



**MURUGAPPA POLYTECHNIC COLLEGE**  
(A GOVT. AIDED ACADEMICALLY AUTONOMOUS INSTITUTION)  
Sathyamurthy Nagar, Chennai – 600 062.



**DIPLOMA COURSE  
IN  
ELECTRONICS (ROBOTICS)**

**FULL TIME 3½ YEAR SANDWICH**

**REGULATIONS, CURRICULUM AND SYLLABUS**

**MPC 'M'-SCHEME**

**2016**

**REGULATIONS 2016**  
**M Scheme**  
**REGARDING ADMISSION, EVALUATION, AWARD OF DIPLOMA UNDER ACADEMIC**  
**AUTONOMY**  
**APPROVED IN THE 40<sup>TH</sup> ACADEMIC BOARD**

**DIPLOMA COURSES IN ENGINEERING**  
**(SIX-SEMESTER REGULAR, SEVEN-SEMESTER SANDWICH FULL-TIME AND EIGHT**  
**SEMESTERS PART-TIME)**

## **1. CANDIDATES FOR ADMISSION**

### **1.1 AGE LIMIT**

Candidates for admission into the first semester of the six-semester Regular, seven-semester Sandwich, eight- semester Part-Time Diploma Courses and to the third semester Regular Diploma courses under Lateral Entry shall satisfy the age limit as prescribed by the Directorate of Technical Education.

### **1.2 QUALIFICATIONS**

1.2.1. Candidates seeking admission into Full-Time and Part-Time Diploma Courses shall be required to have passed X standard examination of the State Board of Education, Tamil Nadu or any other equivalent examination already recognized by the Directorate of School Education Board, Tamilnadu with eligibility for admission to First year of Higher Secondary School in Tamil Nadu

1.2.2. Candidates seeking admission to the Second Year (III Semester) of Regular Diploma Courses under Lateral Entry shall be required to have passed the Higher Secondary Certificate (HSC) Examination ( Vocational) or 2 year Industrial Training Institute (ITI) Certificate Examination after passing X Std. Examination of State Board of Education as prescribed by the Directorate of Technical Education.

### **1.3 ELIGIBILITY**

Candidates seeking admission shall satisfy the eligibility conditions such as subjects, marks, number of attempts etc, as prescribed by the Directorate of Technical Education, Tamil Nadu.

## **2. DURATION OF COURSE**

The duration for the Full-Time Regular Diploma Course shall be 6 consecutive semesters and for the Sandwich Diploma Course shall be 7 consecutive semesters and spread over 3 and 3 ½ academic years respectively, and for Part-Time Diploma Course shall be 8 consecutive semesters spread over 4 academic years. Each semester shall have a minimum duration of 15 Weeks. One academic year constitutes two semesters.

The minimum and maximum period for completion of Diploma Courses are as given below:

	<u>Minimum</u>	<u>Maximum</u>
Regular Diploma Students	3 years	6 years
Lateral Entry Students	2 years	5 years
Sandwich Diploma Students	3½ years	6½ years
Part-Time Diploma Students	4 years	7 years

### 3. BRANCHES OF STUDY

Candidate may be offered at the time of admission, one of the following branches of study or such other branches of study as may be instituted from time to time.

Branch	Full-Time Diploma Course	Part-Time Diploma Course
Civil Engineering	Regular or Sandwich	Regular
Mechanical Engineering	Regular or Sandwich	Regular
Electrical & Electronics Engineering	Regular or Sandwich	Regular
Electronics & Communication Engineering	Regular or Sandwich	Regular
Computer Engineering	Regular	---
Mechanical Engineering (Tool & Die)	Sandwich	Regular
Electronics (Robotics)	Sandwich	-----

### 4. SUBJECTS OF STUDY

The subjects of study shall include **theory, practical and project work** as detailed in the Curriculum for Full-Time Regular, Sandwich and Part-Time Diploma Courses and **Industrial training** for Sandwich Diploma Courses.

### 5. EVALUATION OF PERFORMANCE

5.1 **THEORY SUBJECTS:** The evaluation of students performance in each one of the theory subjects, shall be by Continuous Assessment comprising three assessment tests, assignment, attendance and an end-semester examination as mentioned below:

Components	Marks	Max. Marks
Continuous Assessment Test (CA)		25
CA Test I , II, III #	15	
Assignment*	5	
Attendance**	5	
End-Semester Examination***		75
Total		100

# 3 CA Tests shall be conducted and each shall be reduced to 5 marks making a total of 15 marks.

CATEST	Syllabus Portion	WHEN CONDUCT	TO	Maximum Marks	DURATION IN HRS
TEST-1	Unit-I	4 <sup>th</sup> week		50	2
TEST-2	Unit-II & III	9 <sup>th</sup> week		50	2
TEST-3	Unit-IV & 50% of Unit V	13 <sup>th</sup> week		50	2
	Model Exam	15 <sup>th</sup> week		75	3

Question paper pattern:

Part-A - Answer all 5 one mark question - 5 x 1 = 05

Part-B - Answer any 5 out of 7 question of three marks each - 5 x 3 = 15

Part-C - Answer any 3 out of 5 question of 10 marks each - 3 x 10 = 30

\* For each theory subject, at least three Assignments are to be given and the marks scored shall be reduced to 5 marks.

