.

Unit-II: Linear Open-Loop System, Response of first-order systems, physical examples of first order systems, response of first order systems in series, Higher-order systems and Transportation Lag.

Unit-III: Linear closed-loop systems, Control systems, Controllers & Final Control Elements, Closed-loop Transfer Functions, Transient Response of Simple Control Systems.

Unit-IV: Control valve, construction, valve sizing, characteristics, and valve positioner.

Unit-V: Stability, Routh Test for stability, Root Locus.

Unit-VI: Introduction to Frequency Response, Bode diagrams, Gain Margins and Phase Margins, Ziegler-Nichols Controller settings.

TEXT BOOKS:

1. Chemical Process Control - An Introduction to Theory and Practice: G. Stephanopoulos - Prentice Hall of India, New Delhi.
2. Process System Analysis and Control: D.R. Coughanowr - McGraw - Hill.

REFERENCE BOOKS:

1. Process Dynamics and Control: J.M. Douglas - Prentice Hall of India, New Delhi.
2. An Introduction to Process Dynamics and Control: T.W. Weber - John Wiley.

Note: Five out of eight questions are to be attempted. At least one question but not more than two is to be set from each unit.

CHE-405 : ENERGY TECHNOLOGY
B. Tech. Semester - VII (Chemical Engineering)

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

- Unit-I:** Solid Fuels: Classification of coals, origin, composition, characteristics of coal, washing, storage of coal, pulverized fuel, coal carbonization, properties of coal.
- Unit-II:** Liquid Fuels: Origin, composition, classification of petroleum, processing of crude oil, cracking, reforming, octane & cetane number, purification of petroleum products, properties of petroleum products.
- Unit-III:** Gaseous Fuels: Natural gas, L.P.G., Water Gas, Producer Gas, Flue Gas analysis.
- Unit-IV:** Combustion: General principles of combustion, types of combustion processes, Burners, combustion calculation.
- Unit-V:** Alternate Energy System: Biogas, Solar Energy and its applications, wind energy, geothermal energy, fuel cells, tidal energy.

TEXT BOOKS:

1. Elements of Fuels, Furnaces and Refractories: O.P. Gupta- Khanna Publishers
2. Energy Technology: S.Rao, B.B. Parulekar- Khanna Publisher.

REFERENCE BOOKS:

1. Fuels & Combustion: S.Sarkar - Longman Publishers India Ltd. - IInd Edition.
2. Fuels and their combustion: R.T. Haslam and R.P. Russel- McGraw-Hill.
3. Renewable Energy Resources: J. Twindell and Tonyweir- E & FN spon.

NOTE: Five out of eight questions are to be attempted. At least one question (but not more than two) is to be set from each unit.

HUM-451 : LANGUAGE SKILLS FOR ENGINEERS

B. Tech. Semester - VII (Open Elective)

L	T	P	Credits	Class Work	: 50 Marks
4	-	-	4	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.

REFERENCE BOOKS:

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.

Note: Eight questions will be set and students will be required to attempt five questions in all.

CHE-453 : HUMAN RESOURCE MANAGEMENT

B. Tech. Semester - VII (Open Elective)

L	T	P	Credits	Class Work	: 50 Marks
4	-	-	4	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 Communication; 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 McGrawHill 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, New Delhi.

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	Class Work	: 50 Marks
4	-	-	4	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.

REFERENCE 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 (International Founder, New Delhi)
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 at least 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	Class Work	: 50 Marks
4	-	-	4	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.

REFERENCE BOOKS:

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. Shruiter, Tata Macgraw Hill, New Delhi.
5. English Business Letters by F.W. Wing & D. Annecree, 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	Class Work	: 50 Marks
4	-	-	4	Examination	: 100 Marks
				Total	: 150 Marks
				Duration of Examination	: 3 Hours

UNIT-I: 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-II: PREPARATION AND CHARACTERIZATION OF NANOPARTICLES-Nanoscale Lithography, Dip Pen Lithography, E-Beam Lithography, Nanosphere Lithography; 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-III: 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-IV: 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, Co₂ 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	Class Work	:	50 Marks
4	-	-	4	Examination	:	100 Marks
				Total	:	150 Marks
				Duration of Examination	:	3 Hours

- UNIT-I:** 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 camers, engine combustion control, washing machine, vehicle suspensions, electro-mechanical brakes, manufacturing machine, industrial robots, air conditioning systems, etc..
- UNIT-II:** 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-III:** 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-IV:** Mechanical actuation systems - kinematic chains, cams, gear trains, beld 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-V:** 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-VI:** 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-VII:** 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-VIII:** 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. Histan, 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 & EXPERT SYSTEMS

B. Tech. Semester - VII (Open Elective)

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

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.

