

Foreword

Technical Teacher's Training Institute (ER), Calcutta has been awarded Academic Consultancy by the Govt. of Mizoram for the 3^d phase of World Bank Project for Quality improvement of polytechnic Education system in the State.

The quality improvement of the system largely depends on the quality of the curriculum and its implementation. It's a common experience that even the best-designed curriculum could not yield desired result due to lack of proper implementation. Again an excellent curriculum, designed at a particular time becomes obsolete after laps of a period depending on the life-span of the technology. Periodic revision of curriculum, is therefore, an essential condition for dynamically responding to the changing needs of the world of work. The three year diploma curriculum in Civil, Electrical, Mechanical and Electronics & Telecommunication Engineering has been revised with due emphasis on the

- Present needs of the world of work
- Flexibility in the entry and exit from the system and
- Assessment system

A model of Multi-Point Entry and Credit System (MPECS) has been developed to introduce the above flexibility. It will be observed that the entire curriculum has been divided into broad category of courses viz.,

- Foundation
- Hard Core
- Soft Core
- Basic Technology
- Applied Technology &
- Elective courses

It is suggested that appropriate resources in terms of faculty, support staff, laboratory and workshop etc. along with appropriate learning resources and evaluation system be developed for implementation of the curriculum.

I sincerely thank Mrs. B. Sangkhumi, Project Director, Govt. of Mizoram, and her faculty members for their active support and contribution in the revision of the curriculum. My special thanks are due to the external experts, and the faculty members and the support staff of TTTI, Calcutta who have contributed in the revision process.

(Dr. S.K. Bhattacharya)
Principal

GUIDELINES FOR MPECS

1.0 INTRODUCTION :

The National Policy on Education 1986, recommends (Art 6.6) that “..... Technological and Management Education Programs including education in Polytechnic, will also be on a flexible, modular pattern based on credits with provision for multi-point entry. A strong guidance and counseling service will be provided.” Multi-Point Entry & Credit System (MPECS) is the mode for introducing the desired flexibility in the curriculum of diploma program. Under the World Bank assisted Tech Ed. Project I & II, TTTIs have facilitated successful introduction of MPECS in the diploma programs offered by various States in the country, including the State of Assam in the Eastern region.

The State of Mizoram has initiated a World Bank assisted project (Tech.Ed.III) for capacity expansion, improvement of quality and efficiency of the technician education system of the State. One of the essential criteria of the project is offering diploma programs in MPEC system.

TTTI, Calcutta has drafted a guide document for incorporating MPEC system in the revised curriculum of the Diploma program in Mechanical Engineering, being offered by the State.

2.0 PHILOSOPHY OF MPECS :

It has been observed that students demonstrate better performance in Teaching-Learning process when they are made responsible for their own learning. The MPECS allows the student himself/herself to select content, learning strategies and to decide the pace in which he/she desires to learn, which results in increased motivation among the students. The influences of individual differences is also taken into consideration in order to provide flexibility to the learners.

2.1 Objectives :

The scheme for introduction of MPECS has been designed with the following objectives :

- To allow students, possessing different academic qualifications, entry to the polytechnics at different levels appropriate to their qualifications.
- To provide opportunity to the students to pursue program of studies at flexible pace according to their capability.
- To provide option to students to select courses of study according to their needs and interest.
- To provide scope for working personnel to upgrade their knowledge and skills.

2.2 Advantages of MPECS :

The following advantages and benefits are expected to be obtained by offering the Diploma program in MPEC mode.

- Students can select their individual courses according to their needs, interests, aptitudes, abilities and their entry qualifications.
- Students will have a higher degree of motivation and psychological satisfaction as they will be involved in the decision making progress in the course selection.
- Students can complete the program at their own pace.
- The inbuilt flexibility permits of easily catering to the changing and diversified manpower needs. The programs provide for multiple option catering to a spectrum of occupations within and across the discipline.
- The concept of pass/fail is replaced by accumulation of credits by individual student depending on their capability and thus promoting competition and reducing frustration.
- Students possessing entry qualifications higher than the minimum stipulated will get the opportunity to complete the program earlier.
- Fast learners have the opportunity to route his/her program such as to attain the desired credit in less time.
- Low achievers, unable to attain credit in particular course(s) can re-route his/her program to complete in longer time and thus reduce frustration.
- Extra credits can be earned by students as & when necessary to obtain upto date knowledge.
- New specialized and advanced courses, to keep abreast with the developments in the industry and emerging technologies, can be easily introduced without affecting the total structure.
- Efficiency of the system will be increased by reducing the wastage of time.

2.2..1 Benefits o MPECS

To Students-

- No Stigma of pass/fail
- Possibility of completing program in less/more time, according to choice
- Choice of courses according to need.
- Scope of taking interdisciplinary course for value addition

To Teachers-

- Task of teaching less strenuous and enjoyable with motivated students in class
- Enhancement of GUIDANCE & COUNSELLING skill.

To industry-

- Higher probability of getting technical manpower with proper mix of knowledge and skill

- Possibility of utilization of the system for continuing education of its personnel leading to career development.

3.0 SALENT FEATURES:-

The salient features of the proposed system are as below :

3.1 Eligibility for admission to Diploma program;

3.1.1 To be eligible for admission into the Diploma program in Mechanical Engineering, a student will have to possess the minimum qualifications of

- (i) Pass in High School Leaving Certificate (HSLC) Examination (10+) conducted by the Board of Secondary Education, Mizoram or any other examination recognized by the State Council for Technical Education as equivalent, and
- (ii) Be selected through the appropriate screening/selection process conducted by the State Directorate of Technical Education or any appropriate authority.

3.1.2 State Council for Technical Education will decide the equivalence of other examinations notify from time to time.

3.2 Multi-Point Entry:

This provides entry of students, with different qualifications, to the Diploma program at different points on the CREDIT SCALE and not on TIME scale with the provision of appropriate credit exemption depending on entry qualification. Fig-1 below illustrates the system-

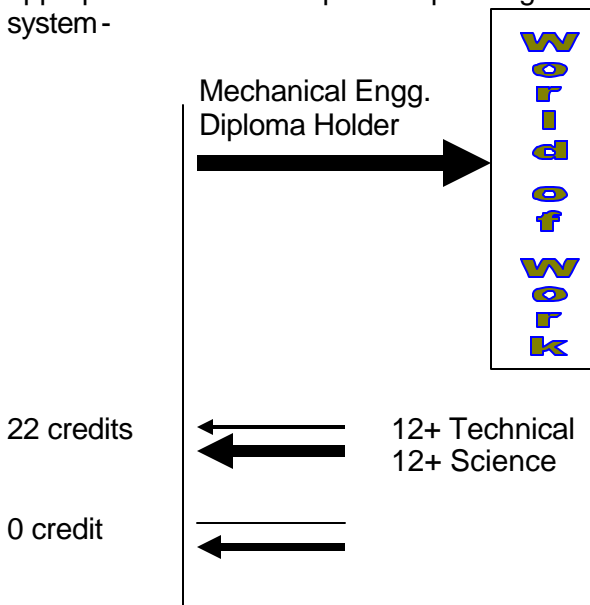


Fig – 1

3.3 Credit:

The weightage to any course is provided in terms of CREDIT based on contact hours. The contact hour is the sum of Lecture, Tutorial and Practical classes allotted per week for teaching the course.

According to the AICTE Norms

1 Credit = 1 Lecture hour per week
OR 2 Tutorial/Practical hours per week.

Depending upon the course structure, each course will have a credit designated to it. As for example, a course having a teaching scheme of Lecture (L)-Tutorial (T)-Practical (P) as 3-0-0 will carry 3 credits, L-T-P as 3-2-0 will carry 4 credits, L-T-P as 3-2-2 will carry 5 credits, L-T-P as 0-0-6 will carry 3 credits.

The credits are rounded off to the nearest higher round number. For example, a course with a L-T-P of 3-0-3 will have 4.5 credits to be rounded off to 5.

3.3.1 *Minimum Credits:* Minimum credits to be earned by a student for award of Mechanical Engineering Diploma is 120 credits. The allocation of minimum credits to be acquired by a student under each category of courses is appended.

3.3.2 Students admitted to the Diploma program with qualifications higher than the minimum specified entry qualification would get suitable exemption from attending the courses of the Diploma programme already studied by him.

3.3.2.1 Students admitted after passing Higher Secondary School Leaving Certificate (HSSLC) Examination conducted by the Board of Higher Secondary Education, Mizoram or any other equivalent examination with Physics, Chemistry and Mathematics will be exempted from attending the foundation courses and will be granted **22 credits** for the exempted courses.

3.3.2.2 The State Council for Technical Education will decide the courses for exemption and grant of credit for the same for students entering with other higher qualifications like 10+ ITI, 12+Technical etc.

3.4 Course Categories:

The courses (*i.e subjects under conventional system*) of study under the Diploma program will include theory, practical, tutorial, project work etc. These courses are categorized in six (6) groups as indicated below:

- (1) **FOUNDATION COURSES:** These are courses essential for further study of technology related courses including courses like Communication in English, Applied Mathematics and Engineering Science.

- (2) **HARD CORE COURSES:** The institute core of technical courses belonging to all disciplines including courses like Engineering Drawing, Workshop Practice, Engineering Mechanics and Introducing to Information Technology.

- (3) **SOFT CORE COURSES:** These are courses providing basic concepts of supervision/management/environment and technology courses related to allied disciplines. A student has the option of taking only TWO (2) courses from the list according to his need and interest.

- (4) **BASIC TECHNOLOGY COURSES:** These are basic courses required for Mechanical Engineering as bridge between the Applied Science and Applied Technology.

- (5) **APPLIED TECHNOLOGY COURSES:** These are professional courses through which the desired knowledge and skills are developed among the students to perform their job functions as Mechanical Engineering Diploma holders. These courses provide for intensive hand on practice to the students through laboratory and project work.

- (6) **ELECTIVE COURSES:** The training through previous courses listed in (1) to (5) would provide a broad base to the students for performing their job functions in the world of work. The elective courses provide an opportunity to the students of acquiring specialized knowledge in areas of interest to them.

3.5 Academic Session:

Each Academic year will be divided into two terms, each of six months duration. "ODD TERM" will span from July to December and "EVEN TERM" will span from January to June. Each term will have a minimum contact period of 35 hours per week for 15 weeks. The preparatory study leave to the students, term-end examination, publication of results, term-end break etc. will be covered by the balance duration of the terms.

3.6 Time required for obtaining Diploma:

A student can obtain the Diploma within **a minimum duration of 2 years and a maximum duration of 6 years**

3.7 Scheme of Studies and Evaluation

The Scheme of studies and evaluation for Mechanical Engineering Diploma program including the list of courses, pre-requisites for each course, the requisite minimum number of credits to be acquired by the students in different categories of course, mode of contact, contact hours and the evaluation scheme are appended.

4.0 REGISTRATION:

Nomenclature: The different terms used in connection with the MPEC system are explained below:

- **Registration for a course:** It entitles a student to regularly attend classes for the course to satisfy the prescribed provision for earning the credit for the course.

Earning Credit for a registered course: Appearing in end term theory/practical examination for the course, having end-term examination, and securing minimum specified percentage of marks in Theory/ Practical examination, separately for each course.

Securing minimum specified percentage of marks in Internal Assessment for the course not having end-term examination.

- **Keeping the Term:** Students who have satisfied the eligibility for appearing in end term examination for a course and either have not appeared in end-term examination or appeared in the end-term examination but could not obtain the credit for the respective course are said to have "kept the term" for the respective course.

Such students have the option of either '*registering a fresh*' for the course or '*re-registering*' for the course. In the event of fresh registration, the credits for attendance and I.A. will not be accumulated.

- **Eligibility for appearing in the end-term examination:** Attending the classes regularly to attain minimum prescribed percentage of attendance and securing minimum percentage of marks in Internal Assessment (I.A) of respective course would make a student eligible for appearing in the end-term examination for the respective course.

- **Re-registration for a course:** The students who have '*kept the term*' for a course can re-register for the respective course. Such students will have to appear only in the end-term examination of the respective course and the credits earned for attendance and Internal Assessment will be accumulated for transfer to the student. Such courses will be called "**Backlog Courses**"

However, the accumulated credit for attendance and internal assessment will not be transferred if the student **registers afresh** for the respective course.

4.1 A student will have to register, at the polytechnic, for the courses he/she would like to study in a term, at the beginning of each term, till he/she becomes eligible for the award of diploma. The Guidance & Counselling Unit of the Institute will advise the student in deciding about the courses of his/her choice and the pace of learning.

4.1.1 A student must complete the study of the pre-requisite course (i.e., at least have "kept the term") specified for a course before selecting the respective course for registration.

4.1.2 A 10+ student would be allowed to register for Applied Technology and Elective courses only after he/she has completed the study (at least have "kept the term") of Foundation and Hard Core courses.

4.1.3 A 12+ student would be allowed to register for Applied Technology and Elective courses only after he/she has completed the study (at least have "kept the term") of Hard Core courses.

4.1.4 The Institute authorities would provide the list of courses to be offered in the odd and even terms of an academic year, at the commencement of each academic year.

4.1.5 The Guidance & Counselling Unit would advise the students about the options available to each individual student, taking into consideration the courses in which credit had been earned by the student (through study/exemption), pre-requisites for the courses, backlog courses and limits for registration of courses.

4.1.6 The Institute would not arrange special classes in courses not scheduled to be offered in the term.

4.1.7 Selection of courses would be done satisfying the condition of maximum and minimum number of courses.

4.2 Limit of courses for registration:

4.2.1 A student can register in any term for a maximum seven (7) number of courses out of which, the courses having end-term examination shall not be more than six.

A student not having any course for re-registration would have to register in any term, except the last term for minimum three [3] courses having end-term examination.

4.2.2 However, High Achiever students would be permitted to register for additional courses in any term, in excess of stipulation of 4.2.1, as below:

4.2.2.1 10+ High Achiever students would be permitted to register for up to eight (8) courses in any term after completion of odd and even terms of first year.

4.2.2.2 12+ High Achiever students would be permitted to register for up to nine (9) courses in any term after completion of odd term of first year.

[Note:

(a) 10+ High Achiever- Those 10+ students who have registered for minimum seven (7) courses in each of the odd term and even term of first year and have earned credits for all the registered courses in first attempt would be designated as 10+ High Achiever.

(b) 12+ High Achiever- Those 12+ students who have registered for minimum seven (7) courses in the odd term of first year and have earned credits for all the registered courses in first attempt would be designated as 12+ High Achiever.

(c) Those high achiever students will have to continue earning credits for all the subsequently registered courses in the first attempt to be eligible to continue as high achievers.]

4.2.3 Maximum number of courses having end-term examination registered and re-registered by a student in any term shall not exceed ten (10).

4.2.3.1 Examples explaining the above rule are given below:

A 10+ student has registered in a term for 6 courses, all having end-term examination (4.2.1) and has earned credit for only 1 course but has "kept the term" for other 5 courses.

Option I: The student decides to re-register for all the 5 backlog courses. Maximum number of courses, with end-term examination, for registration/re-registration = 10 (4.2.3)

*Allowable number of courses, with end-term examination,
for registration = $10 - 5 = 5 < 6$ (OK, 4.2.1)*

Hence, allowable number of fresh courses, mid end-term examination, for registration = 5

Total allowable number of fresh courses, with & without end-term examination, for registration = $5 + 7 = 6$.

Option II: The student decides to re-register for 2 backlog courses and to register afresh for other 3 courses.

Maximum number of courses, with end-term examination, for registration/re-registration = 10 (4.2.3)

Allowable number of courses, with end-term examination,
for registration = $10 - 2 = 8 > 6$ (Not OK.4.2.1)
Hence, allowable number of courses, with end-term examination,
for registration = 6 (4.2.1)

Hence, allowable number of fresh courses, with end-term examination, for registration = $6 - 3 = 3$

Total allowable number of fresh courses, with & without end-term examination, for registration = $3 + 1 = 4$

5.0 EXAMINATION RULES:

The State Council for Technical Education (SCTE) would conduct the examinations according to the prevailing system.

5.1 Two end-term examinations (odd and even) would be held in each academic.

5.2 Each term examinations in any term would be conducted for all courses, registered and unregistered for examination, in the respective term.

5.3 Registration for examination: Students eligible for appearing in the end-term examination for a course will have to register/re-register for examination of the respective courses in which he/she desires to appear in a term. Registration/re-registration processes have to be completed within the stipulated period specified by SCTE

5.4 Eligibility for appearing in end-term examination of a course: A student shall regularly attend the classes prescribed for the course to attain minimum 75% of attendance(theoretical and practical classes separately) and secure minimum 50% marks in the Internal Assessment for the course to be eligible to register for examination of the respective course.

5.5 A student would not be allowed to re-register for examination of a course in she has already earned credit.

5.6 A student has to pay the examination fees, as prescribed by the SCTE from time to time, at the time of registration/re-registration for examination in the course by the prescribed form.

5.7 SCTE shall ensure publication of results of end-term examinations in any term within the term itself.

5.8 Eligibility for earning credit for a course:

The following criteria are to be satisfied by a student to earn the credit for a course-

5.8.1 For courses having end-term examination-

(i) a student must first satisfy the eligibility condition in 5.4 for appearing in the examination and

(ii) Secure 40% marks in Theory end-term examination and 50% marks in Practical end-term examination of the course, as specified in the scheme of evaluation.

5.8.2 For courses not having end-term examination- a student must secure 50% marks in the Internal Assessment for the course, as specified in the scheme of evaluation.

5.9 Performance of a Student:

The performance of a student would be expressed in terms of 'Credit Point Average' (CPA), which would be computed as below:

CPA(%) of a student for diploma program

$\Sigma (\% \text{ of marks obtained in a course} \times \text{No. of credits for the course})$

$\Sigma I = \frac{\text{of Credits in all courses studied}}{\text{of Credits in all courses studied}}$

5.10 Award of Diploma:

A student who has successfully completed the study of a minimum number of courses and has earned the stipulated minimum number of credits for each category of courses (i.e..

Foundation, Hard Core, Soft Core, Basic Technology, Applied Technology and Elective courses) as per specified evaluation scheme of Diploma program will be awarded Diploma in Mechanical Engineering by the State Council of Technical Education.

5.10.1 The students would be awarded classes on the basis of CPA of a student, computed for the whole diploma program, as below:

<u>CPA</u>	<u>Class</u>
75% and above	First Class with Distinction
60% and above and less than 75%	First Class
50% and above and less than 60%	Second Class

5.11 A student may be allowed to discontinue his/ her studies after attending at least 2 terms and he/she must rejoin within 2 years from the date of discontinuation to be entitled for transfer of all credits accumulated by him/her. A student may avail of this flexibility of discontinuing the study maximum twice.