\*\* Marks for attendance shall be awarded only to candidates securing above 80% attendance (Minimum required for completion of semesters, (vide clause 6)) i.e. 0.25 marks for each percent above 80%.

## Model Examination of 3 hour duration for 75 marks shall be conducted during the last week of the semester to give more End Semester Examination Orientation.

5.2. **PRACTICAL SUBJECTS:** (a) For practical subject the Continuous Assessment marks shall be 25 and the End Semester Examination shall be 75. Continuous Assessment and End Semester Examination marks will be assigned as mentioned below:

Components	Marks	Maximum Marks
Continuous Assessment		25
Record - Average Mark of Expt./Exercises @	10	
Mid Semester Test \$	10	
Attendance **	5	
End Semester Exam \$\$		75
Total		100

\$ Mid Semester Test Pattern:

It will be conducted in 8<sup>th</sup> and 9<sup>th</sup> week for 50 marks split up are given below and reduced to 10 marks:

Concept/Diagram/flowchart -10

Connection/Tabulation/Compilation -30

Result/Execution -10

@ Each Exercise shall be evaluated in Mid Semester Test pattern and reduced to 10 marks.

\$\$ End Semester Exam Question pattern:

End semester Exam shall be conducted in the question paper pattern as described in the detailed syllabus.

5.3 **PROJECTWORK** : The evaluation of **Project work** shall be based on Continuous Assessment consisting of two periodical Reviews during final semester and End Semester Examination consisting of written test, project report and viva-voce, demonstration and explanation.

5.4 **INDUSTRIAL TRAINING:** Industrial Training for Sandwich Diploma Course students will be evaluated based on continuous assessment consisting of two periodical Reviews and End-Semester Evaluation of Training Report and viva voce.

## 6. ATTENDANCE REQUIREMENT FOR COMPLETION OF A SEMESTER

A student shall secure not less than 80% attendance during the semester for the completion of a semester.

## 7. COURSE REPETITION

7.1 A student who secures less than 80% of attendance in a semester, has to repeat all the subjects of that Semester (vide clause 6) in the next academic year on Readmission.

7.2 A student who has 80% or more attendance but not appeared even for any one End Semester Examination is not eligible to continue the Consequent Semester. But he/she can repeat the same semester by obtaining Readmission in the next Academic Year.

## 8. REQUIREMENTS FOR APPEARING IN END SEMESTER EXAMINATION

A candidate shall normally be permitted to appear for the end semester examination of the current semester if he/she has satisfied the semester completion requirements (vide clause 6) and has registered for examination in all subjects of the current semester and arrears of all the previous semesters, if any.

## 9. SANDWICH DIPLOMA COURSE

9.1. The performance and attendance of a student of Sandwich Diploma Course during Industrial Training has to be satisfactory to continue in the Sandwich Diploma Course, otherwise the student has to repeat the Industrial training or discontinue the Diploma Course. The Sandwich Diploma Course Industrial Training is regulated by the Apprenticeship Amendment Act 1983.

9.2. Sandwich Diploma Course students shall complete the industrial training for one year in two spells of six months each during the course of study, first spell of Industrial Training during the fourth semester and the second spell during the seventh semester.

## 10. SUBJECTWISE PASSING REQUIREMENTS

10.1. For a pass in the **Theory Subject**, a student should secure a minimum of 30 marks out of 75 marks in the End Semester Examination and 40 marks out of 100 marks, the Aggregate of Continuous Assessment marks and End Semester Examination marks.

10.2. For a pass in **Practical Subject**, a student should secure a minimum of 35 marks out of 75 marks in the End Semester Examination and 50 marks out of 100 marks, the Aggregate of Continuous Assessment marks and End Semester Examination marks.

10.3. For a pass **Industrial training** for Sandwich Diploma Course, a student should secure a minimum of 25 marks out of 50 marks in the End Semester Examination and 50 marks out of 100 marks, the Aggregate of Continuous Assessment marks and End Semester Examination marks.

10.4. For a pass in **Project Work**, a student should secure a minimum of 35 marks out of 75 marks in end semester examination and 50 marks out of 100 marks, the Aggregate of Continuous Assessment marks and end semester examination marks.

10.5. If a student fails in a subject, the Continuous Assessment Marks obtained by him/her in the first attempt shall be retained and considered valid for all subsequent attempts.

## **11. DISCIPLINE AND MALPRACTICE IN THE EXAMINATION**

11.1. Every student is required to be disciplined and to have decorous behavior both inside and outside the campus and not to indulge in any activity, which will tend to bring down the prestige of the institution.