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.

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 LIPS.

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.

Expert systems- II, societal impacts reasoning in artificial intelligence, inference with rules, with frames: model based reasoning, case based rezoning, 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 Edn. Addison 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	Class Work	: 50 Marks
4	-	-	4	Examination	: 100 Marks
				Total	: 150 Marks
				Duration of Examination	: 3 Hours

Unit-I:	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-II:	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-III:	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-IV:	File System: Different types of files and their access methods, directory structures, various allocation methods, disk scheduling and management its associated algorithms, Introduction to distributed file system.
Unit-V:	Process-Synchronization & Deadlocks: Critical Section Problems, semaphores; methods for handling deadlocks-deadlock prevention, avoidance & detection; deadlock recovery.
Unit-VI:	I/O Systems: I/O Hardware, Application I/O Interface, Kernel, Transforming I/O requests, Performance Issues.
Unit-VII:	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 System by A. Tanenbaum, 1992, Prentice-Hall.
3. Operating System Internals and Design Principles by William Stalling 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 Ritchie, 1974, TMH.
4. Operating Systems by Mandrik & Donovan, TMH
5. Operating System 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	Class Work	: 50 Marks
4	-	-	4	Examination	: 100 Marks
				Total	: 150 Marks
				Duration of Examination	: 3 Hours

UNIT-I: INTRODUCTION: Intelligence, features characterizing intelligence, intelligent instrumentation system; features of intelligent instrumentation; components of intelligent instrumentation system; Block diagram of an intelligent instrumentation system.

UNIT-II: 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).

UNIT-III: SMART SENSORS: Primary sensors; Excitation; Compensation (Nonlinearity: 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..

UNIT-IV: INTERFACING INSTRUMENTS & COMPUTERS: Basic issues of interfacing; Address decoding; Data transfer control; A/D converter; D/A converter; Sample & hold circuit; Other interface considerations.

UNIT-V: 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 BOOKS:

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 BOOKS:

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 exam, 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	Class Work	: 50 Marks
4	-	-	4	Examination	: 100 Marks
				Total	: 150 Marks
				Duration of Examination	: 3 Hours

-
- UNIT-I:** 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 -II:** MICROCONTROLLER ARCHITECTURE-Introduction to PIC microcontrollers, Architecture and pipelining, program memory considerations, Addressing modes, CPU registers, Instruction set, simple operations.
- UNIT-III:** 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 peripheral device, O/p port Expansion, I/p port expansion, UART.
- UNIT-IV:** SOFTWARE-Development tools/ environments, Assembly language programming style, Interpreters, High level languages, Intel hex format object files, Debugging.
- UNIT-V:** 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-VI:** DESIGNING USING MICROCONTROLLERS-Music box, Mouse wheel turning, PWM motor control, Aircraft Demonstration, ultra sonic distance measuring, Temperature Sensor, Pressure Sensor, Magnetic Field Sensor.

TEXT BOOKS:

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 & CONTROL
B. Tech. Semester - VII (Open Elective)

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

UNIT-I: Waste Water & its treatment Processes -Waste-water characteristics, effluent standards, primary treatment, secondary treatment – aerobic (activated sludge, aerated lagoons, trickling filter, roughing filter, rotating biological contactor) anaerobic (contact process, UASB).

UNIT-II: Air Pollution- Classification of air pollutants Particulates: Physical characteristics, mode of formation, setting properties, Control measures. 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.

UNIT-III: 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. Elementary treatment of nuclear pollution, metal pollution, noise pollution their effects & control.

REFERENCE BOOKS:

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 SYSTEMS

B. Tech. Semester - VII (Open Elective)

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

-
- UNIT-I:** 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-II:** Information Technology - A manager's overview, managerial overviews, computer hardware & software, DBMS, RDBMS and Telecommunication.
- UNIT-III:** 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-IV:** Detailed system design - Inform 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-V:** 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-VI:** Advanced Concepts in Information Systems - Enterprise Resources Management (ERP), Supply 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	Class Work	: 50 Marks
4	-	-	4	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.