5.12 A student, with or without temporary discontinuation, would have to complete the diploma program within 6 years from the date of first registration.

6.0 Guidance and Counseling unit

An effective guidance and counseling unit in the polytechnic is an essential requirement for successful implementation of MPECS, which has also been recognized by the National policy of education. This unit would be responsible for guiding and counseling of students and also for planning, implementation and operation of MPECS.

6.1 Structure:

The unit will have as its member senior teachers from all departments of the institute offering diploma program. One of them will be designated as Coordinator of the unit, who will be responsible for effective operation of the unit. The designated teachers must be effectively trained in MPECS and Guidance & Counselling of students.

The work of existing students section and examination section will come under the purview of this unit. The secretarial assistance and support staff for this unit can be provided by redeployment of the concerned administrative staff. The supporting staff should also be trained in MPECS.

The unit must be provided with adequate computer facility and trained staff for efficient functioning of the unit.

6.2 Functions: The guidance & counseling unit of the institute will have the following major functions:

- Making the students aware about the structure and operation of MPECS.
- Providing guidance to the students during registration and re-registration.
- Counselling the students in selection of courses.
- Maintaining record of progress of individual student.
- Providing & collecting data to / from the SCTE.
- Continuously conducting study on entry category/ choice of courses/ performance in various courses.
- Developing & maintaining data base on entry level/characteristics/program duration/pass rate/ employment etc.

MULTI POINT ENTRY AND CREDIT SYSTEM (MPECS)

Category of Courses	Reference to first Digit of Course Code	Credits to be acquired	No. of Courses
Foundation Course	1	22	06
Hard Core Course	2	17	06
Soft Core Course	3	06	02
Basic Technology Course	4	28	09
Applied Technology Course	5	41	13
Elective Course	6	06	02
TOTAL:		120	38

Scheme of Studies and Evaluations (MPECS)

Diploma in Mechanical Engineering

1. FOUNDATION COURSE :

Sl. No.	Code	Course	Study Scheme			Evaluation Scheme						Total Mark	Credit	
			Pre-requisite	Contact Hour/Week			Theory			Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment			
								Class Test	Assignment		Sessional			Viva
1	101	Communication in English - I		2	1	0	70	15	15	0	0	0	100	3
2	102	Communication in English - II	101	2	1	0	70	15	15	0	0	0	100	3
3	103	Applied Mathematics-I		3	0	0	70	15	15	0	0	0	100	3
4	104	Applied Mathematics-II		3	0	0	70	15	15	0	0	0	100	3
5	105	Engineering Science - I		3	0	4	70	15	15	25	25	0	150	5
6	106	Engineering Science - II	105	3	0	4	70	15	15	25	25	0	150	5
TOTAL				16	2	8	420	90	90	50	50		700	22

2. HARD CORE COURSE :

Sl. No.	Code	Course	Study Scheme			Evaluation Scheme							Total Mark	Credit	
			Pre-requisite	Contact Hour/Week			Theory				Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment				
								Class Test	Assignment		Sessio nal	Viva			
7	201	Engineering Drawing –I		0	0	6	0	0	0	50	50	0	100	3	
8	202	Engineering Drawing –II	201	0	0	6	0	0	0	50	50	0	100	3	
9	203	Workshop Practice - I		0	0	4	0	0	0	0	25	25	50	2	
10	204	Workshop Practice – II	203	0	0	4	0	0	0	0	25	25	50	2	
11	205	Engineering Mechanics		3	0	0	70	15	15	0	0	0	100	3	
12	206	Introduction to IT		2	0	3	50	0	0	25	25	0	100	4	
TOTAL				5	0	23	120	15	15	125	175	50	500	17	

3. SOFT CORE COURSE : (Any two to be taken)

Sl. No.	Code	Course	Study Scheme				Evaluation Scheme						Total Mark	Credit
			Pre-requisite	Contact Hour/Week			Theory			Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment			
								Class Test	Assignment		Sessional	Viva		
13	301	Engineering Economics & Accountancy		3	0	0	70	15	15	0	0	0	100	3
14	302	Element of Management and Industrial Legislation		3	0	0	70	15	15	0	0	0	100	3
15	303	Entrepreneurship Development		3	0	0	70	15	15	0	0	0	100	3
16	304	Element of Electronics	105,106	3	0	0	70	15	15	0	0	0	100	3
17	305	Materials Science	105,106	3	0	0	70	15	15	0	0	0	100	3
18	306	Environmental Education		3	0	0	70	15	15	0	0	0	100	3
TOTAL				6	0	0	140	30	30	0	0	0	200	6

4. BASIC TECHNOLOGY COURSES FOR MECHANICAL ENGINEERING:

Sl. No.	Code	Course	Study Scheme				Evaluation Scheme						Total Mark	Credit
			Pre-requisite	Contact Hour/Week			Theory			Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment			
				Class Test	Assignment			Sessio nal	Viva					
19	401	Mechanics of materials	205	3		2	70	15	15		25	25	150	4
20	M402	Thermal Engineering	105,106	3	0	0	70	15	15				100	3
21	M403	Fluid Mechanics	205	3	0	2	70	15	15		25	25	150	4
22	M404	Element of Electrical Engineering		3	0	2	70	15	15		25	25	150	4
23	M405	Mechanical Drawing	202	0	0	6				100	50	50	200	3
24	M406	Theory of Machine	205	3	0	0	70	15	15				100	3
25	M407	Workshop Practice –III		0	0	4					100	50	150	2
26	M408	Manufacturing Process – I		3	0	0	70	15	15				100	3
27	M409	Workshop Practice - IV		0	0	4					100	50	150	2
TOTAL				18	0	20							1250	28

5. APPLIED TECHNOLOGY COURSES FOR MECHANICAL ENGINEERING:

Sl. No.	Code	Course	Study Scheme				Evaluation Scheme						Total Mark	Credit
			Pre-requisite	Contact Hour/Week			Theory			Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment			
								Class Test	Assignment		Sessio nal	Viva		
28	M501	Fluid Machines	M403	3	0	2	70	15	15		25	25	150	4
29	M502	Thermal Engineering – II	M402	3	0	0	70	15	15				100	3
30	M503	Manufacturing Process-II		3	0	0	70	15	15				100	3
31	M504	Machine Tools – I	204,205	3	0	0	70	15	15				100	3
32	M505	Machine Design & Drawing	M405	2	0	4	50			100	50		200	4
33	M506	Production Management		3	0	0	70	15	15				100	3
34	M507	Mechanical Measurement	M408	4	0	0	70	15	15				100	4
35	M508	Machine Tools – II	M504	3	0	0	70	15	15				100	3
36	M509	Workshop Practice –V		0	0	4					100	50	150	2
37	M510	Mechanical Estimation	M405	2	0	2	50				50	50	150	3
38	M511	Projects		0	0	6					100	50	150	3
39	M512	Plant Maintenance Engineering		3	0	0	70	15	15				100	3
40	M513	Seminar, Tech. & Industrial Tour		0	0	6					100	50	150	3
TOTAL				28	0	26							1650	41

6. ELECTIVE COURSES FOR MECHANICAL ENGINEERING (Any two to be taken)

Sl. No.	Code	Course	Study Scheme				Evaluation Scheme						Total Mark	Credit
			Pre-requisite	Contact Hour/Week			Theory			Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment			
				Class Test	Assignment			Sessio nal	Viva					
41	M601	Foundry Technology	M408	3	0	0	70	15	15				100	3
42	M602	Automobile Engineering	M502	3	0	0	70	15	15				100	3
43	M603	Refrigerator & Air Conditioning	M502	3	0	0	70	15	15				100	3
44	M604	Production Technology	M408, M503	3	0	0	70	15	15				100	3
45	M605	Welding Technology	M408	3	0	0	70	15	15				100	3
Total of Two Courses				6	0	0							200	6

COURSE DETAILS

Scheme of Studies and Evaluation (MPECS)
Diploma in Mechanical Engineering

1. FOUNDATION COURSES :

Sl. No.	Code	Course	Study Scheme				Evaluation Scheme						Total Mark	Credit
			Pre-requisite	Contact Hour/Week			Theory			Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment			
								Class Test	Assignment		Sessional	Viva		
1	101	Communication in English-I		2	1	0	70	15	15	0	0	0	100	3
2	102	Communication in English-II	101	2	1	0	70	15	15	0	0	0	100	3
3	103	Applied Mathematics-I		3	0	0	70	15	15	0	0	0	100	3
4	104	Applied Mathematics-II		3	0	0	70	15	15	0	0	0	100	3
5	105	Engineering Science -I		3	0	4	70	15	15	25	25	0	150	5
6	106	Engineering Science -II	105	3	0	4	70	15	15	25	25	0	150	5
Total				16	2	8	420	90	90	50	50	0	700	22

2. HARD CORE COURSES :

Sl. No.	Code	Course	Study Scheme			Evaluation Scheme							Total Mark	Credit
			Pre-requisite	Contact Hour/Week			Theory			Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment			
							Class Test	Assign ment		Sessio nal	Viva			
7	201	Engineering Drawing -I		0	0	6	0	0	0	50	50	0	100	3
8	202	Engineering Drawing -II	201	0	0	6	0	0	0	50	50	0	100	3
9	203	Workshop Practice-I		0	0	4	0	0	0	0	25	25	50	2
10	204	Workshop Practice -II	203	0	0	4	0	0	0	0	25	25	50	2
11	205	Engineering Mechanics		3	0	0	70	15	15	0	0	0	100	3
12	206	Introduction to IT		2	0	3	50	0	0	25	25	0	100	4
Total				16	0	23	120	15	15	125	175	50	500	17

3. SOFT CORE COURSE : (Any two to be taken)

Sl. No.	Code	Course	Study Scheme				Evaluation Scheme						Total Mark	Credit
			Pre-requisite	Contact Hour/Week			Theory			Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment			
								Class Test	Assignment		Sessional	Viva		
13	301	Engineering Economics & Accountancy		3	0	0	70	15	15	0	0	0	100	3
14	302	Element of Management and Industrial Legislation		3	0	0	70	15	15	0	0	0	100	3
15	303	Entrepreneurship Development		3	0	0	70	15	15	0	0	0	100	3
16	304	Element of Electronics	105,106	3	0	0	70	15	15	0	0	0	100	3
17	305	Materials Science	105,106	3	0	0	70	15	15	0	0	0	100	3
18	306	Environmental Education		3	0	0	70	15	15	0	0	0	100	3
TOTAL				6	0	0	140	30	30	0	0	0	200	6

4. BASIC TECHNOLOGY COURSES FOR MECHANICAL ENGINEERING:

Sl. No.	Code	Course	Study Scheme				Evaluation Scheme						Total Mark	Credit
			Pre-requisite	Contact Hour/Week			Theory			Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment			
				Class Test	Assignment			Sessio nal	Viva					
19	401	Mechanics of materials	205	3		2	70	15	15		25	25	150	4
20	M402	Thermal Engineering	105,106	3	0	0	70	15	15				100	3
21	M403	Fluid Mechanics	205	3	0	2	70	15	15		25	25	150	4
22	M404	Element of Electrical Engineering		3	0	2	70	15	15		25	25	150	4
23	M405	Mechanical Drawing	202	0	0	6				100	50	50	200	3
24	M406	Theory of Machine	205	3	0	0	70	15	15				100	3
25	M407	Workshop Practice –III		0	0	4					100	50	150	2
26	M408	Manufacturing Process – I		3	0	0	70	15	15				100	3
27	M409	Workshop Practice - IV		0	0	4					100	50	150	2
TOTAL				18	0	20							1250	28

5. APPLIED TECHNOLOGY COURSES FOR MECHANICAL ENGINEERING:

Sl. No.	Code	Course	Study Scheme				Evaluation Scheme						Total Mark	Credit
			Pre-requisite	Contact Hour/Week			Theory			Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment			
								Class Test	Assignment		Sessio nal	Viva		
28	M501	Fluid Machines	M403	3	0	2	70	15	15		25	25	150	4
29	M502	Thermal Engineering – II	M402	3	0	0	70	15	15				100	3
30	M503	Manufacturing Process-II		3	0	0	70	15	15				100	3
31	M504	Machine Tools – I	204,205	3	0	0	70	15	15				100	3
32	M505	Machine Design & Drawing	M405	2	0	4	50			100	50		200	4
33	M506	Production Management		3	0	0	70	15	15				100	3
34	M507	Mechanical Measurement	M408	4	0	0	70	15	15				100	4
35	M508	Machine Tools – II	M504	3	0	0	70	15	15				100	3
36	M509	Workshop Practice –V		0	0	4					100	50	150	2
37	M510	Mechanical Estimation	M405	2	0	2	50				50	50	150	3
38	M511	Projects		0	0	6					100	50	150	3
39	M512	Plant Maintenance Engineering		3	0	0	70	15	15				100	3
40	M513	Seminar, Tech. & Industrial Tour		0	0	6					100	50	150	3
TOTAL				28	0	26							1650	41

Note 1: Seminar, Tech. & Industrial Tours (M513) Evaluation will include evaluation of report on Industrial visit.

6. ELECTIVE COURSES FOR MECHANICAL ENGINEERING (Any two to be taken)

Sl. No.	Code	Course	Study Scheme				Evaluation Scheme						Total Mark	Credit
			Pre-requisite	Contact Hour/Week			Theory			Practical				
				L	T	P	End Exam	Internal Assessment		End Exam	Internal Assessment			
								Class Test	Assignment		Sessional	Viva		
41	M601	Foundry Technology	M408	3	0	0	70	15	15				100	3
42	M602	Automobile Engineering	M502	3	0	0	70	15	15				100	3
43	M603	Refrigerator & Air Conditioning	M502	3	0	0	70	15	15				100	3
44	M604	Production Technology	M408, M503	3	0	0	70	15	15				100	3
45	M605	Welding Technology	M408	3	0	0	70	15	15				100	3
Total of Two Courses				6	0	0							200	6

COMMUNICATION IN ENGLISH -1

L T P
2 1 0

Total Contact hrs.:45

Total marks: 100

Curri. Ref . No : 101

Theory :100

End Term Exam: 70

I.A: 30

Theory: 30

Tutorial: 15

Prerequisite; Nil

Credit: 3

Rationale

English is not our mother tongue, nor most of us live in an atmosphere of English. In schools you read English as a subject and [lie main reason behind your reading, for many of you, was simply to pass the examinations.

Now, in your job oriented education, you find that you need to learn English not as a

subject but as a service language- serving as a vehicle for your educational as well as professional needs. These are needs for communication. For example, when you are reading a text book/reference book on engineering in English, you are, in fact, sharing information with the writer. Sometimes, you may disagree even. In a way, you are communicating with the writer. Similarly, when you are writing an examination answer in the language you are, in fact, communicating with your reader, that is, the examiner. You are trying to expose your feelings and ideas in such a way that they become understandable, meaningful and convincing to him. Or, when you are listening to a class lecture you are also sharing information with your speaker- teacher. You understand and assimilate his points and take notes in your own way. When there is any confusion, you ask, argue and clarify.

In your post study vis-a-vis professional life, you need to work effectively and efficiently with the language. When you write a job application, you try to put your best self forward to the prospective employer so that he feels an urge to dispatch an interview letter. Your communication becomes successful. Your ultimate success comes when you win over the Board in the job interview by able communication in English. After getting the job, you do a host of communication in English, such as, you write reports, read instructions and manuals for setting up a machine perfectly and speak to clients for more orders.

Thus you feel, there is a gulf of difference between the purposes for which you read

English at school and for which you are reading now. With globalization, improvements in science and technology, and technology transfer, your need for communication in English is growing. You have to be successful in life and so you have to develop your English communication skills along with the development of your technological skills. By skill we mean the knowledge and ability that enables you to do something well and for that you require training. Moreover, there is no end to the communication needs. But it is not possible to make you skillful in all the needs of communication within the limited span of English communication classes. So, two things have been done to make your learning of the use of the language practicable and easier. First, a list of functions you are supposed to perform in your student and post student life have been decided upon. This will act as the syllabus or contents. Secondly, a language curriculum has been prepared (and given to the teachers) on the basis of the functional needs so that you can achieve the following skills in doing those communicative functions :

To develop reading skills, listening skills, speaking skills and writing skills while using appropriate grammar in reading, writing and speaking.

UNIT TOPIC / SUB-TOPIC		Hrs.	Total hrs.
1.0	Content:	Revision of the basic language skills (grammar, punctuation and vocabulary).	10 hrs.

1.1	Tasks	Grammar- <ul style="list-style-type: none"> • Subject - verb agreement • Tense - present, past and future • Voice-active and passive • Relative clauses for sentence contraction • Prepositions of time and place • Modals - making polite statements • Discourse markers • Comparing x with y • Cause and effect. Punctuation - Fullstop, Comma, Semicolon, Colon, Inverted Commas, Note of Interrogation. Vocabulary- Technical, semi-technical and general words Word formation-verbs to nouns, adjectives to nouns Suffixes and prefixes Nominal compounds.	
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1.2 Objectives Without structure no language can function. This reinforcement of the basis skills of communication will enable the learner to use them more confidently in their communicative activities.

1.3 Methodology: Grammar etc., do not come in isolation in communication; they become meaningful in contexts. So the teaching should be through texts and not in isolation (excepting in situations which demand isolated treatment for the benefit of the learner. In other words, grammar etc., should not be taught for its own sake : they should be taught through skills. They should help learners to develop their skills of listening, speaking, reading and writing. We should remember that one who knows grammar need not be a good communicator.

1.4 Role of Teacher : The class is no more a teacher fronted one. It is purely student activities-learning by doing. But to involve the students in the activities, the teacher has to do a lot of home work. The teacher has to decide the item he is going to teach, he has to prepare or adapt from textualised materials to teach the discrete items. Before giving those materials for student activities, he must be sure that those items really teach what they are expected to. Materials should be of different types: written and oral. In the classroom his role will be a facilitator moving from one student to another and guide the students when they are facing problems. After the students are taught the discrete items, the teacher should prepare tasks which integrate a few discrete items and test how much they have learnt. Peer correction is better than teacher correction.

1.5 Class Organisation : Depending on the need of the activities, the teacher may organise individual work, pair work, group work and whole class work.

1.6 Role of Learner: They must understand what the teacher wants them to do and why and then do it according to the prescribed organisation (individual, pair work etc.) and follow the time schedule as told.