11.2. Any act of malpractices by a student during the examinations, such as copying from the answer books of other students, possession of cell phones, written / printed matters, showing / transferring answer books, discussing with other candidates etc., notified from time to time, shall be punishable as per DOTE norms.

## **12: CLASSIFICATION OF SUCCESSFUL CANDIDATES:**

Classification of candidates who shall pass out the final examinations from April 2019 onwards (joined in first year in 2016-2017) shall be done as specified below.

### **12.1 First Class with Superlative Distinction**

A candidates shall be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 3/ 3<sup>1/2</sup> /4 years (Full time/ Sandwich/Part Time) without any break in study.

### **12.2 First Class with Distinction**

A candidate shall be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 3/ 3<sup>1/2</sup> /4 years (Full time/ Sandwich/Part Time) without any break in study.

### **12.3 First Class**

A candidate shall be declared to have passed in **First Class** if he/ she secures not less than 60 % of the aggregate marks in all the semesters put together and passes all the subjects within the stipulated period of study 3/ 3<sup>1/2</sup> /4 years (Full time/ Sandwich/Part Time) without any break in study.

### **12.4 Second Class**

All other successful candidates shall be declared to have passed in **Second Class**.

The above mentioned classifications are applicable for the Full Time Regular, Sandwich and Part Time students who pass out Final Examination from April / October 2019 onwards (joined in First Year in 2016-2017and Second Year Lateral entry in 2017-18)

### 13. DECLARATION OF RESULTS

The results shall be declared after the approval of the **marks** and **classification** by the **Awards Committee** of the institution.

### 14. REVALUATION

Any candidate can apply for Photocopy of his/her answer script of any **Theory subject**, he/she had appeared, if he/she is not satisfied with the marks awarded to him/her in the subject. The candidate has to fill-in the prescribed application form and remit Rs.100/- per paper for obtaining the photocopy of the answer script within 10 days from the date of publication of results. After going through the Answer script if the candidate desires for re-valuation he/she has to pay a revaluation fee of Rs.400/- per paper, within 3 working days, after receipt of the photocopy of the answer script.

The revaluation system is not applicable for Practical subjects, Project work and Industrial Training.

### 15. MARK SHEET

15.1. The Mark sheet shall be issued to each student at the end of each semester, up to final semester.

15.2. Transcript (consolidated Mark-sheet) shall be issued for the passed out student, at the end of the course.

15.3 Course Completion Certificate, and Conduct Certificate shall be issued for all candidates at the end of the Course.

### 16. ELIGIBILITY FOR AWARD OF DIPLOMA

A student shall be declared eligible for the award of the Diploma if he/she has:

16.1 Registered and successfully completed all the theory and practical subjects and project work (in the case of Full-Time Regular Diploma Course and Part-Time Diploma Courses) and in addition two spells of industrial training in the case of Sandwich Diploma Course (vide clause 9.2).

16.2. No dues to the institution.

### 17. ADDITIONAL CHANCE

Candidate will be given 6 more chances (3years) to complete the arrears after completing the course. After exhausting all 6 chances they will be given 2 more Additional chances in the next calendar year

The minimum and maximum period for completion of Diploma Courses are as given

Diploma Course	Minimum period	Maximum period	After over the Maximum period (Additional Chance)
Full Time	3 Years	6 Years	2 Chances in the next Calendar Year
Full Time (Lateral Entry)	2 Years	5 Years	2 Chances in the next Calendar Year
Sandwich	3 ½ Years	6 ½ Years	2 Chances in the next Calendar Year
Part Time	4 Years	7 Years	2 Chances in the next Calendar Year

## 18. AWARD OF DIPLOMA

The State Board of Technical Examination and Training, Department of Technical Education, Tamilnadu awards the Diploma to the successful candidates on the recommendations of **Awards Committee** of the institution.

## 19. BREAK OF STUDY

Students shall not be permitted to discontinue the course of study for a duration of more than three years during any part of their course of study. However, for students for whom continuous break in study is less than or equal to three years, prior permission of the Chairman, Board of Examination is necessary to continue in the Diploma Course and to appear in the examination. Such students will be awarded **only Second Class**.

## 20. DISCONTINUATION OF COURSE

Any student of first semester who has less than 80% attendance or who has 80% or more attendance but not appeared even for any one of the end semester examination is not eligible for continuing the Diploma course.

## 21. POWER TO MODIFY

Notwithstanding all that have been stated above the Academic Board of the institution has the right to modify any of the above regulations from time to time.