CHE-407 : POLYMER SCIENCE AND ENGINEERING
B. Tech. Semester - VII (Chemical Engineering)

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

UNIT-I: Chemistry of Polymerization Reactions- Functionality, Polymerization reactions, polycondensation, addition, free radical and chain polymerization. Copolymerization, block and graft polymerizations, stereospecific polymerization.

UNIT-II: Polymerization Kinetics- Kinetics of radical, Chain and ionic polymerisation and copolymerisation systems.

UNIT-III: Molecular Weight Estimation -Average molecular weight: number average and weight average. Theoretical distributions, methods for the estimation of molecular weight.

UNIT-IV: Polymerisation Processes - Bulk, Solution, Emulsion and suspension polymerisation, Additives.

UNIT-V: Rheology- simple rheological response, simple linear viscoelastic models- maxwell. voigt, material response time, temperature dependence of viscosity. Rheological studies.

UNIT-VI: Processing methods, Mixing including internal mixture, Calendering, Extrusion, Moulding, Casting, Thermoforming, Applications.

TEXT BOOKS:

1. Text Book of Polymer Science: Jr. Billmayer & W. Fred- Wiley Tappers.
2. Polymer Science and Engineering: Davil J. Williams- Prentice Hall of India, New Delhi.

REFERENCE BOOKS:

1. Principles of Polymers systems: Rodringuez- Tata Mc Graw Hill.
2. Polymer Processing: J.M. Mc kelvey -John wiley.
3. Polymer Science: Shreedhar & Gowarikar.

NOTE: Five out of eight questions are to be attempted. At least one question (but not more than two) is to be set from each UNIT.

CHE-409 : PROCESS DYNAMICS & CONTROL LAB
B. Tech. Semester - VII (Chemical Engineering)

L	T	P	Credits
-	-	3	3

Class Work	: 50 Marks
Examination	: 50 Marks
Total	: 100 Marks
Duration of Examination	: 3 Hours

List of Practicals / Demonstrations:

1. Liquid Level Tank.
2. Non-interacting system.
3. Interacting system.
4. Dynamics of mixing tank.
5. Dynamics of Heat Exchanger.
6. Analysis of Valve.
7. Time constant of a Mercury Thermometer.
8. PI and PID controller.
9. Temperature, Pressure and Flow control.

NOTE: At least eight experiments are to be performed.

CHE-411 : ENERGY TECHNOLOGY LAB
B. Tech. Semester - VII (Chemical Engineering)

L	T	P	Credits
-	-	2	2

Class Work	: 25 Marks
Examination	: 25 Marks
Total	: 50 Marks
Duration of Examination	: 3 Hours

List of Practicals / Demonstrations:

1. Determination of Flash point and fire point.
2. Determination of Calorific value.
3. Proximate analysis of coal.
4. Cloud point and pour point.
5. Smoke point.

CHE-415 : PROFESSIONAL TRAINING-II
B. Tech. Semester - VII (Chemical Engineering)

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

CHE-417 : PROJECT
B. Tech. Semester - VII (Chemical Engineering)

L	T	P	Credits	Class Work	: 50 Marks
-	-	4	4	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 project supervisor).

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.

CHE-402 : PROCESS MODELING & SIMULATION

B. Tech. Semester - VIII (Chemical Engineering)

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

- UNIT-I:** Introduction: Use of mathematical models, scope of coverage, principles of formulations.
Fundamental Laws- continuity equations, energy equations, equations of motion, transport equations, equation of state, equilibrium, chemical kinetics.
- UNIT-II:** Mathematical Models of Chemical Engineering System - Reactor, Heat exchanger, Distillation column, Vaporizer etc.
- UNIT-III:** Computer Simulation-Numerical simulation, Interval Halving, Newton Raphson Methods etc., Simulation examples - CSTR, Distillation column, Reactor etc.
- UNIT-IV:** Analysis and design of advanced control - Dead time compensation, Inverse response, Control System with Multiple Loops, Feed forward and Ratio control, Adaptive and Inferential control.
- UNIT-V:** Process control using digital computers-Digital Computer Control loops, Continuous and Discrete time systems, Z-Transforms.