2.0 Content: Reading**10 hrs**

- 2.1 Tasks: Pre-reading activities for Scanning - requiring the students to locate, as fast as they can, a specific fact or a single word Skimming - (reading to get overall information) — requiring students to glance quickly and locate facts which are expressed in sentences rather than in single words, or to say briefly what a text is all about Detailed reading activities or intensive reading for guessing the meanings of unknown difficult words from the context Understanding the main information in the text Structuring important information Throwing away the non-required words or information Using non-text information Inferencing and Evaluating.
- 2.2 Objectives: After doing the tasks the learner will be able to read by themselves text and reference books, articles, different government orders, various letters, non-text materials like charts, diagrams, brochures, technical reports and other writings which not only claim factual comprehension but demand higher levels of comprehension involving inferencing and evaluation etc.
- 2.3 Methodology: Teaching the specific reading strategies (e.g., word-attack, text-attack strategies) via authentic, motivating and interesting model texts.
- 2.4 Role of Teacher : Reading involves skills that the learners must learn for himself, and that the measure of the teacher's success is how far the student learns to do without his help. Some people would go so far as to say that reading cannot be taught, but only learnt. This does not, however, mean that there is nothing for the teacher to do : there is, in fact, a great deal. What sort of help the teacher should give ? The answer to the question sees the teacher's job as providing, first, suitable texts and second, activities that will focus the student's attention on text. The student must develop his own skills, but teacher must make him aware of what he is doing, and interested in doing it better. Conscious development of reading skill is important because it is obviously impossible for teachers to familiarize the students with every text they will ever want to read. Instead, the teacher must introduce them with techniques for approaching texts of various kinds, to be read for various purposes. Teaching students just how to read Text A is not teaching them how to read. However, the generalized skills of reading can only be acquired for reading Text A, Text B and so on. One of the teacher's jobs is to make sure that the bridge is built between the specific and the general. And one way of helping the student to generalize his skills is to make sure that he reads a lot and does a lot of practice in using the skills with varied materials.
- 2.5 Class organization : On the basis of requirement of learning, the class activities may be organized differently
- | | | |
|------------|---|--------------|
| Individual | - | Pair |
| Pair | - | Group |
| Group | - | Whole class. |
- 2.6 Role of Learner : The idea that reading and listening skills are passive skills has long been left out. Today we know that these are not only active skills but also very much interactive. So, if the reading texts are authentic, interesting and are like a " Do-it-yourself-kit", the learner will take interest to be active as well as interactive.

3.0 Content:**Listening****15 hrs.**

- 3.1 Tasks: Listening for specific information (the date and time of Joint Entrance Examination)

Listening for general understanding (topic, purpose, major idea, supporting ideas)

Intensive listening (take class-notes, identify topic, topic development, key lexical items, function of intonation- pitch, volume, pace, repetition)

Predictive listening

Inferential listening

Listening for following instructions, directions.

3.2 Objectives : The Teaching will; enable learners to listen, understand and respond appropriately.

3.3 Methodology: Teaching and allowing students to practice listening tasks Via Model (recorded) spoken items. Newscasts, weather reports, conversation between personalities on television may be interesting inputs for students learning.

Simulation activities and role plays may also be motivating.

3.4 Role of Teacher : The teacher has to plan effectively the teaching lessons before the actual teaching takes place and accordingly record from radio/television/class lecture, the nonreciprocal (in-transfer of information has one direction — from the speaker to the listener) items of speech, exploit these materials to build up students activities and finally, play in the classrooms as listening tasks.

Reciprocal listening activities (with opportunity for interaction with the speaker) should also be prepared /adopted and introduced into the classroom by way of role-plays and simulation activities.

As the teacher has made remarkable homework to make activities interesting and meaningful, he should restrict his activities in the class within only administering the activities (i.e., playing, rewinding, stopping, re-playing the tape recorder) or just a facilitator giving some clues to learners when needed. At the same time, he should minutely note who are not taking due role in the process approach and involve, the errors the students are making and plan a new lesson to do away with those errors.

3.5 Class Organization : For academic / non reciprocal listening

Individual - whole class
and

For conversational reciprocal listening

Individual - Individual
Individual - Group.

3.6 Role of learner : The learner is expected to be very much involved in the teaching situation - must be active, interactive, responding and demonstrating.

4.0 Content: Speaking 10 hours

4.1 Tasks: Eliciting - information, directions, clarification, help

Expressing - thanks, requirements, opinions, confirmation, apology, want / need, information, complaints, reasons /justifications

Reporting - description, decisions

Narrating - sequence of events

Facing - job interviews.

4.2 Objectives: After the teaching, the learners will be able to

- ask for clarification of class lectures, instructions

- carry on conversations in job-interviews

- carry on job specific / need-based discussion / narration/
Expression / reporting in Spoken English.

4.3 Methodology :Teaching of speaking as a communicative activity gives emphasis on both listening and speaking - comprehension and production (giving formal lectures has not been included in the course design).

Naturally, teaching of integrated skills should be taken care of. Not only integration of listening with speaking, but integration of grammar models, situational vocabulary should also be introduced in the teaching.

Role-plays and simulation activities in these classes take important and interesting part provided the teacher creates situations for a "information gap".

4.4 Role of Teacher : Audio and audio-visual cassettes demonstrating speaking activities may be helpful for learner-motivation. Thus, the teacher has to do a lot of homework in collecting / adapting / preparing materials which will give the learners sufficient scope of practising the activities with interest and motivation.

In the classroom he has to act sometimes as a facilitator to learning and sometimes as a catalyst for classroom communication. He should always enthuse and encourage the learners to speak out in an anxiety-free atmosphere. Naturally, correcting students after they say something should never be attempted at because, in our environmental learners get seldom scope of speaking in English and so they are shy at the outset. The instant feedback will have a negative impact on learners' attempt to speak out. Of course, the mistakes, not the slips, the learners make while speaking should be taken note of. (recording students' conversations and speech may be a good and rewarding activity for the teacher) and further lessons on speaking need be prepared on the basis of those mistakes.

As mentioned earlier, learning is a dynamic activity. There can be no settled or decided lesson plans. Students' performance in the classroom may require a new planning.

4.5 Class Organization : As said, role-plays and simulation activities are very much essential in speaking classes. Thus, depending on the tasks and necessity, the class organization may be

- Learner - Teacher
- Learner - Learner(in simulation activities)
- Learner - Group (in mock interviews - the group acting as the Board of interviewers and the learner as the interviewee)
- Group - Group.

4.6 Role of learner : The learner should be motivated to actively participate in the comprehension and oral production. Their roles mostly are as presenter, receiver, thinker and negotiator of information.

COMMUNICATION IN ENGLISH 11

L T P
2 1 0

Curri. Ref. No.:102

Total Contact hrs.:45

Total marks: 100

Theory: 100

Theory : 30

End Term Exam: 70

Practical: 15

I.A : 30

Prerequisite:

Communication English - I

Credit: 3

UNIT TOPIC / SUB-TOPIC

Hrs. Total hrs.

1.0 Content **Speaking**

20 hours

- 1.1 Tasks :
- Eliciting - information, directions, clarification, help
 - Expressing — thanks, requirements, opinions, confirmation, apology, want / need, information, complaints, reasons / justifications
 - Reporting - description, decisions
 - Narrating - sequence of events'
 - Facing —job interviews.
- 1.2 Objectives:
- After the teaching, the learners will be able to
 - ask for clarification of class lectures, instructions
 - carry on conversalions in job-interviews
 - carry on job specific / need-based discussion / narration/ expression / reporting in Spoken English.
- 1.3 Methodology :Teaching of speaking as a communicative activity gives emphasis n both listening and speaking — comprehension and production (giving formal lectures has not been included in the course design). Naturally, teaching of integrated skills should be taken care of. Not only integration of listening with speaking, but integration of grammar models, situational vocabulary should also be introduced in the teaching. Role-plays and simulation activities in these classes take important and interesting part provided the teacher creates situations for"information gap".
- 1.4 Role of Teacher: Audio and audio-visual cassettes demonstrating speaking activities may be helpful for learner-motivation. Thus, the teacher has to do a lot of homework in collecting / adapting / preparing materials which w7!!! give the learners sufficient scope of practising the activities with interest and motivation. In the classroom lie has to act sometimes as a facilitator to learning and sometimes as a catalyst for classroom communication. He should always enthuse and encourage the learners to speak out in an anxiety-free atmosphere. Naturally, correcting students after they say something should never be attempted at because, in our environment learners get seldom scope of speaking in English and so they arc shy at the outset. The instant feedback will have a negative impact on learners' attempt to speak out. Of course, the mistakes, not the slips, the learners make while speaking should be taken note of (recording students' conversations and speech may be a good and rewarding activity for the teacher) and further lessons on speaking need be prepared on the basis of those mistakes.

1.5 Class Organization :As mentioned earlier, learning is a dynamic activity. There can be no settled or decided lesson plans. Students' performance in the classroom may require a new planning. As said, role-plays and simulation activities are very much essential in speaking classes. Thus, depending on the tasks and necessity, the class organization may be

- Learner - Teacher
- Learner - Learner (in simulation activities)
- Learner - Group in mock interviews ~ the group acting as the Board of interviewers and the learner as the interviewee)
- Group - Group.

1.6 Role of learner: The learner should be motivated to actively participate in the comprehension and oral production. Their roles mostly are as presenter, receiver, thinker and negotiator of information.

2.0 Content: Writing 25 hrs.

2.1 Task: Structure and integrate information into cohesive and coherent paragraphs and texts for target audience while

- Writing General - Specific paragraphs
- Writing Process - Description paragraphs
- Writing Problem — Solution paragraphs
- Writing Data - Comment paragraphs
- Writing technical reports (short)
- Writing letters -- asking for quotation, placing orders, of complaints, of adjustments
- Writing job applications - Covering letters and Curriculum Vitae.

2.2 Objectives :After completing the leaching lessons along with what has been taught by this time, a learner will be able to

- decide what he already knows, what he needs to know
- what he wants to know understand how paragraphs, letters, technical reports, CV's are commonly organized
- choose the right style of writing i.e., where to use the a voice and where the passive voice - know how to make a series of sentences clear and easy to
- pay attention to details, such as spelling, punctuation etc.
- write effective and meaningful paragraphs, letters, reports, applications, CV's.

2.3 Methodology :Writing is seen to be a skill which involves cognitive, meaning-making processes where a message is plant appropriate content is selected and composed in effective manner, with an awareness of the audience, context and purpose, the value of 'thinking' things out on paper, drafting and redrafting involving critical reading of one's own text is emphasized. A teacher who has a working understanding of what writing is can be expected to create situations in the tasks where the learners can explore possibilic'8 of thinking, solving problems, writing, re- writing.

As a classroom facilitator, the teacher can help in getting appropriate vocabulary, organization, accuracy and flow in writing.

2.4 Role of Teacher : In writing classes, teachers should be concerned not only with the products - the letter / the paragraph / the report a learner has written-but also with the process through which he has traversed in making the product, that is, how much thinking, drafting / re-drafting, addition / alteration have taken place in writing are important activities behind every **good** writing. Naturally, in the classroom the teacher should be alert in

making the students write and give continuous feedback and clues, hints for changing, redrafting whenever necessary.

2.5 Class Organization : Generally, writing is an individual work but when writing to learn, pair work and group work may be of advantage to learning.

2.6 Role of Learner: If there is sufficient motivation for activities in the writing class, the role of learners is very much active.

Integrated Skills

In real life situations, communication takes the form of integrated activities e.g., reading a text, writing a summary, picking up some points for oral discussion and so on. Therefore, though the contents of the Curriculum have been separated and isolated for convenience in teaching, in fact, study should be meaningfully amalgamated whenever possible and integrated tasks should be designed by the teacher for student activities. At least 20 class hours should be kept when all the parts of the Curriculum are completed, for such integrated practices.

Evaluation of Learners' Achievement

Tests may be constructed primarily as devices to reinforce learning and to motivate the students or primarily as a means of assessing the students' performance in the language, in the former case, the test is geared to the teaching that has taken place whereas in the latter case, the teaching is often geared largely to the test.

A language test which seeks to find out what candidates can do with language provides a focus for purposeful, everyday communication activities. Such a test will have a more useful effect on the learning of a particular language than a mechanical test of structure.

Although most teachers wish to evaluate individual performance, the aim of the classroom test is different from that of the external examination. While the latter is generally concerned with evaluation for the purpose of selection, the classroom test is concerned with evaluation for the purpose of enabling teachers to increase their own effectiveness by making adjustments in their teaching to enable certain groups of students or individuals in the class to benefit more.

A good classroom test will also help to locate the precise areas of difficulty encountered by the class or by the individual student. Unless the teacher is able to identify and analyze the errors a student makes in handling the target language, he or she will be in no position to render any assistance at all through appropriate anticipation, remedial work and additional practices.

A test which sets out to measure students' performances as fairly as possible without in any way setting traps for them can be effectively used to motivate them. A well-constructed classroom test will provide the students with an opportunity to show their ability to perform certain tasks in the language. Provided that details of their performance are given as soon as possible after the test, the students should be able to learn from their weaknesses. In this way, a good test can be used as a valuable teaching device.

Four major skills in communicating through language are broadly defined as listening, listening and speaking, reading and writing. These skills should be carefully integrated and used to perform as many genuinely communicative tasks as possible. It is important for the test writer to concentrate on those types of test item which appear directly relevant to the ability to use language for real-life communication. For example, in the written section of a test questions requiring students to write letters and reports would be used in place of many of the more traditional compositions used in the past.

It is important that a test reflects the actual teaching and the course being followed. As we have adopted a communicative approach to language learning, the test specifications should be based on the types of language task included in the learning programme.

A good test must have two basic criteria - validity and reliability. A validity of a test is the extent to which it measures what it is supposed to measure and nothing

else. For example, the following test item is invalid if we wish solely to measure writing ability:

Is photography an art or a Science ? Discuss .

It is likely to be invalid simply because It demands some knowledge of photography and will consequently favour certain students.

Reliability is a necessary characteristics of any good test : for it to be valid at all, a test must first be reliable as a measuring instrument. If the test is administered to the same candidate on different occasions (with no language practice work taking place between these occasions), then, to the extent that it produces differing results, it is not reliable. One effective way of increasing test reliability is by means of a carefully drawn up banding system or rating scale.

Different roles of a teacher in a communicative language classroom

Role

Giver of Knowlegde

Curriculum Designer

Task Constructor

Manager

Facilitator

Counsellor

Evaluator

Functions

Provide new knowledge,
Terminology, Vocabulary, Information

REFERENCES BOOKS:

1. English for Specific Purposes : A learning - Centred approach
— Hutchinson, Tom and Waters, A Ian
CUP 1987
2. The Second Language Curriculum
— Ed. Robert Keith Johnson
CUP 1989
3. Designing Tasks for the Communicative Classroom
— David Nunan
CUP 1989
4. Writing English Language Tests
— J. B. Heaton
Longman Group U K Limited 1988
5. Testing for Language Teachers
— Arthur Hughes
CUP 1989
6. Writing Matters
-- Kristine Brown & Susan Hood
CUP 1989
7. Communicate 2
— Keith Morrow and Keith Johnson
CUP 1980

8. In at the deep end
—Vicki & Hollett
CUP 1989
9. Teaching the Spoken Language
— G. Brown and G. Yule
CUP 1983
10. Teaching Reading Skills in a Foreign Language
— Christine Nuttall
Heinemann 1982
11. Communication in English for Technical Students
— Orient Longman 1984
12. Teachers' Manual (for Communication in English for Technical Students,
Orient Longman 1984)
— Curriculum Development Centre
Technical Teachers' Training Institute
(Eastern Region) 1985.

APPLIED MATHEMATICS -1

<i>L</i>	<i>T</i>	<i>P</i>
3	0	0

Curri. Ref. No. : 103

Total Contact hrs.:45

Total marks: 100

Theory:100

Theory: 45

End Term Exam: 70

Tutorial: 0

I. A.: 30

Prerequisite: Nil

Total Credit: 3

RATIONALE:

Mathematics is the basis of solution of engineering problems and as such it is important to have the working principles of mathematics to solve most of the engineering problems involving results based on mathematical expressions which are obviously different for different engineering problems.

AIM:

To develop fundamental concepts and principles of mathematics to solve problems related to Algebra, Trigonometry, Mensuration, Vector Algebra, Two-dimensional Co-ordinate Geometry, Differential and Integral Calculus, Differential Equation and Basic Statistics which are found to be important in Technician Education.

UNIT TOPIC / SUB-TOPIC

	Hrs.	Total hrs.
1.0 Algebra :		20
1.1 Theory of Indices, Surds and Complex Numbers :	3	
(learners will correctly)		
(i) State and explain Laws of Indices		
(ii) Define Surds		
(iii) State and explain Complex numbers		
(iv) Solve simple problems on indices, surds and complex numbers.		
1.2 Theory of quadratic equation :	4	
(Learners will correctly define and explain with examples)		
(i) General Solution of Quadratic Equation		

- (ii) Nature of roots
- (iii) Relation between the Roots and Coefficients
- (iv) Formation of a quadratic equation from given roots.
(Solve problems on quadratic equations)

Assignment and class test

1.3 . Determinants : **4**

- (i) Define determinant
- (ii) State the Properties of determinants of Order-three
- (iii) Evaluate determinants by Chio's Method
- (iv) Compute Product of two determinants
- (v) Solve simultaneous equations in three unknowns
by Cramer's rule.