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**MURUGAPPA POLYTECHNIC COLLEGE, SATHYAMURTHY NAGAR, CHENNAI – 62**  
**DIPLOMA COURSE IN ELECTRONICS (ROBOTICS) ENGINEERING (3 ½ YEARS SANDWICH)**  
**M SCHEME CURRICULUM AND SCHEME OF EXAMINATION**

**I SEMESTER**

S.NO	Subject Code	Subject Name	Hours / Week		ESE Hrs	CAM	ESM		Total Marks	
			T	P			Max.	Min. for a pass	Max.	Min. for a pass
1.	GEM 11	Communication Skills in English	4	-	3	25	75	30	100	40
2.	GEM 12	Engineering Mathematics-I	8	-	3	25	75	30	100	40
3.	GEM 13	Engineering Physics-I	5	-	3	25	75	30	100	40
4.	GEM 14	Engineering Chemistry-I	5	-	3	25	75	30	100	40
5.	GEM 15	Engineering Physics –I Practical	-	2	3	25	75	35	100	50
6.	GEM 16	Engineering Chemistry-I Practical	-	2	3	25	75	35	100	50
7.	GEM 17	Engineering Graphics-I Practical	-	6	3	25	75	35	100	50
8.	GEM 18	Basic Computer Application Practical	-	3	3	25	75	35	100	50
Total			22	13					800	

**II SEMESTER**

S.NO	Subject Code	Subject Name	Hours / Week		ESE Hrs	CAM	ESM		Total Marks	
			T	P			Max.	Min. for a pass	Max.	Min. for a pass
1.	GEM 21	Engineering Mathematics-II	5	-	3	25	75	30	100	40
2.	GEM 22	Applied Mathematics	5	-	3	25	75	30	100	40
3.	GEM 23	Engineering Physics-II	4	-	3	25	75	30	100	40
4.	GEM 24	Engineering Chemistry-II	4	-	3	25	75	30	100	40
5.	GEM 25	Communication Skills in English Practical	-	4	3	25	75	35	100	50
6.	GEM 26	Engineering Physics-II Practical	-	2	3	25	75	35	100	50
7.	GEM 27	Engineering Chemistry-II Practical	-	2	3	25	75	35	100	50
8.	GEM 28	Engineering Graphics-II Practical	-	6	3	25	75	35	100	50
9.	GEM 29	Work shop practice	-	3	3	25	75	35	100	50
Total			18	17					900	

T – Theory Hours      P – Practical hours  
 ESE - End Semester Examination

CAM - Continuous Assessment Mark  
 ESM - End Semester Examination Mark

### III Semester

S.No	Subject Code	Subject Name	Hours / Week		ESE Hrs	CAM	ESM		Total Marks	
			T	P			Max	Min for a Pass	Max	Min for a Pass
1	MEM31	Strength of Materials	6	-	3	25	75	30	100	40
2	ERM32	Electronic Devices and Circuits	5	-	3	25	75	30	100	40
3	ERM33	Electrical Circuits and Machines	4	-	3	25	75	30	100	40
4	ERM34	Machine Shop Technology	4	-	3	25	75	30	100	40
5	ERM35	Electronic Devices and Circuits Practical	-	5	3	25	75	35	100	50
6	ERM36	Electrical Circuits and Machines Practical	-	5	3	25	75	35	100	50
7	ERM37	Machine Shop Technology Practical	-	5	3	25	75	35	100	50
		Seminar & Library	-	1	-	-	-	-	-	-
Total			19	16	-	-	-	-	700	-

### IV Semester

S.No	Subject Code	Subject Name	Hours / Week		ESE Hrs	CAM	ESM		Total Marks	
			T	P			Max	Min for a Pass	Max	Min for a Pass
1	ERM41	Measuring Instruments & Sensors	4	-	3	25	75	30	100	40
2	ERM42	Sensor Practical	-	3	3	25	75	35	100	50
3	ERM43	Industrial Training- I	-	-	3	50	50	25	100	50
		Seminar & Library	-	1	-	-	-	-	-	-
Total			4	4	-	-	-	-	300	-

### V Semester

S.No.	Subject Code	Subject Name	Hours / Week		ESE Hrs.	CAM	ESM		Total Marks	
			T	P			Max	Min for a Pass	Max	Min for a Pass
			1	ERM51			Analog and Digital Electronics	5	-	3
2	ERM52	Elective – I	4	-	3	25	75	30	100	40
3	ERM53	Hydraulic and Pneumatic systems	4	-	3	25	75	30	100	40
4	ERM54	Analog and Digital Electronics Practical	-	5	3	25	75	35	100	50
5	ERM55	Hydraulic, Pneumatic and PLC Practical	-	4	3	25	75	35	100	50
6	ERM56	Computer Aided Machine Drawing Practical	-	4	3	25	75	35	100	50
7	GEM57	Life and Employability Skills Practical	-	4	3	25	75	35	100	50
8	ERM58	Programming in “C” Practical	-	4	3	25	75	35	100	50
Total			14	21	-	-	-	-	800	-