TEXT BOOKS:

1. Process modelling simulation and control: W.L. Luyben- McGraw Hill.
2. Chemical Process Control - An Introduction to Theory and Practice: G. Stephanopoulos - Prentice Hall of India, New Delhi.

REFERENCE BOOKS:

1. Chemical Process simulation: Asghar Husain- Wiley Eastern.
2. Chemical Engineering Dynamics: E.J. Dunn- V.C.H.
3. Modeling and simulation in chemical Engineering: R.G.E. Franks Wiley Interscience.

Note: Five out of eight questions are to be attempted. At least one question (but not more than two) is to be set from each unit.

CHE-404 : PROCESS ENGINEERING & ECONOMICS

B. Tech. Semester - VIII (Chemical Engineering)

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

- UNIT-I:** Introduction, Flow-sheeting, Plant Location, Plant Layout, Health and Safety Hazards, Degree of freedom, Environmental Protection.
- UNIT-II:** Cost and Asset Accounting: Basic relationships in accounting, Balance Sheet Cost Estimation: Cash Flow, Capital Investments, Methods for estimating Capital Investments, Cost Indexes, Total Product Cost
- UNIT-III:** Interest and Investment Costs: Types of Interest, Present Worth and Discount, Annuities, Perpetuities and Capitalized Costs
- UNIT-IV:** Depreciation and Taxes: Types of Taxes, Types of Depreciation, Methods for Determining Depreciation, Insurance: Types of Insurance & legal responsibility.
- UNIT-V:** Profitability: Profitability standards, Methods for Profitability Evaluation, Alternative Investments.
- UNIT-VI:** Optimum design: General Procedure for determining optimum conditions, Break-Even chart and its significance for optimum analysis, optimum conditions in cyclic operations, Examples of optimum design in a chemical process plant.

TEXT BOOKS:

1. Plant design and Economics for chemical Engineering: M.S. Peters and K.D. Timmerhaus- Mc Graw Hill.
2. Chemical Engineering Vol. 6: J.M. Coulson and Richardson J.F.- Pergamon Press.

REFERENCE BOOKS:

1. Strategy of process engineering: D.F. Rudd and C.C. wat sons- John wiley and sons.
2. Optimization Theory and practice: G.S.G. Beveridge and R.S. Schechter- Mc Graw Hill.
3. Project Engineering of Processes Plants: H.F. Rase and M.H. Barrow - John Willey.

Note: Five out of eight questions are to be attempted. At least one question (but not more than two) is to be set from each unit.

CHE-451 : ENVIRONMENTAL POLLUTION & CONTROL (ELECTIVE-I)

B. Tech. Semester - VIII (Chemical Engineering)

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

UNIT-I: Causes of Environmental Pollution: Interaction of systems, Environmental disturbances, public awareness and action, population and economic growth, Industrialization, Energy growth, manmade disturbances.

UNIT-II: Air Pollution: Air quality requirement, types of air pollutants, Sources of air pollution, effects of air pollutants, Measurement of air quality.

UNIT-III: Water Pollution: Water quality requirement, types of water pollutants, sources of water pollution, Effects of water pollution, control of water pollution, Measurement of water quality, water pollution laws.

UNIT-IV: Wastewater and sludge treatment methods, Sources and characteristics of wastewater, Primary treatment, Secondary treatment, Tertiary treatment, Adsorption, Disinfection, Sources and characteristics of sludge, Sludge stabilization, Thickening and dewatering, Aerobic and anaerobic digestion of sludge, wastewater reclamation and reuse, Effluent and sludge disposal.

UNIT-V: Industrial pollution monitoring and control including treatment methods in various process industries (such as refineries, fertilizer, chlor alkali, food, mining and metallurgical industries etc.)

REFERENCE BOOKS:

1. Wastewater System Engineering: H.W. Parker- Prentice Hall of India.
2. Air Pollution: H.C. Perkins-Mc Graw Hill.
3. Air Pollution: M.N. Rao and H.V.N. Rao- Tata McGraw Hill.
4. Environmental Engineering: G.N. Panday and G.C. Carney- Tata Mc Graw Hill.
5. Environmental Engineering: Peavy H.S. and Rowe D.R.-McGraw Hill.
6. Wastewater treatment disposal and Reuse: Metcalf and Eddy - Tata Mc-Graw Hill.