Assignment and class test

1.4 Progressions: **3**
(Learners will correctly state and explain with examples)

- (i) Arithmetic Progression (AP)
 - (ii) Geometric Progression (GP)
 - (hi) Problems and their solutions on AP & GP.
- Assignment and class test

1.5 Permutations and Combinations **2**

- (Learners will correctly explain)
- (i) Concept of permutation and combination and meaning
of ${}^n C_r$ and ${}^n P_r$
 - (ii) Evaluation of ${}^n C_r = \frac{n!}{r!(n-r)!}$
 - (iii) Simple Problems and their solutions

Assignment and class test

1.6 Binomial theorem: **2**

- (Learners will correctly explain)
- (i) Statement of the Theorem to Positive integral index
 - (ii) Calculation of general terms, middle term/terms
 - (iii) Use of Binomial theorem to
- (c) find the middle term of $(2x-5)^9$ and $(x+x^{-1})^8$
 - (d) find approximate values of $4(0.996)^{\frac{1}{2}}$, etc.
 - (e) Application to engineering problems

Assignment and class test

1.7 Logarithms, exponential functions and graphs : **2**

- (Learners will correctly develop)
- (i) Concept of Logarithms and use of logarithms for computations
 - (ii) Concept of Exponential Functions and their applications
 - (iii) Graphs of e^x & $\log_a x$

Assignment and class test

2.0 TRIGONOMETRY: **10**

(Learners will correctly state and explain)

- 2.1 Measurement of an angle and its definition; definition
of a radian; relationship between degree and radian ;
simple problems. 1
- 2.2 Circular Functions 1
- 2.3 Trigonometric ratios of an acute angle; 1
- 2.4 Trigonometric identities and formulae such as 1

$$\sin \theta \times \operatorname{cosec} \theta = \cos \theta \times \sec \theta = \tan \theta \times \cot \theta = 1$$

$$\sin \theta / \cos \theta = \tan \theta ;$$

$$\sin^2 \theta + \cos^2 \theta = 1; \sec^2 \theta - \tan^2 \theta = 1;$$

$$\operatorname{cosec}^2 \theta - \cot^2 \theta = 1$$

Simple problems on identities

2.5	Compound multiple and sub-multiple angles.	1
2.6	Trigonometric equations and their solutions	2
2.7	Concept of Inverse Circular functions and solution of simple problems.	1
2.8	Properties of triangles; derivation of sine and cosine rules.	1
2.9	Applications of Trigonometry in relation to Engineering Problems.	1

Assignment and class test

3.0 MENSURATION : **2**

(Learners will correctly state and explain with examples)

(i) Trapezoidal Rule

(ii) Simpson's one - third rule

Assignment and class test

4.0 VECTOR ALGEBRA :

(Learners will correctly state and explain with examples)

(i) Definition of Vector and Scalar

(ii) Addition and Subtraction of Vectors

(iii) Multiplication of a Vector by a Scalar.

(iv) Scalar and Vector product of two Vectors

Assignment and class test

5.0 CO-ORDINATE GEOMETRY (TWO DIMENSION) ;

(Learners will correctly develop concepts and principles of)

5.1	Cartesian and polar co-ordinates of a point; Distance between two points; Division formula; Co-ordinates of Centroid of a triangle; Area of a triangle; Extension of the concept to Three Dimension.	3
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5.2	Locus of a point : Equation of a straight line in various forms. Distance of a point from a line. Angle between two straight lines. Conditions for parallelism and perpendicularity. Bisectors of an angle between two straight lines.	3
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Assignment and class test

5.3	Circle : Equation of a circle; equation of tangent and normal at a point on the circle.
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5.4	Standard curves like Parabola, Ellipse, Hyperbola.
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Assignment and class test

APPLIED MATHEMATICS-II

<i>L</i>	<i>T</i>	<i>P</i>
3	0	0

Total Contact Hrs :45

Theory: 45

Tutorial :0

Prerequisite: Nil

Total Credit: 3

Total marks: 100

End Term Exam: 70

Curri. Ref. No. : 104

Theory : 100

I.A.: 30

UNIT TOPIC / SUB-TOPIC	Hrs.	Total hrs.
1.0 DIFFERENTIAL CALCULUS :	20	
(Learners will correctly develop)		
1.1 Concept of functions, simple algebraic and trigonometric functions.	2	
1.2 Concept of limit and continuity of a function. Theorems on limit of a sum, difference, product and quotient of functions (no proof required)	4	
1.3 Concept of derivative of a function at a point, Derivative of standard functions. Derivative of Sum, Product and Quotient of functions.	4	
1.4 Derivative of composite functions, implicit functions. Logarithmic differentiation. Elementary concepts of partial differentiation.	2	
Assignment and class test		
1.5 Derivative of functions upto second order.		
1.6 Geometrical interpretation -of derivative and Discussion on Tangents and normals.		
1.7 Physical signifiCcince of derivative.		
1.8 Maximum and minimum value of a function of a single variable and its applications.		
Assignment and class test		
2.0 INTEGRAL CALCULUS :		10
(Learners will correctly develop)		
2.1 Integration as inverse of differentiation. Standard table of integrals (simple algebraic and trigonometric functions).		2
2.2 Integration by Substitution, by Parts, by Partial Fraction		4
2.3 Definite integrals by fundamental* theorem of integral calculus and by limit of a sum.		2
2.4 Application to engineering problems		2
Assignment and class test		
3.0 DIFFERENTIAL EQUATION:		10
(Learners will correctly)		
3.1 Define differential equation & its order and degree.		1
3.2 State first order differential equation of 1st and 2nd degree. (a) L.H.S. resolved into factors (b) L.H.S. not resolved into factors		6
3.3 Apply simple differential equations in mechanical and electrical engineering problems.		3
Assignment and class test		
4.0 BASIC STATISTICS :		5
(Learners will correctly explain)		
4.1 Frequency Distribution, Histogram, Frequency Polygon Cumulative frequency distribution.		
4.2 Percentile, mean, median and mode. Standard deviation, correlation. Application of normal distribution to engineering problems.		
Assignment and class test		

REFERENCE BOOKS

1. Mensuration for Indian Schools and College Part I and II By A. E. Pierpoint
2. Differential Calculus By B. C. Das &

3.	Integral Calculus	B. N. Mukherjee By B.C. Das & B. N. Mukherjee
4.	Elementary Co-ordinate Geometry and Solid figures	By B. Das
5.	Plane Trigonometry Part – I	By S. L. Loncy
6.	Plane Trigonometry	By A.R. Majumder & P.L. Ganguli.
7.	Engineering Mathematics Volume I and 11	By Vishwanalh
8.	College Algebra	By A. R. Majumder & P. L. Ganguli
9.	Engineering Mathematics Part I	By Shanti Narayan.

ENGINEERING SCIENCE - I

L T P
3 0 2

Curri. Ref. No. :105

Total Contact hrs.: 45

Total marks: 150

Theory: 100

Theory: 30 +15

End Term Exam: 70

Practical: 30+30

I.A : 30

Prerequisite: Nil

Practical: 50

Credit: 5

End Term Exam:

25

I.A : 25

RATIONALE :

Engineering Science comprising of Physics and Chemistry is an important subject in technician education, because of the fact that fundamental knowledge and skills in respect of physical and chemical characteristics of matters related to solid, liquid and gas are essential elements on which various aspects of application in engineering depend upon.

AIM:

Appropriate courses of study selected from relevant fields of Physics and Chemistry have been included in the Engineering Science in order to reinforce the fundamental concepts of

engineering applications for the technicians to satisfy the following aims:

- To develop fundamental knowledge and skills related to physical behaviour of matters , such as units and measurements, mechanics of materials, properties of matter, heat, sound, light, magnetism and electricity, and their appropriate applications in engineering.

- To develop fundamental knowledge and skills related to chemical properties of matters in

general, such as solid liquid and gas, and their appropriate applications in engineering disciplines which include Electro-chemistry, fuel, lubricants, corrosion, protective coatings,

organic chemistry, plastic and polymer, general chemistry, chemistry of water and environmental science.

Applied Physics -1

THEORY: 30 Hours

UNIT TOPIC / SUB-TOPIC

Hrs.

Total hrs.

1.0 Units, Dimension and Measurements :

2

1.1	Units, Dimension	
	<ul style="list-style-type: none"> • Concept of unit of physical parameters • Fundamental and derived units • SI systems of units of different physical parameters • Dimension with examples of different physical parameters. 	
1.2	Measurements	
	<ul style="list-style-type: none"> • Measuring devices e.g., slide calipers, screw gauge, spherometer with concept of vernier constant, least count and zero error. 	
2.0	Mechanics	3
2.1	Motion along a straight line and Force	
	<ul style="list-style-type: none"> • Concept of scalar and vector quantities • Speed, velocity and linear acceleration • Equations of motion with constant acceleration (derivation not required) • Equations of motion of falling body under gravity • Simple problems on linear motion • Newton's laws of motion, Action and reaction, tension • Force, inertia, momentum, impulse and impulsive force with practical examples • Conservation of linear momentum. 	
3.0	Gravitation;	2
	Learners will correctly state and explain	
	<ul style="list-style-type: none"> • Newton's laws of gravitation • Newton's gravitational constant G and its SI unit • Acceleration due to gravity (g) and its relation with "G". • Variation of g with altitude and latitude (deduction not required) • Difference between mass and weight • Simple problems 	
4.0	Work, Power and Energy (Review)	2
	<ul style="list-style-type: none"> • Work, power and energy with their units and mathematical expressions • Relation between Horse power and Watt • Different forms of mechanical energy : PE, KE and their expressions • Conservation of energy and transformation of energy with examples • Simple problems 	
5.0	Properties of matter :	3
5.1	Properties of solid	
	<ul style="list-style-type: none"> • Plasticity and elasticity in solids • Deformation of bodies by the action of external forces • change in size and change in shape • Unit of stress ~ tensile stress, compressive stress and Shear stress with examples • Unit of strain - tensile strain., .Volumetric strain and shear strain • Hooke's law • Modulus of elasticity - Young's modulus, Bulk modulus and Modulus of rigidity. Poison's ratio and their units • Stress - Strain curve 	

5.2 Properties of Fluid	3
<ul style="list-style-type: none"> • Thrust and pressure • Law of fluid pressure, Pascal's law and working principles of hydraulic press • Archimedes Principle and its applications • Specific gravity and relative density • Hydrometers and their uses • Properties of gas : Toricelli's Expt. & Simple Barometer • Simple problems 	
6.0 Heat	8
6.1 Heat and temperature (Review)	
<ul style="list-style-type: none"> • Heat and temperature • Fixed points and different scales of temperature Fahrenheit, Celsius and Kelvin and their relationships 	
6.2 Measurement of heat	4
<ul style="list-style-type: none"> • Quantity of heat, units of heat-Joule and Calorie • Specific heat of solid, heat capacity ,water equivalent • Principle of calorimeter, Measurement of specific heat • Change of state : Latent heat, evaporation & boiling, effect of pressure • Boyle's law and Charles law. Universal gas law, and universal gas constant. • Idea of two specific heat capacities of gas: Cp and Cv and their relationships • Simple problems 	
6.3 Thermal expansion & Transmission of heat	3
<ul style="list-style-type: none"> • Expansion of solid - linear, superficial and Cubical co-efficient of expansion & their units • Interrelationship between different co-efficient of expansion with examples • Different methods of transmission of heat: conduction, convection and radiation • Co-efficient of thermal expansion & its unit • Good conductors and bad conductors of heat • Simple problems 	
7.0 Sound:	7
7.1 Simple Harmonic Motion	2
Learners will correctly define and state	
<ul style="list-style-type: none"> • Simple harmonic motion and its characteristics • Time period, frequency & amplitude of vibration • Mathematical expression of SHM • Examples of SHM: Simple Pendulum • Simple problems 	
7.2 Production and propagation of Sound	2
Learners will correctly define and state	
<ul style="list-style-type: none"> • Natural vibration, forced vibration with examples • Resonance of sound with examples • Principle of resonance to find out velocity of Sound in air. • Velocity of sound , Newton's formula and Laplace correction (Idea only, no deduction) 	
7.3 Reflection of sound	1
<ul style="list-style-type: none"> • Echo, reverberation and reverberation time 	

- Acoustics of buildings, absorption power of a surface
 - Acoustic defects & its remedies for an auditorium
- 7.4 Musical sound, noise and noise pollution 2
- Characteristics of musical sound and noise with examples
 - Factors affecting sound
 - Sources of noise pollution & remedial measures

APPLIED PHYSICS - 1 (PRACTICAL) : 30 Hours

UNIT TOPIC/SUB-TOPIC	Hrs	Total Hrs.
1.0 To measure the volume of a wooden block by using Vernier callipers./ To measure the surface area of a metal washer by Vernier inside callipers & to measure the depth of a hole by Depth Gauge (Slide callipers)		
2.0 To measure the cross-section of section of a wire by Screw Gauge.		
3.0 To determine the thickness of a glass plate by Spherometer.		
4.0 To adjust a common balance and to determine the specific gravity of a solid.		
5.0 To adjust a common balance and to determine the specific gravity of a liquid by specific gravity bottle.		
6.0 To establish the relation between pressure and volume of a gas at a constant temperature.		
7.0 To determine the acceleration due to gravity (g) of a place by simple pendulum.		
8.0 To determine the water equivalent of a calorimeter by method of mixture.		
9.0 To measure the velocity of sound by vibration air column method.		

Applied Chemistry -1

THEORY: 15 Hours

UNIT TOPIC / SUB-TOPIC	Hrs.	Total Hrs.
1.0 General Chemistry		9
1.1 Concept of symbol, valency, formula, atomic mass, molecular mass, elementary idea of atomic structure (Review).		
1.2 Solution		
1.2.1 Classify and explain solution according to concentration		
1.2.2 Distinguish among suspension, colloids and true solution.		
1.2.3 Define and explain solubility, effect of temperature on solubility		
1.2.4 Mention practical applications of colloids in different situations :		
1.2.4.1 Colloidal impurities in drinking and sewage water.		
1.2.4.2 Finely divided colloidal particles in air causes Air-Pollution.		
1.2.5 To demonstrate the principles of coagulation and flocculation by using Jar Testing Instrument (Visual observation only).		
Assignment and Class test		
1.3 Acid, Base and Salt		
1.3.1 Define and classify acid, base and salt (Review)		
1.3.2 Define and explain normal solution, molar solution, titration and indicator		
1.3.3 Define pH of a solution and pH Scale		
1.3.4 Calculate pH from H ⁺ ion concentration		
1.3.5 Mention application of pH in industry such as		
1.3.5.1 pH of a boiler feed water		
1.3.5.2 Role of pH in sewage treatment		

1.3.5.3 pH in Sugar, Paper industry

Assignment and Class test

1.4 Chemical Equilibrium:

1.4.1 Define reversible and irreversible reaction with examples

1.4.2 Define and explain chemical equilibrium

1.4.3 Describe Le Chatelier's principle and its application in the manufacturing processes.

Assignment and Class test

- 1.5 Catalysis: Define and classify of catalysis, industrial application of catalysis
- 2.0 Chemistry of water 6hrs.
- 2.1 State the different types of impurities present in natural water and name impurities under each of them types.
- 2.2 Explain how natural water gets contaminated with the impurities.
- 2.3 Explain the action of soap on water
- 2.4 Define and explain soft and hard water with illustrations
- 2.5 Classify and explain hardness of water with illustration
- 2.6 State different ways of expressing concentration of impurities in water including hardness.
- 2.7 Name the bad effects caused by natural water when used in domestic as well as industrial purpose.
- 2.8 State and Explain the remedial measures of the following bad effects of natural water in boiler.
- Scales and sludges
 - Caustic Embrittlement
 - Priming and foaming
 - Corrosion
- 2.9 Define boiler feed water
- 2.10 Describe with help of diagram of the following water treatment Process.
- 2.10.1 Lime soda process
- 2.10.2 Permutit or Zeolite process
- 2.10.2 De-ionisation or demineralization process
- 2.11 Describe with the help of block diagram, the treatments done on a sample of raw water to produce drinking water and boiler feed water.
Solve problems on a) bad effects on natural water b) water treatment process.

Assignment and Class test

APPLIED CHEMISTRY -1 (PRACTICAL) : 30 Hours

UNIT TOPIC / SUB-TOPIC _____ Hrs. Total Hrs.

- 1.0 To titrate standard alkali solution with unknown acid solution
- 2.0 To determine the alkalinity of water by titramalic method
- 3.0 To determine action of soap on hard water.
- 4.0 To determine the total hardness of water
- 5.0 To detect qualitatively the presence of Arsenic/Iron in drinking water by using Water Analysis Kit

ENGINEERING SCIENCE – II

L T P
3 0 4

Total Contact hrs.: 45

Theory: 24+21

Practical: 30+30

Total marks: 150

Curri. Ref. No. : 106

Theory: 100

End Term Exam: 70

I.A :30

Pre requisite: Engineering
Science -1
Credit: 5

Practical:50
End Term Exam: 25

Applied Physics -II

THEORY: 24 Hours

UNIT TOPIC / SUB-TOPIC

	Hrs.	Total hrs.
1.0 Light		8
1.1 Photometry:	1	
• Rectilinear Properties of light (Review)		
• Luminous flux, luminous intensity, illumination and their units.		
• Law of inverse square for illumination & its applications..		
1.2 Reflection of light		
1.2.1 Reflection of light on plane surface (Review):		
• Laws of reflection		
• Image formation		
• geometrical method of locating image.		
1.2.2 Reflection of light on spherical surface :		
• Different types of spherical mirror		
• Radius of Curvature and focus		
• Reflection by a spherical mirror: Real and virtual images, magnification		
• Geometrical method of determination of image position, size and nature of the images formed		
• Relation between focal length and radius of curvature of the spherical mirror. Relation between object distance, image distance and focal length (no deduction) & Sign convention		
• Uses of different types of mirrors.		
1.3 Refraction of light:	4	
1.3.1 Refraction of light through plane surface (Review)		
• Laws of refraction		
• Refractive index in terms of velocity of light in different media		
• Total internal reflection and critical angle, concept of fibre optics & its various practical applications		
• Refraction through a prism & condition of minimum deviation		
1.3.2 Optical Lens :		
• Different types of lenses		
• Position and nature of images formed by convex and concave lenses ,		
• Image formation formula (no deduction)		
• Power of a lens		
• Dispersion of light - dispersion of light through a prism, pure and impure spectra		
• Electromagnetic spectrum : Infrared, Ultra violet & visible light		
• Simple problems		
2.0 Magnetism	4	
2.1 Magnetic properties (Review)	1	
• Natural and artificial magnets		
• Properties of magnets		
• Types of magnets - bar, horse-shoe, needle		
• Preparation of temporary and permanent magnets		

	<ul style="list-style-type: none"> • Induced magnetism • Nature of induced polarities • Molecular theory of magnetism. 	
2.2	Magnetic measurement	3
	<ul style="list-style-type: none"> • Uniform and non-uniform Held • Magnetic moment • Inverse square law • Magnetic intensity-end on and broadside on position • Couple on a magnet in an uniform field • The tangent law & its application in Tangent Galvanometer • Elements of terrestrial magnetism : dip, declination and horizontal component 	
3.0	Electrostatics	
3.1	Electrostatics Basic (Review):	2
	<ul style="list-style-type: none"> • Basic concept of Electric charge • Its production and nature — electrification by rubbing :Kinds of electrification • Electrostatic induction and conduction (conductors and non-conductors • Surface density of charge. The lightening conductor • Coulomb's law between electric charges • Field intensity and electric potential • Electric pcrmitivity • Lines of force in electrostatic Held 	
3.2	Capacity and condensers :	
	<ul style="list-style-type: none"> • Electrostatic capacity & its SI unit • Condensers of different types • Capacity of parallel plate condensers • Condensers in series and parallel (formula only, no deduction) • Uses of condensers • Simple problems 	
4.0	Current Electricity	
4.1	Electric current:	5
	<ul style="list-style-type: none"> • Cell: Primary & Secondary • Flow of charge - electric current and its unit • Electric motive force (EMF) • Ohm's law • Resistance and its unit, specific resistance • Factors affecting resistance • Calculation on EMF of primary cells, current, potential difference • Grouping of similar cells - cells in series & parallel • Condition of obtaining maximum current tthrough an external resistance • Whealstone bridge circuit • Relation for balanced wheatstone bridge • Meter bridge, P.O. Box • Simple problems 	
4.2	Magnetic Heating effects of electric current	
	<ul style="list-style-type: none"> • Magnetic effect of electric current • Application of Magnetic effect of electric current - Galvanometer 	

- Joule's law
- Electrical work, energy and power with units.
- Simple problems

APPIED PHYSICS - II (PRACTICAL) : 30 Hours

UNIT TOPIC / SUB-TOPIC	Hrs.	Total Hrs.
1.0 To determine the focal length of a convex lens by plane mirror method		
2.0 To determine the focal length of the convex lens by U.V. method		
3.0 To determine the refractive index of the material of the glass slab by pin method		
4.0 To draw I.D. curve and to determine the refractive index of the material of a prism		
5.0 To plot magnetic lines of force of a bar magnet with north pole pointing north and to locate the neutral points / To plot magnetic lines of force of a bar magnet with South Pole pointing north and to locate the neutral points		
6.0 To locate the poles of a bar magnet and to measure the magnetic length		
7.0 To verify Ohm's law by Ammeter - Voltmeter method		
8.0 To find equivalent resistance using Voltmeter, Ammeter with (i) three resistances connected in series, (ii) three resistances connected in parallel		
9.0 To measure the unknown resistance / resistivity of the material of a wire by meter bridge		
10.0 To measure the unknown resistance of the material of a wire by P. O. box.		