#### ERM 52 Elective – I

ERM 52.1 – Industrial Instrumentation and Automation

ERM 52.2 – Total Integrated Automation

ERM 52.3 – Virtual Instrumentation

### VI Semester

S.No.	Subject Code	Subject Name	Hours / Week		ESE Hrs.	CAM	ESM		Total Marks	
			T	P			Max	Min for a Pass	Max	Min for a Pass
			1	MEM61			Industrial Engineering and Management	5	-	3
2	MEM62	Computer Aided Design and Manufacturing	4	-	3	25	75	30	100	40
3	ERM63	Process Control	4	-	3	25	75	30	100	40
4	ERM64	Microcontroller & Embedded System	4	-	3	25	75	30	100	40
5	ERM66	Elective – II	4	-	3	25	75	30	100	40
6	MEM65	Computer Aided Design and Manufacturing Practical	-	6	3	25	75	35	100	50
7	ERM67	Process Control and Instrumentation Practical	-	3	3	25	75	35	100	50
8	ERM68	Microcontroller and its Interfacing Practical	-	4	3	25	75	35	100	50
Seminar & Library			-	1	-	-	-	-	-	-
Total			22	13	-	-	-	-	800	-

#### ERM 66 Elective – II

ERM 66.1 – Auto Electronics

ERM 66.2 – Non Destructive Testing

ERM 66.3 – Mechanical Instrumentation

## VII Semester

Sl. No	Subject Code	Subject Name	Hours / Week		ESE Hrs	CA M	ESM		Total Marks	
			T	P			Max	Min for a Pass	Max	Min for a Pass
1	ERM71	Robotics	4	-	3	25	75	30	100	40
2	ERM72	Robotics Practical	-	3	3	25	75	35	100	50
3	ERM73	Project Work	-	3	3	25	75	35	100	50
4	ERM74	Industrial training- II	-	-	3	50	50	25	100	50
		Seminar & Library	-	1	-	-	-	-	-	-
Total			4	7	-	-	-	-	300	-

**T** – Theory

**P** – Practical

**CAM-** Continuous Assessment Mark

**ESE** – End Semester Examination

**ESM** – End Semester Examination Mark

**To be implemented from the Academic year 2016- 2017**

**Course Name** : Common to all first year diploma students  
**Subject Code & Name** : GEM11 Communication skills in English  
**Semester** : First

**TEACHING & SCHEME OF EXAMINATION**

**No. of Weeks per Semester: 15 weeks**

Subject	Instructions		Examination			
	Hours/Week	Hours/Semester	Marks			Duration
			Continuous Assessment	End Semester	Total	
<b>Communication skills in English</b>	4	60	25	75	100	3Hrs.

**RATIONALE**

In the current globalized environment there is a clear necessity for effective English Communication skills for Diploma students. The English language has become a major medium for communication across borders globally. To be successful in any field one need to know and understand how to communicate effectively. Communication is the most important skill required to professional practice in the global arena. At the end of the course the student will be able to communicate well both verbally and in writing. Many jobs require strong communication skills. Students with improved communication skills usually enjoy better interpersonal relationships across different employment sectors throughout their working life.

**TOPICS & ALLOCATION OF HOURS**

UNIT	TOPICS	HOURS
I	Grammar	12
II	Grammar	12
III	Grammar	12
IV	Composition	12
V	Composition	12
	Total	60

**DETAILED SYLLABUS**

UNIT	TOPIC	CONTENT	LEARNING OUTCOMES	CONTACT HRS.
I	Grammar	1) Pronunciation 2) Plurals 3) Naming words 4) Adjectives 5) Tense forms 6) Preposition 7) Articles	*Distinguish the pronunciation of past tense & plural endings * Identify nouns & verbs * Recognize and use adjectives and prepositions in speech and writing *Differentiate tense forms	12

II	Grammar	1) Spelling 2)Punctuation 3)Conversion 4)Lexical sets 5) Action words 6) Active/passive form.	* Recognize and spell the words * Use capitals, commas and necessary punctuation. * Convert words into other forms * Build and expand vocabulary use *Recognize& Distinguish active/passive forms	12
III	Grammar	1)Direct & Indirect speech 2)Question tag 3) Prefixes 4) Suffixes 5)Degrees of comparison, 6) Idioms & Phrases 7)Rearranging jumbled words, 8) Giving directions.	*Convert from direct to indirect *Add suitable question tags *Use prefixes and suffixes appropriately *Sort positive, comparative and superlative forms * Identify and rearrange the words into sentences * Write directions for the given road map	12
IV	Composition	1)Comprehension, 2)Personal Letters, 3)Official Letters, 4) Short report writing 5) Verbal to visual comprehension.	*Comprehend, interpret and analyze passage *Identify and compose personal letters *Recognize& use appropriate structure and write letters *Recognize structure and use passive forms * Organize& interpret the text into visual	10
V	Composition	1)Description of events 2)Writing about personal experiences 3)Writing short message 4)Advertisement writing 5) Linkers 6) Hints Development.	*Organize & write paragraph *Write messages for given contexts *Design an advertisement using relevant vocabulary *Organize paragraph using linkers * Develop hints by framing sentences	10

### TEXT BOOK:

1. "Communication Skills in English", Ms.S.Rajalakshmi and Ms.S.Anandhi, Saravana Publishers.