Note: Five out of eight questions are to be attempted. At least one question (but not more than two) is to be set from each unit.

CHE-453 : INTRODUCTION TO BIOCHEMICAL ENGINEERING (ELECTIVE-I)

B. Tech. Semester - VIII (Chemical Engineering)

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

-
- UNIT-I:** Aspects of microbiology, cell theory, structure of microbial cells, classification of micro-organism, influence of environmental parameters on micro-organisms.
- UNIT-II:** Introduction to Bio-chemistry - Chemical composition of the cell, Lipids, Carbohydrates, Proteins and enzymes.
- UNIT-III:** Metabolism and Energetics - Assimilatory and dissimilatory process, The metabolic mechanism of the cells.
- UNIT-IV:** Bio-Chemical Kinetics - Simple enzyme kinetics with one or two substrate, Modulation and regulation of enzymatic activity, enzyme reactions in heterogeneous systems.
- UNIT-V:** Microbial Fermentation Kinetics - Growth - cycle phases for batch cultivation, mathematical modeling of batch growth, product synthesis, Kinetics, overall kinetics and thermal death kinetics of cells and spores.
- UNIT-VI:** UNIT operations in Bio-Chemical process - Agitation and aeration, gas-liquid mass transfer, determination of oxygen transfer rates, determination of 'a' and 'KLa' scaling of mass transfer equipment. Heat balance and heat transfer correlations for biochemical system, sterilization, filtration and drying. Immobilization of cells and enzymes.
- UNIT-VII** Design and Analysis of Bio-Reactors - Classification and characterization of different bioreactors, batch and continuous reactors, tubular, CSTR and tower reactors. Aerobic and anaerobic fermentation, process design and operation of typical aerobic and anaerobic fermentation processes, manufacture of microbial products, e.g. antibiotics, alcohol/wine etc. use of immobilized enzymes and whole cells for industrial process.

TEXT BOOKS:

1. Biochemical Engineering: S.Aiba, A.E. Humhrey, N.F. Mills, 2nd ed., Academic Press, New York, 1973.
2. Biochemical Engineering Fundamentals: J.E. Baley, D.F. Ollis, 2nd ed., McGraw Hill, 1986.

REFERENCE BOOKS:

1. Biochemical Reactor: B. Atkinson, Pion Ltd., London, 1974.
2. Elements of Bio-technology: P.K. Gupta, Rastogi Publication first ed. reprint, 1997.

Note: Five out of eight questions are to be attempted. At least one question is to be set from each unit.

CHE-452 : NOVEL SEPARATION TECHNIQUES (ELECTIVE-II)

B. Tech. Semester - VIII (Chemical Engineering)

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

- UNIT-I:** Separation processes in Chemical & Biochemical industries, categorization of separation processes, equilibrium and rate governed processes.
- UNIT-II:** Nature of bubbles and foams, stability of foams, foam fraction techniques, batch, continuous, single stage and multistage columns.
- UNIT-III:** Physical factors in membranes, osmotic pressure, partition coefficient and permeability, concentration polarization, electrolyte diffusion facilitated transport.
- UNIT -IV:** Ultrafiltration, reverse osmosis and electrodialysis, membrane structure and production.
- UNIT-V:** Theory and application of pervaporation, permeation, critical extraction and freeze drying.
- UNIT-VI:** Theory of adsorption, application, adsorption isotherms, adsorption hysteresis, batch and continuous adsorption etc.

REFERENCE BOOKS:

1. Separation Processes - C.J. King, Tata Mc-Graw Hill.
2. New separation Techniques - J.D. Henry & N.N. Li, AIChE Today Series, AIChE (1975).
3. Hand Book of Separation Techniques for Chemical Engineers by Philip A. Schweitzer - McGraw Hill Book Company.

NOTE: Five out of eight questions are to be attempted. At least one question (but not more than two) is to be set from each unit.