Applied Chemistry — II

THEORY: 21 Hours

UNIT TOPIC / SUB-TOPIC	Hrs.	Total Hrs.
1.0 Electrochemistry	3	
1.1 Define conductor, insulator, semi conductor, electrolyte and non-electrolyte with examples.		
1.2 State postulates of Arrhenius and electrolytic theory of Dissociation		
1.3 Demonstrate the phenomenon of electrolysis.		
1.4 State and explain Faraday's 1st and 2nd laws of electrolysis		
1.5 Mention the following industrial applications : <ul style="list-style-type: none"> • Extraction of metals • Refining of metals • Electro plating of metals 		
1.6 Define and explain conductance, specific conductance, molar conductance, electrochemical cell		

Solve problems on electrolysis

Solve problems. Assignment and Class test.

2.0 Fuel	5	
2.1 Explain importance of fuels in industries.		
2.2 Define 'fuel' and 'combustion of fuel' with examples.		
2.3 State the classification of fuels into two different ways, namely		
2.3.1 Classification based upon occurrence with examples.		
2.3.2 Classification based upon state of aggregation with		

- examples.
- 2.4 Define calorific value and mention its units.
 - 2.5 Distinguish between gross (or higher) and net (or lower) calorific value.
 - 2.6 State the relative merits and demerits of solid, liquid and gaseous fuel
 - 2.7 State the availability of different fuels in India.
 - 2.8 Define coal.
 - 2.9 State and explain origin of coal.
 - 2.10 Classify coal by rank.
 - 2.11 State different methods for proper storage of coal.
 - 2.12 Define pulverized coal
 - 2.13 State the advantage and disadvantage of pulverized coal.
 - 2.14 State the principles of carborization of coal.
 - 2.15 Distinguish between low temperature carborization and high temperature carborization of coal.
 - 2.16 Explain proximate and ultimate analysis of coal.
 - 2.17 Define 'Petroleum' or 'Crude oil'
 - 2.18 Classify three varieties of crude oil, namely, paraffmic-base type, asphaltic-base type and mixed-base type.
 - 2.19 Describe the fractional distillation of crude petroleum.
 - 2.20 Name the main products obtained from crude petroleum and mention their respective boiling ranges and uses.
 - 2.21 State and explain important properties of liquid fuels namely, viscosity, flash and fire point, smoke point, aniline point, knocking, octane number, cetane number, anti-knocking properties.
 - 2.22 State composition, preparation and industrial application of coal gas, water gas, producer gas, LPG, natural gas and gobar gas.

(Solve problems, Assignments and class tests)

3.0 Lubricants

- 3.1 Define 'lubricant' and 'lubrication'.
- 3.2 Mention the major functions of a lubricant.
- 3.3 Define lubricating oil
- 3.4 Define greases, solid lubricants and lubricating emulsion with their applications.

(Solve problems, Assignments and class tests)

4.0 Corrosion

- 4.1 Define corrosion.
- 4.2 Describe the causes of corrosion.
- 4.3 State the different types of corrosion of metal.
- 4.4 Explain chemical corrosion of metals and mention the names of the corrosion products.
- 4.5 Explain rusting of iron
- 4.6 Name the various methods of corrosion control.

(Solve problems, Assignments and class tests)

5.0 Protective Coating

- 5.1 State the necessity of protective coating.
- 5.2 State the main types of protective coatings.
- 5.3 Recall the different kinds of organic and inorganic (or metallic) protective coating.
- 5.4 Explain the term "Paint "

5.5 State the functions of drying oil, pigment, driers and thinners with examples.

5.6 Explain the terms : varnish, enamel and lacquer.

(Solve problems, Assignments and class tests)

6.0 Organic Chemistry

6.1 Define Organic Chemistry and its scope in various industries

6.2 State uniqueness of carbon atom.

6.3 Distinguish between organic and inorganic compounds.

6.4 Explain saturated and unsaturated organic compounds up to two carbon atoms.

6.5 Name the important derivatives of benzene.

6.6 State the uses of benzene, toluene and phenol.

(Solve problems, Assignments and class tests)

7.0 Plastics and Polymer

2

7.1 Define polymer.

7.2 Illustrate the types of polymerization.

7.3 Classify polymers

7.4 State the properties of thermoplastics and thermosetting polymers.

7.5 Define plastics

7.6 Name important plastic materials with their properties and uses (in tabular form).

Namely : Polythene, Polypropylene, polystyrene, PVC, Nylon, Terelene, Neoprene, Perspex, Bakelite, Urea-formaldehyde and Formica.

7.7 Mention examples of plastics used in different situations :

- i) Electrical insulation
- ii) Lubrication
- iii) Ropes and beams
- iv) Optical lens
- v) Adhesives
- vi) Pipes and housing
- vii) Fibre glass

(Solve problems, Assignments and class tests)

8.0 Environmental Science

3 hrs.

8.1 Explain the importance of environment on human life.

8.2 Define pollution.

8.3 Categorize environmental pollution.

8.4 State the causes of air pollution.

8.5 State the effect of air pollution on human beings, animals, plants and materials.

8.6 State causes of water pollution.

8.7 State effect of polluted water on human health (Mention various diseases only)

(Solve problems, Assignments and class tests)

APPLIED CHEMISTRY-11 (PRACTICAL) : 30 Hours

UNIT TOPIC / SUB-TOPIC

Hrs. Total hrs.

1. To determine calorific value of solid fuel using Bomb Colorimeter.
2. To find the proximate analysis of coal
3. To determine the viscosity of petroleum oil by using Red-wood Viscometer
4. To determine smoke point of petroleum products by using Smoke meter
5. To determine flash point of petroleum products by using Pensky-Martain instrument
6. To determine the aniline point of petroleum products by using Aniline point

Instrument

7. To determine the conductivity of water by Conductivity meter.

Engineering Science (Applied Physics)

Text Books :

1. Principle of Physics - Subrahmanyam & Brizal
2. Intermediate Physics - S.C.Roy Chaudhury & D.B.Sinha

Reference Books :

1. Fundamentals of Physics—David Malliday, Robert Resnick & Jeal Walka
2. University Physics - Francis W. Sears, Mark W. Zemansky & Hugh D. Young
3. University Physics " Hugh D. Young & Roger H. Freedman
4. A text book of Physics - C. R. Dasgupta Part I & II
5. Elements of Higher Secondary Physics (Part I & II) — D. Dulla, U. Pal & B. Chaudhuri
6. Physics Volume 1 & II — Ajoy Chakraborty

Engineering Science (Applied Chemistry)

Text Books Recommended :

1. Modern Intermediate Chemistry Part — I and Part — II
by R. N. Nanda, A. K. Das, Y. R. Sharma
2. Engineering Chemistry by Jain & Jain
3. A Text book of Polytechnic Chemistry by J. P. Mehta & Jain and Jain
4. Industrial Chemistry by B. K. Sarma
5. Environmental Chemistry by A. K. Dey

Reference Books :

1. Intermediate Chemistry by R. K. Samal
2. Text Book of Environmental Chemistry by C. P. Tyagi and M. R. Mehera
3. Water Pollution & Management by C. K. Vaswani
4. Hand book of Air Pollution Analysis by M. Ray, Rogger Perry ,
5. P. H. Engineering by S. C. Rangawala

ENGINEERING DRAWING-1

L T P
0 0 6

Curri. Ref. No. 201

Total Contact hrs.: 90

Total marks: 100

Practical

Theory: Nil

End Term Exam: 50

Practical: 90

IA.: 50

Prerequisite: Nil

Credit: 3

Rationale : Engineering Drawing is the precise means of communicating the ideas of the engineer, designer, architect to the workmen who will produce/build the desired object. It is

necessary that all diploma engineers have command over making and reading of engineering drawing and have thorough understanding of geometric principles of orthographic projection upon which engineering drawing is based.

Aims :

- Read and interpret common engineering drawings
- Translate the geometrical features of real objects into engineering drawings and conceive the features of a real object from its engineering drawings.

Detailed Course Contents :

UNIT TOPIC/ SUB -TOPICS	Hrs	Total Hrs.
1.0 Introduction	6	
1.1 Drawing as a medium of communication. Use and care of drawing instruments. <ul style="list-style-type: none"> • Explain importance of drawing for engineers • Make a minimum list of drawing instruments and other drawing implements a student must possess • Demonstrate the use of the following instruments - Drawing board, T-square, Set square, Compass, Scale, Protractor • Identify drawing sheets of different sizes as per IS standard (IS 10711 : 1983) • Select proper grade of pencils for different works in drawing • Demonstrate the use of drafting machine. 		
1.1 Assignments : Drawing of horizontal and vertical lines. Rectangle, Mosaic Pattern, Angular pattern, Circular pattern.		
2.0 Geometrical construction (by use of scale and compass only).	21	
2.1 Finding the centre of an arc; construction of equilateral triangles; squares; polygons; circles; tangents. <ul style="list-style-type: none"> • Find the centre of an arc • Construct an equilateral triangle given the length of the side • Construct an equilateral triangle of a given altitude • Construct a square given the length of a side • Construct a regular polygon, given the length of its side (use approximate methods where necessary) • Draw a tangent to a given circle (a) at any point on it (b) from any point outside it. (c) parallel to a given line • Draw common internal and external tangents to two given circles of (a) equal radii (b) unequal radii • Draw a circle (a) passing through a given point (b) passing through a given point and touching a given circle (c) to touch a given line and a given circle at a given point on the circle. 		
2.2 Curves used in Engineering - different methods of construction of ellipse and parabola; drawing of cycloidal (epicycloid, hypocycloid) curves; drawing involute. <ul style="list-style-type: none"> • Construct an ellipse v/hen the distance of the focus from the directrix and eccentricity are given • Construct a parabola, when the distance of the focus from the directrix is given. • Construct a cycloid given the diameter of the generating circle. • Draw an involute of a given circle. 		
2.3 Assignments : Drawing of James Clip, Hook, Wrench with bolt head, Heart cam, Rocker arm by employing geometrical construction.		
3.0 Free Hand Drawing : Sketching of Common Engineering Objects	3	
Assignment: Practice of above exercises using pencil and drawing pen.		
4.0 Lines, Lettering and Dimensioning.	12	
4.1 Lines (SP 46 : 1988) - line thickness, outlines, margin lines, hidden or dotted lines, centre lines, dimension lines, projection lines, construction lines, section lines, leader lines, cutting-plane lines, short-break lines, long-break lines. <ul style="list-style-type: none"> • Draw different types of lines of different thickness, using different grade of pencil and ink pen. 		
4.2 Single Stroke Lettering (IS 9609 : 1990); <ul style="list-style-type: none"> • Vertical and inclined type lettering (IS 11665 : 1985) 		

- Write titles, dimensions, notes and other important particulars on a drawing sheet using single stroke lettering.

4.3 Dimensioning (IS 11669 : 1986)- size and location of dimensions; elements of dimensioning; different systems of dimensioning.

- Demonstrate the different elements of dimensions : projection line, dimension line, leader line, dimension line origin indication, notes.
- Use different types dimensioning systems aligned system, un-dirccional system.
- Use different arrangements of dimensions : chain dimensioning, parallel dimensioning, combined dimensioning, dimensioning by co - ordinales.

5.0 Scales (IS 10713 : 1983)

3

5.1 Scales used in drawing - reducing scales, enlarging scales and full size scales.

5.2 Different ways of expressing scales— engineer's scale, graphical scale, representative fraction.

5.3 Types of scales - plain scale, diagonal scale, comparative scale.

- Select proper scale in preparing a drawing.

6.0 Basic Descriptive Geometry (SP 46 : 1988)

21

6.1 Projections of a point when it is situated in any of the four quadrants.

- Draw the projection of a point which is situated in any of the four quadrant.
- Determine from projections the quadrant in which the point lies.

6.2 Projection of a straight line when

- it is parallel to one or botli the planes
- it is contained by one or both the planes
- it is perpendicular to one of the planes
- it is inclined to one plane and parallel to the other
- it is inclined to both the planes
- line contained by a plane perpendicular to both the reference planes.

6.2.1 Other problems of projections (a) true length of a straight line and its inclinations with the reference planes when projections are given. (b) draw the line when traces are given. (c) Draw projections of a line when its relations with the reference planes are given and vice versa.

6.3 Projection of Planes -

Projection of perpendicular planes, projection of oblique planes.

- Draw horizontal traces and vertical'traces of perpendicular planes
- Draw horizontal traces and vertical traces of oblique planes.

6.4 Projections on Auxiliary Planes -

types of auxiliary planes and views; projection of a point on an auxiliary plane; projection of lines and planes on auxiliary planes; determination of true length of a line; obtaining point-view of a line and edge view of a plane; determination of the true shape of a plane figure.

- Draw the projection of a point on an auxiliary
 - vertical plane
 - inclined plane
 - plane perpendicular to both the principal planes
- Draw the projection of lines Draw the projections of lines and planes by the use of auxiliary planes.
- Determine true length of a line
- Obtain point view of a line and edge-view of a plane
- Obtain true shape of a plane figure

6.5 Projections of solids- types of regular polyhedron, prism, pyramid, cone, cylinder, projection of solids in simple positions; projection of solids with axes inclined to one of the reference planes and parallel to the other.

- Draw projections of following solids with axes perpendicular to a plane right prism, right pyramid, right cone, right cylinder.

7.0 Orthographic Projection (IS 10714 : 1983) 24

Planes of projection; Four quadrants; First-angle projection (view); Third angle projection (view); Reference line, Symbols for methods of projection; Projection of objects : plate objects, rectangular block, stepped rectangular block, prismatic solids, solids of revolution, structural beam and channel.

Distinguish between first angle projection and third angle projection.

- Draw projection of plate objects, prismatic objects, rectangular blocks with and without steps, cylinder, cones, pyramid, and their combinations.

Assignments-Free hand projection drawing and dimensioning from models.

REFERENCE BOOKS AND STANDARDS :

1. IS 9609 : 1990 Bureau of Indian Standards
1. IS 11669:1986 Bureau of Indian Standards
2. IS 10713:1983 Bureau of Indian Standards
3. IS 11065 (Part 1) : 1984 Bureau of Indian Standards
4. IS 10711:1983 Bureau of Indian Standards
5. IS 11665:1985 Bureau of Indian Standards
6. IS 10714:1983 Bureau of Indian Standards
8. SP 46 : 1988 Bureau of Indian Standards
9. N. D. Bhatt and V. M. Panchal : Elementary Engineering Drawing
— Charotar Publishing House.
10. S. C. Sharma : Engineering Drawing
11. Dharma Gupta : Engineering Drawing
12. R. B. Gupta : A Text Book of Engineering Drawing - Satya Prakashan
13. Frederik Egnisecks and others : Engineering Graphics
14. Warren J. Luzadder and Jon M. Duff: Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production — Prentice Hall of India.
15. K. L. Narang : A text book of Engineering drawing
16. G. R. Nagpal, Geometrical Drawing — Khanna Publishers.
17. W. Abbott: Practical Geometry and Engineering Graphics— Blackie & Son (India) Ltd.
18. W. Abbott: Machine Drawing and Design — Blackie & Son (India) Ltd.
19. I. H. Morris : Geometrical Drawing for Art Students - Orient Longman
20. A. C. Parkinson : General Engineering Drawing — Sir Isaac Pitman and Sons Ltd. London.
21. Anthony E. Zipprich : Freehand Drafting for Technical Sketching

D. Van Nostrand Company Inc
22. Rhodes and Cook : Basic Engineering Drawing Calcutta : Wheeler
23. Sachdeva : Blue Print Reading for Mechanical Trades-TMH, N. Delhi
24. Parkinson and Sinha : First Year Engineering Drawing-Calcutta : Wheeler.

ENGINEERING DRAWING - II

L T P
0 0 6

Curri. Ref. No. 202

Total Contact hrs.: 90

Total marks: 100

Practical

Theory: Nil

End Term Exam: 50

Practical: 90

I.A.: 50

Prerequisite: Engineering

Drawing -1

Credit: 3

UNIT TOPIC / SUB-TOPIC

Hrs. Total hrs.

1.0 Isometric Projection (IS 11065 Part ~1 :1984)

9

- 1.1 Introduction - Isometric axes, lines and planes, isometric scale, isometric view.
- 1.2 Isometric view of objects ~ rectangles, circle and irregular curves, solid objects having planes all parallel to the corresponding pictorial planes, objects having holes, cylindrical features and rounded corners.
- 1.3 Dimensioning of isometric views.
 - Draw isometric view of common geometrical objects, common engineering items, from orthographic projections of objects.
 - Dimension the isometric view.
- 1.4 Assignment: Free hand pictorial drawing from models and orthographic projection drawings.