## **REFERENCE BOOK:**

1. Communication English I&II Govt. Of Tamil Nadu, Text Book DOTE.
2. Ramaya.Y ,“A Hand Book Of Spelling”, Indian Institute of Publishing, Chennai.
3. Wren&Martin, 'High School English Grammar & Composition, S.Chand & Co., Ltd.,

## MODEL QUESTION PAPER

### GEM 11: COMMUNICATION SKILLS IN ENGLISH

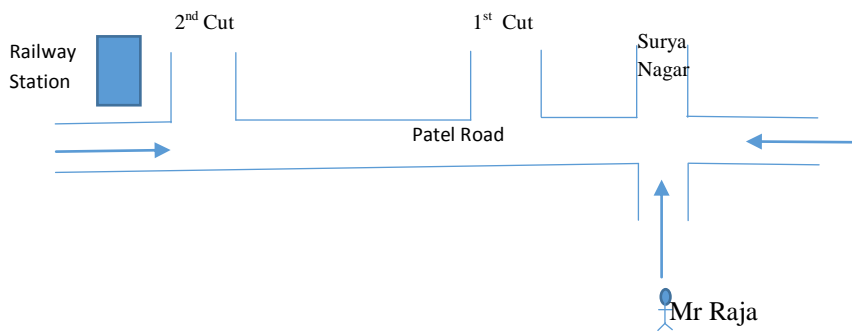
TIME: 3 Hrs.

Max.Marks:75

- I. Answer any TEN of the following questions. (10x2=20)
- Write 2 words related to your 'Class Room'.
    - Identify two action words in the following sentences.
      - He gets back home at 5 o'clock, takes bath and relaxes a while.
  - Identify and write as active/passive sentence against each of the following.
    - The results will announced soon.
    - .I have sent an email to my friend.
  - Covert the dialogue into reported speech.
    - Boy: 'What is your father?'  
Girl: 'My father is a teacher'
  - Supply suitable tags for the following sentences.
    - I am doing my work.
    - Ravi wrote the exam.
  - Write suitable prefixes for the following words.
    - Possible    b.Connect    c. Necessary    d. Relevant
  - Write suitable Suffixes for the following words.
    - able    b. beauty    c. encourage    d. comfort
  - Identify the Degrees of Comparison and write as Positive degree/Comparative degree/Superlative degree for the following sentences.
    - The Internet is the fastest mode of communication.
    - Helicopters do not fly as fast as airplanes.
  - Match the following idioms/phrases with their relevant meaning.
    - for the sake of                      - want of
    - in need of                              - for the benefit
    - on the contrary                      -joys and sorrows
    - ups and downs                        -nevertheless
  - Rearrange the jumbled words into meaningful sentences.
    - my,never,I,time,wasted
    - is,the very,woman,selfish



11. Give two instructions to Raja to reach the park using imperative form.



II. Answer any EIGHT of the following questions. (8x3=24)

1. Identify short and long sounds and write short or long next to each word.

a. dip      b. meet      c. sleep      d. fill      e. sit      f) mutt

2. Fill in the blanks with plural form of the word given in the bracket.

a. How many .....(day) will you stay in Chennai?

b. He Solved all the .....(problem) himself.

c. Where are the ..... (child)?

3. Identify three naming words in the following sentence.

The professor is delivering a lecture on 'first aid 'in the class.

4. Fill in the blanks with the appropriate adjective given in brackets.

a. I like her ..... attitude with everybody. (friend/ friendly)

b. An ..... Man always has a special place in every society. (honest /honesty)

c. The exam questions were quite..... this time.(difficulty/difficult)

5. Identify the tense forms used in the following sentences.

a. I play cricket on Sunday.

b. We are learning English Grammar at present.

c. They have been building this house for the past four years.

6. Fill in the blanks with suitable prepositions.

a. They replied..... my e-mail last week. (for/to)

b. My friend presented me ..... a pen.(by/with)

c. He was driving a car..... 60 km per hour. (with/by)

7. Fill in the blanks with suitable articles in the following sentences.

a. The dog is ..... Faithful animal.

b. I hope you know ..... Latest news.

c. Who is ..... tallest boy in the class?

8. Correct the spelling.

a. michine      b) modherland      c)rekwist

9. Punctuate and use capital letters wherever necessary.
- jane said to john my favourite leader is mahatma gandhi
  - new delhi is the capital of india
  - i am waiting for my friend joseph
10. Convert the following Nouns into verbs.
- conductor
  - teacher
  - formation

III. Answer all the following questions. ( 3x5=15 )

1. Read the following passage carefully and answer the questions that follows.

Addressing the members of Madras management Association after receiving the MMA Amalgamation, Business Leadership Award 2014. Ratan Tata said, "the corporate world has to exist by side, complement each other and move together to make the country rise." Ratan Tata, Chairman-Emeritus of Tata Sons on Tuesday, called for better co-operation and collaboration within the corporate sector.