CHE-454 : DESIGN OF PIPING SYSTEMS (ELECTIVE-II)

B. Tech. Semester - VIII (Chemical Engineering)

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

-
- UNIT-I:** FLOW OF FLUIDS- Frictional loss in pipe and ducts; Equivalent resistance of fittings, valve and bends; carrying capacity of pipes; piping networking; pressure drop and diameter calculations of pipe carrying steam, water, oil and gases.
- UNIT-II:** VAPOUR LIQUID PIPING-Flow pattern, piping design for two-phase flow; Design of piping for reboiler and condenser systems.
- UNIT-III:** HYDRAULIC TRANSPORT-Design of homogeneous and heterogeneous slurry transport line; correlations for various flow regimes.
- UNIT-IV:** PNEUMATIC TRANSPORT-Conveying systems; solid gas flow pattern in vertical, horizontal and inclined pipe lines; concept of saltation and choking velocities. Pressure drop calculations in different pipe lines carrying gas solid mixture; Design of feeding systems for pneumatic transport of solids.
Optimum pipe line diameter calculations and optimum pipe network design.
- UNIT-V:** PIPES AND FITTINGS-Standard sizes, wall thickness, tolerances, design of flanges and other fittings.
- UNIT-VI:** STRENGTH AND FAILURE OF MATERIALS-Stable and unstable deformation, plasticity plastic instability, design assumptions, stress evaluation and design limits, codes and standards. Local components of pipe bends, branch connections and bolted flange connections.
- UNIT-VII:** SIMPLIFIED METHODS FOR FLEXIBILITY ANALYSIS-Thermal expansion loops, code rules, approximate solutions and flexibility analysis by model tests. Approaches to reducing expansion effects, expansions joints.Piping layout consideration, elements of supporting system, fixtures and pipe attachments.Introduction to piping vibrations, their prevention and control.

TEXT BOOKS:

1. Design of Piping Systems: Kellogg, M.W.- Kellog Company (1961).

REFERENCE BOOKS:

1. Piping Hand Book: King, R. C.: and Crocker, S.-McGraw Hill(1967)

Note: Five out of eight questions are to be attempted. At least one question (but not more than two) is to be set from each unit.

CHE-408 : SEMINAR

B. Tech. Semester - VIII (Chemical Engineering)

L	T	P	Credits	Class Work	: 50 Marks
-	-	2	2	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 the department. The committee should comprise of three faculty members from different specializations. The teachers associated in the committee will be assigned 2 hours teaching load per week.

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.

CHE-410 : ENVIRONMENTAL POLLUTION & CONTROL LAB

B. Tech. Semester - VIII (Chemical Engineering)

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

List of Practicals / Demonstrations:

1. Determination of pH and Temperature
2. Determination of dissolved oxygen
3. Determination of BOD
4. Determination of COD
5. Determination of Solids
6. Determination of Conductivity
7. Determination of Turbidity
8. Determination of Acidity and Alkalinity
9. Determination of Hardness
10. Determination of Chlorides, Fluorides and Nitrates
11. Determination of Heavy Metals
12. Determination of Air Pollutants

CHE-414 : MODELING SIMULATION LAB
B. Tech. Semester - VIII (Chemical Engineering)

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

Modeling and Simulation of Chemical Engineering Systems like:

1. Isothermal CSTR
2. Non-Isothermal CSTR
3. Isothermal Batch Reactor
4. Non-Isothermal Batch Reactor
5. Ideal Binary Distillation Column
6. Flash Calculation

Software such as Aspen Plus/Chem-CAD, MATLAB, C++ etc. may be used in modeling above problems. Mathematical modeling of Chemical Engineering problems will be done on computers with the help of related software packages.

CHE-417 : PROJECT

B. Tech. Semester - VIII (Chemical Engineering)

L	T	P	Credits	Class Work	: 50 Marks
-	-	8	8	Examination	: 100 Marks
				Total	: 150 Marks
				Duration of Examination	: 3 Hours

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.

GPCHE-402 : GENERAL FITNESS FOR THE PROFESSION

B. Tech. Semester - VIII (Chemical Engineering)

L	T	P	Credits	Examination	: 100 Marks
-	-	-	4	Total	: 100 Marks
				Duration of Examination	: 3 Hours

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 of Faculty : 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: **(40 Marks)**

- | | | |
|-----|--------------------------------------|------------------|
| 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:

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.

(20 Marks)