2.0 Visualization :

12

- 2.1 Drawing of one view from other views
- 2.2 Drawing of missing line from different views
- 2.3 Drawing isometric view from orthographic views.'
 - Complete the missing view from other views. »
 - Complete the missing geometrical line or curves from other views.

3.0 Section of Solids

Section planes, sections, true shape of a section, section of prisms, pyramids, cylinder, cone, sphere.

4.0 Intersection of Surfaces

6

Line of intersection, methods of determining the line of intersection between surfaces of two interpenetrating solids : Prism and prism, cylinder and cylinder, cylinder and prism, cone and cylinder, cone and prism, sphere and cylinder.

- Determine the line of intersection between surfaces of two interpenetrating solids.

5.0 Development of Surface

6

Concept; methods of development" parallel-line development; radial-line development; Development of lateral surfaces of right solids : cube, prisms, cylinder, pyramids, cone.

- Develop the lateral surface of a right solid.

6.0 Sectional Drawing (IS 10714 : 1983)

6

6.1 Conventional sectioning—full section, half section, broken out section, rotated or revolved section, removed section, local section, aligned section, disposition of successive sections.

- Demonstrate the use of different types of sectional views.

6.2 Hatching of sections; hatching of adjacent components; assembly sectioning; conventional hatching for different materials.

- Prepare sectional views of assemblies whose parts are made from different materials.

6.3 Assignments: Free hand practice of sectional drawings of common objects with dimensions.

- 7.0 Screw threads and screwed fastenings** **9**
- 7.1 Nomenclature- helix, screw thread, parallel screw thread, taper thread, internal parallel screw thread, external parallel screw thread, right hand thread, left hand thread, single thread, multiple thread, geometry of screw thread, pitch of screw thread.
- 7.2 Forms of screw threads :
(IS 4218 Part 1 to Part 6) and (IS 7008 Part 1 to Part 4)
- (a) Vee thread : B.S.W.; B.S.P.; Unified; Metric
(b) Square thread; trapezoidal thread; buttress thread.
- 7.3 Hexagonal and square nut and boll and their proportional dimensional standards. (IS 1363 : 1984)
- 7.4 Assignments : Sectional view of assembly with screwed fastenings, involving nuts and bolts or studs; conventional representation of drawing internal and external threads.

- Identify type of threads
- Draw common screw threads

8.0 Drawing of Machine Elements (First Angle Projections) **18**

- 8.1 Hexagonal bolt
8.2 Hand wheel
8.3 Shaft with a key-way
8.4 Flanged bush bearing
8.5 Pipe flange
8.6 Pulley
8.7 Front and side view of a motor

9.0 Building Drawing and Electrical Drawing **15**

- 9.1 Plan, elevation and section of a simple single storeyed residential building with masonry wall, lintel and RCC roof slab.
- 9.2 Drawing of electrical and architectural symbols as used in electrical installations.
- (a) Actual connection diagram of a circuit for single lamp controlled from two different positions.
(b) Circuit diagram of a florescent lamp
(c) Single line representation of an electrical installation.
- Draw plan elevation and section of single storied residential building.
 - Draw the diagram of an electrical installation.

REFERENCE BOOKS AND STANDARDS :

1. IS 4218 (Part 1 to Part 4) 1976 Bureau of Indian Standards
2. IS 4218 (Part 5) 1979 Bureau of Indian Standards
3. IS 4218 (Part 6) (Part 6) 1978 Bureau of Indian Standards
4. IS 1363 1984 Bureau of Indian Standards
5. IS 10714 1983 Bureau of Indian Standards
6. SP46 1988 Bureau of Indian Standards
7. SP: 29(1) 1985 Bureau of Indian Standards
8. SP: 29(2) 1987 Bureau of Indian Standards
9. SP:29 (3) 1987 Bureau of Indian Standards
10. IS 7008 (Part 1 to Part 4) 1988 Bureau of Indian Standards
11. Gitin M. Maitra and L. V. Prasad : Handbook of Mechanical Design - Tata Me Graw Hill Publishing Company Ltd.
12. W. Abbott: Machine Drawing and Design - Blackie and Son (India) Ltd.
13. N . D. Bhatt: Machine Drawing - Charotar Publishing House
14. Lakshminarayan, Mathur and Vaishwanar : Machine Drawing - Jain Bros. - M.L. Malhur and R.S. Vaishwanar, Jain Bros.

15. N. D. Bhatt and V. M. Panchal: Elementary Engineering Drawing - Charotar Publishing house
16. S. C. Sharma : Engineering Drawing
17. Dharam Kumar : Engineering Drawing
18. Warren J. Luzadder : Graphics and Engineers - Prentice Hall of India (Private) Ltd.
19. K. L. Narang : A Text Book of Engineering Drawing
20. W. Abbott: Practical Geometry and Engineering Graphics - Blackie & Son (India) Ltd.
21. W. E. Kelsey : Geometrical and Building Drawing - The English Language Book Society and Crosby Lockwood Staples, London
22. Roger's Drawing and Design : A Practical Treatise - D. B. Taraporevala Sons & Co. Pvt. Ltd.
23. A. C. Parkinson : General Engineering Drawing - Sir Isaac Pitman and Sons Ltd., London.
24. R. B. Gupta : A Text Book of Engineering Drawing - Satya Prakashan.

WORKSHOP PRACTICE -1

L T P
0 0 4

Curri. Ref. No. 203

Total Contact hrs.: 60

Total marks: 50

Practical

Theory: Nil

End Term Exam: 0

Practical: 60

I.A.: 50

Prerequisite: Nil

Credit: 2

Rationale : Workshop practice is an important work related to the direct hands-on experiences of learners which are useful for application of engineering and technology. All engineering / technological activities demand more of such workshop practices of different kinds which are vital for the on-going processes of various manufacturing industries.

Aim : To develop abilities for different skills through direct hands-on-experiences of learners, related to various works on (a) Carpentry (b) Fittings (c) Smithy (d) Forging (e) Painting.

UNIT TOPIC / SUB-TOPIC

Hrs. Total hrs.

1.0.0 Carpentry Shop

20

1.1.0 Shop Talk

1.1.1 Introduction

1.1.2 Safety precautions

1.1.3 Classification of wood

1.1.4 Grain of wood

1.1.5 Carpentry tools and their uses.

Marking tools : pencil, scratch awl, short-blade knife, marking gauge

Measuring tools : bench rule, steel tape, try square, combination square, protractor.

Cutting tools : handsaw, chisel (firmer, dovetail, mortise,) jack plane, files (half round and flat), hand drill, borer

Working Tables & Vices, mallei, hammer nails, screws, screw driver.

1.1.6 Methods of marking

1.1.7 Carpentry joints :

Butt joint with nail (for making box)

Dado joint (for making shelves etc.)

Lap joint (for frames, legs etc.)

Mortise & Tenon joint (chair, table etc.)
Dovetail joint (for drawer, box, furniture corner)

1.2.0 Practice

- 1.2.1 Marking, sawing, planing, squaring, filing, chiseling, nailing
- 1.2.2 Making of lap joint
- 1.2.3 Making a through Mortise and Tenon joint
- 1.2.4 Making of Dovetail joint

1.3.0 Test and Viva Voce

- Identify soft and hard wood
- List the common shapes and sizes of timber
- Select and use proper marking and measuring tools for a job
- Use of holding tool for a job
- Use of planing tool for a job.
- Select proper cutting tools for a job.
- Select and use proper drilling and boring tools.
- Select proper joints for various furniture/jobs
- Perform marking for various joints
- Make any joint following proper steps.

2.0.0 Fitting Shop

(Chipping, Sawing, Filing, Drilling, Fitting etc.)

20

2.1.0 Shop Talk

- 2.1.1 Introduction and its importance
- 2.1.2 Safety procedures
- 2.1.3 Common marking equipment and tools and their uses : scale, marking gauge, try-square, callipers (outside and inside), spring divider, surface plate, V-block, centre punch.
- 2.1.4 Fitting shop tools and equipment - Their uses & specifications : files, hack-saw and blades, chisels, hammer, bench vice.
- 2.1.5 Hand Drill, machine drill; different drill bits; coolants Description, uses and specification
- 2.1.6 Common engineering materials like cast iron, cast steel mild steel and high carbon steel - how to identify them
- 2.1.7 Introduction to other common metals and alloys like copper, brass/gunmetal, aluminium and its alloys, stainless steel etc.
- 2.1.8 Familiarization with various forms and shapes of materials like sheet, plate, bars (round, square), flats, wires, angle, channel, beam, tubes, pipes, hollow-section, extruded sections, casting, forging, machined components etc.

2.2.0 Practice :

- 2.2.1 Marking, Sawing, Chipping, Filing and Fitting
- 2.2.2 Marking-Drilling, Countersinking
- 2.2.3 Making a key way and key.
 - Identify proper raw material for doing a job
 - Select and use proper holding tools for doing a job
 - Select and use proper marking and measuring tools for doing a job.
 - Select and use proper cutting tools for doing a job
 - Select and use proper finishing tools for doing a job.Perform basic operations - marking, sawing, chipping, filing, drilling.
 - Perform a job according to the specification.

3.0.0 Smithy Shop

3.1.0 Shop Talk

- 3.1.1 Introduction to Black Smithy and Forging, difference between Black Smithy and Forging shop work.

- 3.1.2 Safety precautions
- 3.1.3 Common tools and equipment-description and uses : Anvil, swage block, sledge hammer, tong (different types), fullers, flatter, swage tools, hot and cold chisels.
- 3.1.4 Smithy Hearth, different parts of hearth and their functions, controlling air and fuel, method of lighting a hearth.
- 3.1.4 Colours of steel at different temperatures.
- 3.1.5 Operations like drawing, upsetting, fullering, flatter, swaging, bending, twisting, cutting.

3.2.0 Practice

- 3.2.1 Heating job in a hearth
- 3.2.2 Drawing down of a mild steel rod to square shape and then to an octagonal shape
- 3.2.3 Upsetting & flattening of a M. S. rod to a hexagonal / square bolt.
- 3.2.4 Bending of a rod to ring shape of required size
 - Select and use proper tools and equipment for black smithy job
 - Heat up a job in a smith's hearth
 - Perform the basic forging operations — drawing, upsetting, swaging, bending, cutting
 - Perform a job according to the specification.

3.3.0 Test and Viva Voce

REFERENCE BOOKS :

1. BS S. Raghuwanshi : A Course in Workshop Technology Vol. I & II - Dhanpat Rai & Sons
2. J. Schofield : Workshop Processes and Materials Vol. I & II - Blackie & Son Lid.
3. H. W. Recce : Engineering Workshop Experiments — B. I. Publications , Bombay 1, India.
4. R. L. Timings : Basic Engineering Craft Course (Mechanical) — Longman.
5. R. L. Timings : Basic Mechanical Engineering - Longman
6. W.A.J. Chapman : Workshop Technology Part I, II & III - The English Language Book Society
7. James Anderson, Ear. E. Tatro : Shop Theory - Tata McGraw Hill Publishing Co. Ltd.
8. Reddy, Narayana & Kannaiah : Manual on Workshop Practice - Macmillan India Ltd.
9. Central Instructional Media Institute (CIMI): Fitter 2nd year : Trade Theory & Trade Practical - Wiley Eastern Ltd.

WORKSHOP PRACTICE - II

L T P
0 0 4

Curri. Ref. No. 204

Total Contact hrs.: 60

Total marks: 50

Practical

Theory: Nil

• End Term Exam: 0

Practical : 60

I.A.: 50

Prerequisite: Workshop Practice -1

Credit: 2

UNIT TOPIC / SUB-TOPIC

Hrs. Total hrs.
20

1.0.0 Carpentry and Painting Shop

1.1.0 Shop Talk

1.1.1 Common defects and diseases of limber, its protection and preservation, seasoning (normal and artificial) of timber.

1.1.2 Measurement of Timber-scant and plank - selection of timber for various works and estimation of materials required for a job.

1.1.3 Common wood working machines and their uses.

- Band saw
- Circular saw
- Thickness planer
- Jig saw
- Drill Press
- Wood turning lathe
- Grinder
- Universal wood working machine

1.1.4 Wood finishing, varnishing and painting

1.1.5 Metal surface painting (new and old surfaces)

1.1.6 Spray painting for wooden and metal surface.

1.2.0 Practice

1.2.1 Making of a small item, preferably using one or two joints already learned. (tea/file tray, book stand, electric switch board or meter stand, test tube stand, photo frame etc.)

- Describe common defects and diseases of limber, its protection and preservation and seasoning of limber.
- Select proper timber for a particular work and estimate the materials required for a job.
- Demonstrate the use of the following tools and equipment
 - Hand saw, circular saw, jig saw
 - Thickness planer
 - Wood working lathe, grinder, universal wood working machine.
- Demonstrate the following operations
 - finishing, varnishing and painting
 - metal surface cleaning before painting
 - metal surface painting
 - spray painting of wooden and metal surface
- Make the following items according to specification.
 - Tea/File tray
 - Bookstand
 - Electric switch board or Meter stand
 - Test tube stand
 - Photo frame.

2.0.0 Fitting Shop

20

2.1.0 Shop Talk

2.1.1 Taps and dies - method of external and internal thread cutting

2.1.2 Use of pipe thread die and die holders

2.1.3 Use of reamer, scraper

2.1.4 Vernier scale; use of micrometer; vernier calliper; least count.

2.1.5 Bolts, nuts, studs, screws — their specifications; tap size drill; use of spanners; slide wrench; screw driver; alien wrench; pipe wrench.

2.1.6 Height gauge, Depth gauge, Thread (pitch) gauge-use and specification

2.1.5 Inspection method.

2.2.0 Practice

2.2.1 Marking, filing and fitting (final measurement to be taken by micrometer and vernier callipers.)

2.2.2 Drilling, tapping on a plate and thread cutting by die on a rod of proper diameter.

2.2.3 Drill bit grinding practice

2.3.0 Test and Viva Voce

- Demonstrate the use of following tools
 - Taps and dies
 - Reamer and scraper
- Use and write specification of the following measuring tools
 - Micrometer
 - Vernier callipers
 - Height Gauge
 - Depth Gauge
 - Thread (screw pitch) Gauge
- Perform the following operations
 - Marking
 - Drilling
 - Tapping
 - Filing
 - Fitting
 - Pipe thread cutting.

3.0.0 Forging & Tin Smithy

20

3.1.0 Shop Talk

3.1.1 Forging temperature of different steels

3.1.2 Heat treatment and tempering of steel forging

3.1.3 Introduction to tin smithy; safety precautions

3.1.6 Common tin smithy tools & Equipment — description and uses :

Steel rule, dot punch, snips (hand shears), hammers, bench shear, press-break.

3.1.5 Sheet metal joints, rivet joints, screws

3.1.6 Brazing

3.1.7 Soldering.

3.2.0 Practice

3.2.1 Make a cold chisel from a carbon steel bar; harden and temper the cutting edge.

3.2.2 Bend a mild steel rod to ring shape of required size

3.2.2 Make a square top open tin box following proper sequence of operations :

- (i) draw layout
- (ii) cut strip from sheet
- (iii) bend to form box shape
- (iv) fold edges to form box
- (v) make bottom piece
- (vi) braze box and bottom

3.2.4 Join two steel strips by rivetting.

- Demonstrate the following operations

- Heat treatment of forging
- Bending, swaging and punching
- Forge welding
- Soldering; brazing
- Riveting
- Make the following items
 - Octagonal Chisel
 - Screw driver
 - Tin box
 - Metal ring.

3.3.0 VivaVoce

REFERENCE BOOKS : I refer list given under Workshop Practice -1 also].

1. R. S. Khurmi: A Text Book of Workshop Technology
2. Hazra and Chowdhuri : Elements of workshop Technology Vol. I and II, Media Promoters and publishers Pvt. Ltd.
3. Serope Kalpakjian : Manufacturing Engineering and Technology Addison - Wisley Publishing Company.
4. B. H. Amstead, Philip F. Oswid, Myrond Begcman : Manufacturing Processes- John Wiley and Sons.

ENGINEERING MECHANICS

L *T* *P*
3 0 0

Curri. Ref. No. 205

Total Contact hrs.: 45

Total marks: 100

Theory:

Theory: 45

End Term Exam: 70

Pre requisite: Nil

I.A.: 30

Credit: 3

Practical: Nil

Rationale: The subject of Engineering mechanics deals with the static and dynamic behaviour of rigid bodies under the action of forces. In most of the engineering applications of all disciplines the material bodies are subjected to various forces. To understand the behaviour of such bodies, knowledge and use of engineering mechanics is essential.

Aim: To develop basic concepts and working principles of mechanics applied to engineering problems dealing mainly with statics and dynamics of materials under the action of mechanical forces.

UNIT TOPIC / SUB-TOPIC

Hrs. Total hrs.

1.0 Introduction

2

1.1 Concept of Engineering Mechanics

- Define engineering mechanics, statics, dynamics (kinetics).
- Identify applications of engineering mechanics in practical fields.

1.2 Units of measurement

- Define basic units and derived units
- Define different systems of units (FPS, CGS, MKS, SI)
- Convert unit of measurement from one system of unit to another for density, force, pressure, work, power, velocity, acceleration.

2.0 System of Forces

12

2.1 Concept and definition of force; Effects of a force; Graphical (vector) representation of a force; Principle of physical independence of forces; Principle of transmissibility of forces; System of forces.

- Define force
- State the effects of a force
- Represent forces graphically
- State the principle of independence of forces
- State the principle of transmissibility of forces
- Explain the terms with illustration :
Co-planer forces, Collinear forces, Concurrent forces, Co-planer concurrent forces, Non co-planer concurrent forces, Non co-planer non-concurrent forces.

2.2 Composition and resolution of co-planer concurrent forces

2.2.1 Resultant force; Composition of forces; Parallelogram law of forces; Resolution of forces.

- State Parallelogram law of forces
- Write the expressions for magnitude and direction of resultant for using Parallelogram law of forces
- Solve simple problems using Parallelogram law of forces
- State the principle of resolution of forces.
- Write the expressions of resultant force and its direction using principle of resolution
- Solve simple problems using the principle of resolution of forces.

2.2.2 General Laws for resultant force

- Triangle law of forces, Polygon law of forces.

- State Triangle Law of Forces
- State Polygon Law of Forces
- Determine the resultant of two forces using Triangle Law of Forces.
- Determine the resultant of more than two forces using Polygon Law of Forces.

Forces.