Mr.Tata said that industries and government should collaborate in a proactive manner for growth and prosperity.

QUESTIONS:

- Who is Ratan Tata?
  - What is MMA?
  - What Award was given to him?
  - Whom did he address?
  - What is his suggestion to the Government and Industries?
2. Write a short report of the process of preparing lemon juice.
3. Write a letter to your friend inviting him/her to come to your place for a group study.

(or)

Write a letter to M/s Phoenix Computers placing an order for 10 computers with specifications.

IV. Answer any FOUR of the following questions. (4x4=16)

- Describe a 'Railway Platform' in 5 sentences
- Write your experience on the day when your SSLC results were announced in 5 sentences.
- Write a short message to your friend, wishing him success in the examination.
- Create Advertisement for a book exhibition by M/s Majestic Book House.

5. Fill up the blanks by choosing the suitable linkers given in brackets.

(then, thus, and, because, so)

Yesterday I was working in my office. Without break for tea, even after 5 pm. I felt so tired \_\_\_\_\_ of it. \_\_\_\_\_ I went to a hotel and had a cup of tea. \_\_\_\_\_ I went for a walk \_\_\_\_\_ later resumed my work in the office. \_\_\_\_\_ Relaxation helps us to refresh ourselves.

6. Develop the following hints into a passage of about 50 words.

A farmer - owned a goose - goose laid golden eggs everyday - greedy farmer - wanted all golden eggs at once - killed the goose - no golden eggs – disappointed - learnt a good lesson-moral.

To be implemented from the Academic year 2016- 2017

Course Name : Common to all first year diploma students

Subject Code & Name: GEM12 Engineering Mathematics I

Semester : First

TEACHING & SCHEME OF EXAMINATION:

No. of weeks per Semester: 15

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Continuous Assessment	End Semester	Total	
Engineering Mathematics I	8	120	25	75	100	3Hrs.

**Topics and Allocation of Hours (Engineering Mathematics I)**

Unit No.	Topics	Hours
I	Algebra – Determinants, Matrices and Binomial Theorem	24
II	Complex Numbers	24
III	Trigonometry	24
IV	Differential Calculus – I	24
V	Differential Calculus – II	24
	Total	120

**Rationale:**

This subject being a branch of “Logic” is classified as one of the basic sciences and intends to teach students, basic facts, concepts and principles of mathematics as a tool to analyze Engineering problems. Mathematics lay down foundation for understanding core technology subjects.

**Objectives:**

- Circuit oriented problems can be solved using determinants and matrices.
- To find the value of higher power of any number using Binomials.
- To solve equation having no real solutions.
- Can be applied in differential calculus and integral calculus as well as  $\sin \theta$  and  $\cos \theta$  waves.
- Can be solved technical oriented problems, helpful to find the total differentiation and higher order derivatives.
- Can be used in calculating management oriented problem like profit & loss etc.

## DETAILED SYLLABUS

UNIT	NAME OF TOPICS	HOURS
I	<b>ALGEBRA</b> <b>1.1 DETERMINANTS</b> Definition and expansion of determinants of order 2 and 3. Properties of determinants – simple problems. Solution of simultaneous equations using Cramer’s rule (in 3 unknowns) – simple problems.	8
	<b>1.2 MATRICES</b> Definition – Singular Matrix, Non-singular Matrix, Adjoint of a matrix and Inverse of a matrix up to 3 x 3 only. Simple problems. Definition- Rank of a matrix. Finding Rank of a matrix by determinant method (matrix of order 3 x 4) Simple problems.	8
	<b>1.3 BINOMIAL THEOREM</b> Definition of Factorial notation – Definition of Permutation and Combinations – values of $nPr$ and $nCr$ (results only) [not for examination]. Binomial theorem for positive integral index (statement only) - Expansion – Finding of general term, middle term, coefficient of $x^n$ and term independent of x- Simple problems. Binomial theorem for rational index upto 3 (statement only), Expansions only upto 3 for negative integers.	8
II	<b>COMPLEX NUMBERS</b> <b>Chapter 2.1 ALGEBRA OF COMPLEX NUMBERS</b> Definition – Real and imaginary parts, Conjugates, Modulus and amplitude form, Polar form of a complex number, multiplication and division of complex numbers (geometrical proof not needed) – Simple problems. Argand Diagram – Collinear points, four points forming square, rectangle, rhombus and parallelogram only – simple problems.	8
	<b>Chapter 2.2 DEMOIVRE’S THEOREM</b> Demoivre’s Theorem (statement only) - related simple problems.	8
	<b>Chapter 2.3 ROOTS OF COMPLEX NUMBERS</b> Finding the nth roots of unity– solving equation of the form $x^n \pm 1 = 0$ where $n \leq 8$ – simple problems.	8
III	<b>TRIGONOMETRY</b> <b>3.1 COMPOUND ANGLES</b> Expansion of $\sin(A \pm B)$ , $\cos(A \pm B)$ and $\tan(A \pm B)$ [without proof]. Problems using above expansions.	8
	<b>3.2 MULTIPLE ANGLES</b> Trigonometrical ratios of multiple angles of 2A and 3A and sub multiple angles. Simple problems.	8
	<b>3.3 SUM AND PRODUCT FORMULAE</b> Trigonometrical ratios of sum and product formulae. Simple problems. – Standard Identities – simple problems.	8