2.2.3 Graphical (vector) method for the Resultant Force - Position diagram, Bow's notation, force diagram.

- Draw position diagram showing various forces using Bow's notation.
- Draw the forces (vector) diagram

2.3 Concept of moment; Moment of a force; Graphical representation; Units of moment; Varignon's Principle; Position of resultant force by moments; Application of moments in simple lever.

- Define moment of a force, with its expression and units
- Represent graphically the moment
- State Varignon's principle of moments
- Find the position of resultant force by moments
—simple examples

2.4 Co-planer non-concurrent Parallel Forces - Resultant force of two like parallel forces and unlike parallel forces; Graphical method for the resultant of parallel forces; Couple of a couple; Moment of a couple; Resultant of co-planer couples.

- Identify application of parallel forces in practical life
- Distinguish between like parallel and unlike parallel forces

- Determine magnitude and position of resultant force analytically and graphically
- Solve simple problems in parallel forces.
- Define couple, arm of a couple and moment of a couple
- Solve simple problems on couple.

2.5 Equilibrium of co-planer concurrent Forces

- Principle of equilibrium; Lami's theorem for the equilibrium of co-planer forces acting on a particle; Application of graphical methods for the equilibrium of forces; free body diagram.
- Identify practical examples of system of forces in equilibrium
- Define two force principle, three force principle and four force Principle of equilibrium.
- Determine an unknown force when a number of co-planer forces are in equilibrium using graphical methods (Converse of the Law of Triangle of Forces and converse of the Law of Polygon of forces).
- Solve simple problems on the equilibrium of a body when number of co-planer forces are acting on it.
- Determine forces in a body under equilibrium by free body diagram.

3.0 Centre of Gravity

Concept and definition of C. G. and centroid; C.G. by moments; Centre of gravity of plane figures; Centre of gravity of symmetrical solid bodies (No deduction of formula is necessary).

- Define centroid, and centre of gravity.
- Determine centre of gravity of plane and composite figures using graphical and moment method.
- Determine the centre of gravity of solid bodies (parallelepiped, cone, cylinder, sphere, Hemisphere)

4.0 Friction

4.1 Definition of friction, types of friction - static friction, dynamic friction, sliding friction, rolling friction.

- Define friction
- State different types of friction with examples

4.2 Laws of friction :-

Laws of static friction, co-efficient of friction, angle of friction.

- State laws of static friction
- Write the expressions relating coefficient of friction, friction force and other forces.
- Solve simple problems on friction.

4.3 Equilibrium of a body lying on a rough horizontal plane; equilibrium of a body lying on a rough inclined plane; friction in screw jack; various mechanical devices which utilises friction (belt & pulley drive, brake, vice etc.)

- Calculate the minimum force required to maintain equilibrium of a body on a rough inclined plane subjected to a force acting
 - a) along inclined plane
 - b) horizontally
 - c) at some angle with the inclined plane
- Write the relation between effort and weight
 - a) lifted by a screw jack
 - b) lowered by a screw jack
- Determine the efficiency of screw jack
- Determine the relation between the tensions on tight side and slack side of a belt drive in terms of co-efficient of friction.

(Solve problems, Assignment and class test)

5. Simple Machines

10

5.1 Definition of a machine; types of simple machine; Mechanical advantage; velocity ratio; efficiency; relation between efficiency; mechanical advantage and velocity ratio; frictional loss; law of a machine.

- Define simple machine
- Explain with example the term mechanical advantage
- Write expression for velocity ratio
- Define efficiency
- Give the expression relating efficiency, mechanical advantage and velocity ratio.
- Give the expression for the effort lost in friction.
- State the law of a machine.

5.2 System of pulleys - First system of pulleys, second system of pulleys, third system of pulleys.

- Explain the principle of first system of pulley.
- Explain the principle of second system of pulley
- Explain the principle of third system of pulley

5.3 Working principle and applications of machines wheel and axle; differential pulley; Simple screw jack;

- Explain the working principle and give expression for velocity ratio of simple machines as mentioned below :
 - Wheel and axle
 - differential pulley block
 - Simple screw jack
 - Worm and worm wheel
- Write the field of applications of the above machines.

(Solve problems, Assignment and class test)

6.0 Rectilinear Motion

6

6.1 Motion under uniform acceleration ($S = ut + \frac{1}{2} at^2$); relative velocity

- Solve simple problems

6.2 D'Alembert's principle-application in single and connected bodies on horizontal plane, inclined plane and pulley system (with and without friction).

- State D' Alembert's principle
- Apply D' Alemberts principle to solve simple problems on connected bodies in horizontal plane and pulley systems.

(Solve problems, Assignment and class test)

7. Curvilinear motion

8

7.1 Definitions - Projectile, trajectory, angle of projection, range, time of flight.

7.2 Equation for the path of a projectile; Velocity and direction of motion of a projectile after a given time has elapsed; Velocity and direction of motion of projectile at a given height; Greatest height attained by a projectile and the time to reach the greatest height

- Solve simple problems on projectiles
- Establish by experiment angle of projection for maximum range

7.3 Motion of Rotation Angular displacement; Angular velocity; Angular acceleration; Relation between angular velocity and linear velocity in circular motion; Centrifugal / centripetal force in circular motion.

- Define the terms - angular displacement, angular velocity, angular acceleration, centrifugal force, centripetal force.
- Write the expression relating angular velocity and linear velocity when a particle is moving in a circular path.
- Write the expressions for centrifugal force and centripetal force.
- Solve simple problems
- Design experiment to visualize centrifugal force

(Solve problems, Assignment and class test)

REFERENCE BOOKS:

1. Dr. R. K. Bansai : Engineering Mechanics and Strength of Materials - Laxmi Publications.
2. R. K. Khurni : A Text Book of Engineering Mechanics (Applied Mechanics) - S. Chand & Co. Ltd.
3. M. M. Malhotra, R. Subramanian, P. S. Gahlot, B. S. Rathorc : Text Book in Applied Mechanics -- Wiley Eastern Ltd.
4. S. S. Bhavikatti, K. G. Rajashekarappa : Engineering Mechanics Wilcy Eastern Lt.
5. S. Ramamrutham : Engineering Mechanics & Strength of Materials
• Dhanpat Rai Publishing Co. (P) Ltd.
6. A. B. Basil: Engineering Mechanics - Tata McGraw Hill Publishing Co. Ltd.
7. V. S. Mokashi: Engineering Mechanics Vol. I & II - Tata M Graw Hill Publishing Co. Lt.
8. S. P. Timoshenko, D.H. Young : Elements of Strength of Materials - Affiliated East
–
West Press Pvt. Ltd.
9. William A. Nash: Schaum's Outline Series- Theory and Problems of Strength of Materials - McGraw Hill Book Company.

INTRODUCTION TO INFORMATION TECHNOLOGY

L T P
ToraY Contact hrs.: 75

Theory: 30
Practical: 45

Pre requisite: NIL

Credit: 4

Total marks: 100

End Tenn Exam: 50

Practical:

End Term Exam: 25
I.A:25

Curri. Ref. No. 206

Theory:

THEORY: 30 Hours

UNIT TOPIC/SUB-TOPIC

hrs.

Hrs. Total

UNIT TOPIC/SUB-TOPIC	Hrs.	Total
1. Introduction to IT - its components computer, communication & management	03	
2. Introductory ideas about die components of computer - Hardware - Central Processing Unit, Input Unit, Output Unit, Memory Unit, Auxiliary Unit Peripherals - Monitor, Keyboard, Mouse, Printer, Hard disk, Floppy disk, CD ROM ' Software and firmware building blocks of a computer, its function and its use. Role of operating system.	08	
3. Principles of communication, Analog communication; digital	06	

	communication, advantages of digital communication over analog one. Computer communication interface, introductory concepts of networking, use of Modem, Internet & intranet.	
4.	Classification of software - System Software, Application Software Translator - Compiler, Interpreter, Preprocessor Operating System - Single User, Multiple User Windows 95/98/2000 - Definition of Windows, Windows element. Concept of Graphical user Interface, Concept of Icon, Working with File Management	03
	Concept of GUI based software; concept of client & server, concept of www, Internet services, use of standard browsers, basics of HTML and searching.	06
5.	Overview of Network, Transmission media, Concept of LAN, WAN, Internet	04

PRACTICAL :45 Hours

UNIT TOPIC/SUB-TOPIC	Hrs.	Total
1.	Introduction to MS Office Basic features of Ms Office, Overview of Different Office Tools	01
2.	Introduction to MS Word Creating and Editing document, Formatting Documents, Working with Tables, Spell checking, Mail Merges, Importing Graphics into word Document	18
3.	Introduction to MS Excel Creating a New Work Book, Entering Labels, Values and Formulas, formatting the layout. Working with Functions, Creating die Chart from data, writing macros	12
4.	Introduction to Power Point Creating a Presentation, Adding/Editing Text, Working with objects, Formatting die Presentation, Placing die chart in slide, Slide Show and Printing	07
5.	Introducdon to MS Access Creation of database Creation of tables - Field Declaration, Data type Declaration, Constraint Declaration. Working with records, Querying the database, Joining Tables, Designing die Form, Creating the report	07

ENGINEERING ECONOMICS AND ACCOUNTANCY

L T P
3 0 0

Total Contact hrs.: 45

Total marks: 100

Theory: 100

Theory: 45

End Term Exam: 70

Practical: 0

I.A.: 30

Prerequisite: Nil

Practical: Nil

Credit: 3

Rationale : The knowledge of Economics and Accountancy is needed by personal dealing with the cost of products of any kind related to quality and standards of production including its financial control. Engineers in general, need to know the cost of the final products for marketing purposes. The knowledge of Economics as well as Accountancy is required by all people dealing in any business or enterprise.

AIM : This particular subjects deals in basic concepts of economics, production of materials, different types of industries, market forms, objective of economic planning, concept of value of money, causes of unemployment, industrial policy, business transaction and accountancy, maintenance of cash and balances, receives and expenditures and final accounts.

UNIT TOPIC / SUB-TOPIC	Hrs. Total hrs.
1.0 INTRODUCTION	
1.1 Introduction to Economics and its Utility of study	1
1.2 Importance of the study of Economics	
2.0 BASIC CONCEPTS OF ECONOMICS	3
2.1 Definition of Utility, Consumption, Want, Value, Price, Goods, National Income.	
2.2 Classification of goods, characteristics and classification of wealth.	
2.3 Basic Laws of demand and supply.	
2.4 Concept and Measurement of Elasticity of demand	
3.0 PRODUCTION	
3.1 Meaning and factors of production.	
3.2 Land, Labour, Capital and Organisation	
3.3 Formation of Capital, Break even chart-its uses.	
4.0 SCALE OF INDUSTRIES	
4.1 Definition, advantages and disadvantages of small, medium and large scale production	
4.2 Internal and External Economics	
5.0 MARKET FORMS	
5.1 Definition and types of Markets in respect of present trends.	
5.2 Features of Perfect, Imperfect and monopoly markets.	
5.3 Price determination under perfect competition and monopoly	
6.0 ECONOMIC PLANNING	
6.1 Features of Under-developed and Developing Countries.	
6.2 Meaning, objectives and needs of planning.	
6.1 Introduction to industrial development in India during the five year plans.	
7.0 MONEY	
7.1 Meaning and function of Money	
7.2 Introduction to the concept of the value of money	
7.3 Meaning of Inflation, Deflation, Stagnation.	
8.0 UNEMPLOYMENT	
8.1 Meaning, types and causes of Unemployment	
8.2 Unemployment problems in India	
9.0 INDUSTRIAL POLICY	
9.1 Current Industrial Policy	
9.2 Industrial licensing Policy, De-licensing	
9.3 Monopoly Restricted Trade practices (MRTP) Foreign Exchange Regulation Act (FERA).	
10. BUSINESS TRANSACTIONS AND ACCOUNTANCY	
10.1 Transactions and classifications, need and objectives of proper records including double entry system.	
10.2 Classification of Accounts and its description (in respect of real accounts, personal accounts and nominal accounts)	
10.3 Debit and credit concept; golden rules of debit and credit.	
10.4 Objectives and principles of double entry book-keeping.	
11.0 BOOKS OF ACCOUNT	
11.1 Journal and Ledger, their sub-divisions; posting from journals to ledger.	
11.2 Balancing of Accounts	

12.0 CASH BOOK

- 12.1 Objective of Cash Book (in respect of all kinds of Cash transactions)
- 12.2 Single column, double column and triple column cash
- 12.3 Impress system of Petty Cash Book.

13.0 TRIAL BALANCE

- 13.1 Objective, Preparation errors and rectification (in respect of balance of accounts for the total period).

14.0 FINAL ACCOUNTS

- 14.1 Steps of preparing accounts; Trading Accounts; Profit and Loss Accounts
- 14.2 Revenue and Depreciation adjustment
- 14.2 Introduction to balance sheet

15.0 CAPITAL AND REVENUE EXPENDITURE DISTRIBUTION

- 15.1 Receipt and payments
- 15.2 Income and Expenditure differences

16.0 MEANING AND PURPOSE OF COSTING

- 16.1 Elements of Cost-Analysis and classification of expenditure for cost accounts.
- 6.2 Cost Control - Prime cost, Overhead cost, and Indirect materials and tools.

ELEMENTS OF MANAGEMENT AND INDUSTRIAL LEGISLATION

L T P
3 0 0

Curri. Ref. No. 302

Total Contact Hrs.: 45

Total Marks : 100

Theory : 100

Theory: 45

End Term Exam: 70

Practical : 0

I.A : 30

Prerequisite: Nil

Practical : Nil

Credit : 3

Rationale : Engineering & technology is basically (or production of goods and services for consumption by and benefit of humanity. Majority of such products are produced in industry, which are called industrial products. Right mix of resources (material, men, machines and capital) and technology is essential for manufacturing industrial goods and services. However, another important and essential input is "management". A manager or a group of managers co-ordinates and directs various functions within an industry/organisation which makes it possible to continue to operate and produce desirable goods in a sustained basis. All engineers at all levels have to perform managerial roles in their spheres of activities. It is therefore essential that the diploma engineers are given an exposure of elementary course of management theories and practices.

As workmen are one of the most important factors of any industry, and being a part of humankind for whose benefit industries are run, various statutory rules, acts and regulations have been instituted in India by Central / State governments to ensure that the workmen are not exploited and they can earn their livelihood with respect. As a manager has to work in an industry under binding of such acts and rules, it is essential for them to have a good idea about these acts and rules.

Aim : A fresh diploma engineer will be acquainted with the basic concepts of management theories, concept and idea of business organisation, organisation structures, basic principles of industrial psychology, personnel management and industrial pollution. He should also have some idea of important industrial legislations.

UNIT TOPIC / SUB-TOPIC

Hrs. Total hrs

1.0 Basic Concepts

12

1.1 Definition and concept of industry, industrial business, management; functions of management.

1.2 Scientific management of Taylor and Gilbreth; management concepts by Henry Fayol and Elton Mayo; modern management Theories — decision theory, quantitative management (OR) etc.

1.3 Definition and concept of organisation; organisation chart - their merits and limitations; line, staff and line & staff organisations; functions of different departments of a manufacturing organisation.

1.4 Types of business organisations (or industrial ownership)- proprietorship, partnership, joint stock (private and public limited) companies, co-operatives, public undertaking - definition, merits and demerits with examples.

- State functions of management
- Identify major attributes of scientific management
- Identify major attributes of Henry Fayol's management theory.
- State highlight point of Eton Mayo's views
- Understand purpose of an organisation structure in a business organisation.

- Draw organisation chart for a
 - (i) line and staff organisation
 - (ii) manufacturing organisation
 - (iii) consulting firm
 - (iv) marketing department of a multi product company.

2.0 Industrial Psychology :

2.1 Definition, scope and objective of industrial psychology

2.2 Organisational behaviour : individual and group; individual differences in behaviour; interpersonal behaviour; group dynamics; theory X and Y.

2.3 Definition and concept of morale and motivation; factors affecting morale and motivation.

- List different "individual variables".
- Give examples of formal and informal groups
- Compare between individual behaviour and group behaviour
- Explain theory X and theory Y.

3.0 Personnel Management

3.1 Definition and concept of personnel management; aims and functions of personnel department; principles of good personnel policy.

3.2 Recruitment and selection of employees; selection process; training needs; methods of training/ induction and on-job training.

3.3 Safety in industry; industrial accident; cost of accident; causes of accident; safety equipment; safety programmes; First aid practice

3.4 Definition and meaning of wage, fair wage, incentive, direct and indirect incentive; objectives of incentive schemes; different incentive schemes like straight piece-rate, straight piece-rate with guaranteed minimum wage, differential piece rate etc. profit sharing.

- Explain functions of personnel department
- Define good personnel policy
- Identify different steps of a selection process
- Distinguish between achievement, test and aptitude test
- Explain need of training
- Give examples of indirect costs of an accident
- List contents of a normal first-aid box.
- Identify a few non-financial incentive
- Represent graphically and explain different incentive schemes.

4.0 Concept of ecology and environment;

Factors causing pollution; pollution (air, water, solid waste, noise) caused by industry and their control.

- Distinguish between ecology and environment
- Correlate pollution with population growth
- Demonstrate air pollution by a few simple observations
- Understand various agents for air pollution and their sources

- Explain working principle of air pollution control devices
- Identify agents and their sources for water pollution
- Understand methods of water pollution control
- Describe solid waste handling methods
- Understand noise control measures.

5.0 Industrial Legislation

5.1 Factories Act, 1948 : object and scope; license and registration of factories; inspector; health, safety welfare and working hour provisions; working hours, weekly holidays, overtime and annual leave with wages; employment of women and young persons; special provisions of dangerous operations, accidents and diseases; penalties and obligations of workers.

5.2 The Industrial Dispute Act, 1947 : definition and meaning of industrial dispute, average pay, lay-off, lock-out, retrenchment, strike, settlement; machinery/authorities for settlement of industrial disputes.

5.3 Other social security and welfare legislation : main features of - minimum wages Act-1948, workmen compensation Act-1923, employee's state insurance (ESI) Act-1923, employee's state insurance (ESI) Act-1948, provident fund Act-1952, payment of bonus Act 1965, Maternity benefit Act 1961.

- Explain importance of industrial legislation
- State various provisions of factories Act, 1948
- Understand main features of various welfare legislations
- Distinguish between legal and illegal stoppage of work
- Understand functions of different authorities for settlement of industrial disputes.

REFERENCE BOOKS :

1. B. Kumar : Industrial Engineering - Khanna Publishers
2. O. P. Khanna : Industrial Engineering and Management - Dhanpat Rai & Sons
3. Tara Chand : Industrial Organisation & Management
4. C. R. Basu : Organisation and Management
5. S. C. Jain and H. S. Bawa : Industrial Management - Khanna Publishers.

ENTREPRENEURSHIP DEVELOPMENT

L T P

Total Contact hrs.: 45

Theory: 45

Practical: 0

Prerequisite: Nil

Credit: 3

Curri. Ref. No.303

Total marks: 100

Theory: 100

End Term Exam: 70

I.A.: 30

Practical: Nil

Rationale : The course intends to provide the fundamental aspects of entrepreneurship as a means for self employment and culminating in economic development of the country. It deals with basic issues like entrepreneurial characteristics and quality, governmental policy support and overall scenario along with opportunities and the facilities available for entrepreneurship development.

Aim : The course is meant for giving an awareness for entrepreneurship as it is an alternative to employment in the present days. This course covers the meaning and function of entrepreneur, different forms of business organisation and also small scale and ancillary industries where an entrepreneur may venture. Market survey, sales promotions and public relations are focused in the course. Project report is an important part of starting an entrepreneurship and is also included in the course.

UNIT TOPIC / SUB-TOPIC hrs.	Hrs.	Total
1.0 ENTREPRENEURSHIP	10	
1.1 Definition and function of Entrepreneur, entrepreneurship quality, entrepreneurial spirit, need for entrepreneurship.		
1.2 Individual and social aspects of business		
1.3 Social responsibilities of Entrepreneurs		
2.0 FORMS OF BUSINESS ORGANISATION	4	
2.1 Types of company - Pvt. Limited and Public Limited with definition, comparison etc. - Share and its types.		
2.2 Single entrepreneurship, partnership		
2.3 Joint stock company, companies Act		
2.4 Co-operative (Main features)		
2.5 Merits and demerits of single entrepreneurship, Partnership, Co-operative business, Joint stock companies.		
2.6 Registration of small scale industries, conglomerates.		
3.0 SMALL SCALE AND ANCILLARY INDUSTRIES	6	
3.1 Definition — scope with, special reference to self employment.		
3.2 Procedure to start small scale and Ancillary industries		
3.3 Pattern on which the Scheme/Project may be prepared		
3.4 Sources of finance Bank, govt., and other financial institutions.		
3.5 Selection of site for factory		
3.6 Facilities available : Infra structure, human resource, Govt. support, availability of raw materials, market,		
3.7 Facilities available in backward areas, industrial estates, ancillary industries and scope.		
3.8 N.O.C. from different authorities, e.g., Pollution Control Board, Factories Directorate etc.		
3.9 Trade License.		
4.0 SYSTEM OF DISTRIBUTION		
4.1 Wholesale Trade		
4.2 Retail trade		
5.0 SALES ORGANISATION		
5.1 Market survey, marketing trends, knowledge of competitors, product selection & its basis .		
5.2 Sales promotion		
5.3 Advertisement		
5.4 Public relations and selling skills		
6.0 PRICING THE PRODUCT		
6.1 Basic guidelines		
7.0 INTRODUCTION TO IMPORT AND EXPORT		
7.1 Procedures for export		
7.2 Procedures for import		
7.3 Technical collaboration — international trade		
7.4 Business insurance		
7.5 Rail and road transport		
7.6 Forwarding formalities, FOF, FOB, CIF, etc.		
8.0 BUSINESS ENQUIRIES		
8.1 Enquiries : From SISI, DIC, SFC Dept. of Industrial Development Banks.		
8.2 Offers and Quotations		
8.3 Orders		
9.0 PROJECT REPORT	4	

9.1 Project Report on feasibility studies for small scale industries, proposal for finances from bank and other financial institutions for establishing new industries and its extension, obtaining License enlistment as suppliers, different vetting organizations for Techno Economic feasibility report.

Project Report on feasibility studies for small scale industries, proposal for nuances from bank and other financial institutions for establishing new industries and its establishment obtaining licenses, enlistment as suppliers, different vetting organizations for Techno Economic feasibility report.

Breakeven analysis. Breakeven point.

10.0 ENVIRONMENT LEGISLATION 2

10.1 Air Pollution Act

10.2 Water Pollution Act

10.3 Smoke Nuisance Control Act

11.0 PRINCIPLES OF TQM, ISO 9000 3

(CONCEPTS AND PRINCIPLES)

12.0 VISIT TO INDUSTRIES 4

REFERENCE BOOKS :

1. Entrepreneurship Development Prepared by CTSC Manila Publishers by Tata McGraw Hill Publishing Co. Ltd.
2. Small Enterprise Management Published by ISTE, Mysore
3. Motivation Published by ISTE, Mysore
4. S.S.M. in Environmental Engineering Published by ISTE, Mysore
5. Entrepreneurship New Venture Creations, Holt, Prentice Hall, India.
6. A Handbook of Entrepreneurship edited by B.S. Rathore and J.S. Saini Published by Aapga Publications.
7. Essence of TQM by John Bank

ELEMENTS OF ELECTRONICS

L T P
3 0 0

Curri. Ref. No. 304

Total Contact hrs.: 45

Total marks: 100

Theory: 100

Theory: 45

End Term Exam: 70

Practical: 0

I.A.: 30

Prerequisite: Engineering

Practical: Nil

Science --1 & Engineering

Science - II

Credit: 3

Rationale : The application of Electronic circuits is widespread in all sphere of Engineering. Even knowledge of this subject become essential in Mechanical Engineering also. The basic knowledge of semiconductor physics working principles of diode,

transistors. FET and power control devices have been included in this subject. The block diagram study of the systems are to be described in this subject instead of going in detail

Aim : To acquire knowledge on

- (a) Semiconductor properly
- (b) Characteristics of diode, transistors, FET
- (c) Working principles of sequential and logic circuits
- (d) Working principles and application of Power Electronics devices
- (e) Characteristics and applications of transducers.

UNIT TOPIC / SUB-TOPIC	Hrs.	Total hrs,
1. SEMICONDUCTORS	3	
1.1 To define		
(a) Electrons and holes in semiconductor		
(b) To define : acceptor, band gap, bias, charge carrier compensations, conduction band, conductivity, conductivity type, depletion region, band, dopant, extrinsic conduction holes, intrinsic conduction, majority carrier, minority carrier, mobility, pin junction, receptivity valence band.		
1.2 To explain electrical conductivity		
1.3 To explain the pn-junction diode		
2.0 DIODE	3	
2.1 To Explain the function and characteristics curve of junctions diodes.		
2.2 To describe the current voltage plot of ideal diode		
2.3 To describe the		
(a) rectifying action of diode		
(b) characteristics of Schottky diode (c) Zener diode		
(d) band gap reference diode		
(e) light emitting diode		
2.4 To describe the application of diode as		
(a) full wave rectifier (b) clipping and clamping voltage limitation (c) DC restoration (d) voltage multiplier (e) Logarithmic conversions.		
3.0 TRANSISTORS	6	
3.1 To define the principle of operation of the Bipolar junction transfer		
3.2 To describe characteristics of the common emitter Amplifier		
3.3 To explain the biasing of the transistor, draw load line and set Q-point.		
3.4 To draw small signal equivalent circuit		
3.5 To explain (a) voltage divider bias circuit		
3.6 To describe (a) low frequency response		
(b) high frequency response of common emitter amplifier		
(c) the function of Transistor switches		
(d) specification of transistor.		
4.0 FIELD EFFECT TRANSISTOR		
To describe the (a) structure of a Field Effect Transistor		
(b) the structure of the Junction Field Effect Transistor (JFET)		
(c) Characteristics of an n-channel JFET (d) Biasing the JFET		
(e) equivalent circuit of JFET (f) the practical FET amplifier		
(g) low frequency and high frequency response of JFET		
(h) specification of FET'S		
5.0 VOLTAGE REGULATORS AND OTHER MISCELLANEOUS CIRCUITS		
5.1 To describe the functions of voltage regulator chips		
of IC 7809, 7909, LM 317, LM 337		
5.2 To describe the functions of ADC and DAC chips		
6.0 POWER AMPLIFIER		

- 6.1 To define and describe the following
 - (a) Class A Amplifier (b) Class B Amplifier
 - (c) Class-C Amplifier (d) Class D Amplifier

6.2 State the applications of the above

7.0 POWER SUPPLIES

7.1 To describe the circuit of a unregulated power supply

7.2 To describe the circuit and working principle of switch made power supplies (Block diagram)

8.0 POWER ELECTRONICS 4

8.1 To describe (a) the circuit and working principle of three phase bridge rectifier

8.2 To describe characteristics and working principle of (a) thyristor (b) G.T.O.

8.3 To describe the power control circuits using SCR (heater control and motor speed control circuit)

9.0 DIGITAL ELECTRONICS

9.1 Combinational Logic

9.1.1 To describe the Boolean Algebra and its relevance with the logic gates

9.1.2 To describe the (a) exclusive-OR-gate, its truth table (1) De-Morgan's theorem (c) negative logic (d) Min term and Max term (e) Karnaugh Mapping (f) half adder (g) 2 to 4 line decoder (h) logic voltage levels : noise immunity, power and speed, Fan out.

9.2 Sequential Logic

9.2.1 To describe (S.R. flip-flop (b) clocked flip flops (c) D type and Master-slave flip-flop (d) Counters (asynchronous and synchronous) (e) Shift Registers (f) Astable (g) Monostable Multivibrator (h) Multi-plexer

10.0 SENSOR AND TRANSDUCER 4

10.1 To describe the construction and characteristics of transducers such as (a) LVDT (b) Capacitor Transducers (c) Resistive Transducers (strain gauge, thermistor, LDR) (d) Photo-electric transducer (e) thermo couple (f) thermostat (g) Magnetic pick-up (w) Tachogenerator

11.0 ELECTRICAL INSTRUMENTS 4

11.1 Digital Multimeter : To describe the working principles and usage of Digital Multimeter

11.2 Cathode Ray Oscilloscope : -

11.2.1 To state different type of CRO

11.2.2 (a) to describe the front panel and the function of the knobs of the CRO

(b) to describe the method of

(i) voltage measurement

(ii) time period /frequency measurement

(iii) phase difference measurement.

Class Test

REFERENCE BOOK:

- (1) Electronic and Electrical Engineering (Principles and Practice) by Lionel Warnes (Macmillan)

MATERIALS SCIENCE

Curri. Ref. No. 305

L T P
3 0 0

Total Contact hrs.: 45

Total marks: 100

Theory: 100

Theory: 45

End Term Exam: 70

Practical: 0

I.A.: 30

Pre requisite: Engineering
Science -I & Engineering
Science - II
Credit: 3

Rationale: Entire field of engineering deals with use of host of materials for making objects for human use. Materials include wide spectrum of elements, metals, alloys and compounds to different man made materials and composites with diverse properties. It is imperative that an engineer from any field should have a good knowledge of such materials and their properties.

Aim: The students shall have basic idea of various properties and characteristics of different materials used in the field of engineering, like atomic structure of matter, electronic and mechanical properties, deformation, corrosion, etc of various engineering metals and alloys.

UNIT TOPIC / SUB-TOPIC

Hrs. Total hrs.

1. INTRODUCTION

2

- 1.1 Introduction to Material Science & their various applications
- 1.2 Classification of Engineering Material (Ferrous and non-ferrous metals and its alloys, Organic, Ceramics and Composite materials).

2. ATOMIC STRUCTURE, X-RAYS & PHOTO ELECTRIC EFFECT 5

- 2.1 Structure of Atom
- 2.2 Electron energy levels diagram , Concept of normal & excited atom , Optical Spectra, e.g., Hydrogen spectra
- 2.3 Deficiencies of Bohr's theory
- 2.4 Sommerfield's relativistic model of atom
- 2.5 Quantum numbers and their significance
- 2.6 Pauli's exclusion principle & Electron configuration of elements.
- 2.7 X-rays : Properties & uses
- 2.8 Photoelectric effect, Einstein Photoelectric Equation
- 2.9 Its various applications

3. ELECTRONIC PROPERTIES

9

- 3.1 Difference between Conductors, Insulators & Semiconductors
- 3.2 Electrical Properties
 - Ohm's Law & Resistance
 - Factors Affecting the Electrical Resistance of Materials
 - Conductivity and its Relationship to Band Structure
- 3.3 Bonds in Solids
 - Types of bonds
 - Ionic bonds
 - Covalent bonds
 - Metallic Binding
- 3.4 Electron Energies in Metals
- 3.5 Zone Theory of Solids

3.6 Zones in Conductors, Insulators and Semi-conductors

3.7 Semiconductors

- Energy Band : Valence and Conduction bands, Forbidden Energy gap
- Intrinsic & Extrinsic semiconductor
- Fabrication of integrated circuits
- Some semiconductor devices : junction diode, junction transistor

3.8 Magnetic Properties

- Free electron theory of metals
- Magnetic Materials : Paramagnetic , Diamagnetic Ferromagnetic Materials
- Soft Magnetic Materials, Hard Magnetic Materials, Hysteresis loop
- Ferrites

4.0 MECHANICAL PROPERTIES OF MATERIAL

4.1 Elastic Properties

- Tensile Strength
- Yield Strength
- Impact Strength
- Geep
- Interpretation of Results from Various Tests

4.2 Fracture

- Modes of fracture
- Brittle Fracture
- Ductile Fracture
- Fracture toughness. Shearing Fracture, Fatigue fracture
- Mode of protection against Fracture

4.3 Weldability

4.4 Machinability

5.0 DEFORMATION OF METALS

5.1 Elastic Deformation , Plastic Deformation, Mechanisms of Plastic Deformation

5.2 Dislocation

5.3 Deformation of Polycrystalline Material

5.4 Stress-Strain Curves for Polycrystalline Material, Yield Point Phenomenon

5.5 Work (or Strain) Hardening

5.6 Cold and Hot Working

6.0 IMPORTANT ENGINEERING METALS AND THEIR ALLOYS

6.1 Classification of Metals and Alloys

6.2 Crystal Structure of Metals

- Single Crystals & Space Lattice
- Unit cell
- Lattice parameters
- Crystal symmetry and Structure & Lattice Coordinates
- Miller Indices
- X-ray diffraction for determination of crystal structure

6.3 Ferrous Metals and Alloys

6.3.1 Pig Iron, Wrought Iron, Stainless Steel, Alloy steels: Common and Special type.

6.4 Cutting alloys: Cemented Carbides & Stellite

6.5 Nonferrous Metals and Alloys

6.5.1 Al, Pb, Sn, Cu Zn, Ni and its alloys

6.5.2 Alloys: Bronze, Pb alloy, Babbitt metals, Gun and Bell Metals, Brasses, Muntz Metal, Nichrome etc.

6.6 Organic Materials

6.6.1 Introduction to polymers. Polymerization

6.6.2 Plastics, Rubbers, Fibre and Filaments

6.6.3 Behavior of polymers: Mechanical, Thermal and Electrical behaviors

6.6.4 Timber/Wood and Resins, Its applications like insulators

6.7 Ceramic Material

6.7.1 Introduction to ceramics and its classification.

6.7.2 Properties: Mechanical, Thermal and Electrical.

6.8 Composite materials

6.8.1 Agglomerated Materials: Sintered products, Cermets.

6.8.2 Reinforced Materials : Reinforce concrete, Glass-fibre reinforced plastic, Carbonfibre reinforced plastic.

6.8.3 Laminates: Laminated plastic sheet, Tufnol.

7.0 CORROSION

7.1 Types of corrosion

7.2 Basic Mechanisms of corrosion

7.3 Factors influencing corrosion

7.4 Control and prevention of corrosion: uses of high purity metals, and special alloy, modification of corrosive environment, application of inhibitor, cathodic protection,

use of protective coatings and application of careful design principle.

REFERENCE BOOK:

1. M.Lal: A Text Book of Material Science(1990) - Dhanpat Rai & Sons
2. G.R-S.Narang : Materki Science (1995) - Khanna Publishers, Delhi-6
3. Milton Ohring : Engineering Materials Science (1995) - Academic Press
4. V. Raghavan : Materials Science and Engineering, A first course - Prentice Hall of India Pvt. Ltd.
5. S. K. Hajra Choudhury: Materials Science and Processes
6. Srivastava and Srinivasan : Science of Engineering Materials - New Age International (P) Ltd.

ENVIRONMENTAL EDUCATION

L T P
3 0 0

Curri. Ref. No. 306

Total Contact hrs.: 45

Total marks: 100

Theory: 100

Theory: 45

End Term Exam: 70

Practical: 0

I.A.: 30

Prerequisite: Nil

Practical: Nil

Credit: 3

Rationale : Due to various aspects of human developments including the demands of different kinds of technological innovations most people have been forgetting that the environment in which they are living is to be maintained under various living standards for the preservation of better health and education* The degradation of environment due to industrial growth is very much alarming due to the environmental pollution beyond permissible limits in respect of air, water, land and noise. Therefore, the subject of environmental education is to be learned by everybody in order to educate themselves to control the environment as best as possible.

Aim :To develop the basic concepts of environment ecology, methods of controlling pollution and management of water, sanitation and general environment, also to be aware of air, ater, land and noise pollution and its control.

UNIT TOPIC/SUB-TOPIC	Hrs.	Total
hrs.		
1.0 GENERAL CONCEPT		5
1.1 Nature and scope of environmental problems, definition, interaction of systems, environmental disturbance, public awareness and action.		
1.2 Population and economic growth- population growth, impact of industrialisation and urbanization of environment, future consumption and availability of energy source.		
2.0 ELEMENTS OF ECOLOGY		5
2.1 Concepts of ecosystem -biosphere and its components, examples of ecosystem.		
2.2 Energy flow and food chain in the ecosystem		
2.3 Natural resource cycles (C.N.P. water cycle)		
3.0 ENVIRONMENTAL POLLUTION		20
3.1 Water Pollution - pollutants type, sources and their effects, natural recovery process of water bodies, minimum national standards (MINAS) examples.		
3.2 Air pollution - pollutants type, sources and their effects, air quality standards, examples.		
3.3 Land Pollution — types of pollutants, sources and their effects, examples.		
3.4 Noise Pollution - Sources and their effects, minimum standard, examples.		
4.0 ENVIRONMENTAL SANITATION	7	
4.1 Epidemiology — infectious diseases, sources and causes, and transmission of diseases, sanitary protection measures.		
4.2 Occupational Health hazards		
5.0 ENVIRONMENTAL MANAGEMENT		
5.1 Conservation of land, forests, wildlife, minerals		
5.2 Resource recycling		
5.3 Pollution control strategies, environmental ethics.		