IV	<b>DIFFERENTIAL CALCULUS -I</b> <b>4.1 LIMITS</b> Definition of Limits. Problems using the following results: $(i) \lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}, \quad (ii) \lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$ $(iii) \lim_{\theta \rightarrow 0} \frac{\tan \theta}{\theta} = 1 \quad (\theta \text{ in radians}) \text{ (results only) – Simple problems.}$	8
	<b>4.2 DIFFERENTIATION</b> Definition – Differentiation of $x^n$ , $\log x$ , $e^x$ , $\sin x$ , $\cos x$ , $\tan x$ , $\operatorname{cosec} x$ , $\sec x$ , $\cot x$ , $u \pm v$ , $uv$ , $uvw$ , $u/v$ ( $v \neq 0$ ) (results only). Simple problems using the above results.	8
	<b>4.3 DIFFERENTIATION METHODS:</b> Differentiation of function of functions (chain rule), Inverse Trigonometric functions and implicit functions - Simple problems.	8
V	<b>DIFFERENTIAL CALCULUS –II</b> <b>5.1 SUCCESSIVE DIFFERENTIATION</b> Successive differentiation up to second order (Parametric form not included). Definition of differential equation, order and degree, formation of differential equation. Simple problems.	8
	<b>5.2 PARTIAL DIFFERENTIATION</b> Definition – Partial differentiation of two variables up to second order only - Simple problems.	8
	<b>5.3 EULER’S THEOREM</b> Definition – Homogeneous function – Euler’s theorem (statement only) – simple problems.	8

### Text Book

Engineering Mathematics I For Polytechnic College , E.Geethalakshmi and M. Narayana Vadivoo, Saravana Publishers.

### Reference Book:

- 1.Engineering Mathematics I and II –E.Geethalakshmi and M. Narayana Vadivoo, Saravana Publishers.
2. Mathematics for Higher Secondary – I year and II year (Tamil Nadu Text Book Corporation)
3. Engineering Mathematics – Dr.M.K.Venkatraman, National Publishing Co, Chennai.
4. Engineering Mathematics – Dr.P.Kandasamy& Others. S.Chand& Co Ltd, New Delhi.

## MODEL QUESTION PAPER

Time : 3hrs

Max. Marks: 75

Subject Code and Name : GEM12 ENGINEERING MATHEMATICS I

Note:

1. Answer ALL the questions in PART –A ( 1 mark each)
2. Answer any ONE question from each Unit in PART – B ( 3 marks each)
3. Answer any ONE question from each Unit in PART – C (10 marks each).

**PART-A (Answer all the questions: 10x1=10)**

1. Solve for x;  $\begin{vmatrix} x & 4 \\ 9 & x \end{vmatrix} = 0$
2. Find the first three terms in the expansion  $\left(x^2 + \frac{1}{x}\right)^7$
3. Find the distance between the complex numbers 1+i and 3-2i
4. Simplify:  $\frac{\cos 8\theta + i \sin 8\theta}{\cos 2\theta - i \sin 2\theta}$
5. If  $\tan A = \frac{1}{2}$   $\tan B = \frac{1}{3}$  find  $\tan(A+B)$
6. Prove that  $\frac{\sin 2A}{1 + \cos 2A} = \tan A$
7. Evaluate:  $\lim_{x \rightarrow 0} \frac{\sin 7x}{9x}$
8. Find  $\frac{dy}{dx}$  if  $y = \tan^{-1} \sqrt{x}$
9. Find the order and degree of  $\frac{d^3 y}{dx^3} + 6 \left(\frac{dy}{dx}\right)^2 - 4y = 0$
10. State Euler's theorem.

**PART-B (Answer any one question from each unit: 5x3=15 marks)**

**UNIT I**

11. Prove that  $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = 0$ . [OR]

12. Find the 10th term in  $\left(2x^2 + \frac{5}{x^3}\right)^{15}$

**UNIT II**

13. Find the modulus and amplitude of  $\frac{1+i}{1-i}$  [OR]

14. If  $a = \cos \alpha + i \sin \alpha$ ,  $b = \cos \beta + i \sin \beta$  then prove that  $\sin(\alpha + \beta) = \frac{1}{2i} \left(ab - \frac{1}{ab}\right)$

**UNIT III**

15. If  $\sin \theta = \frac{1}{2}$  find  $\sin 3\theta$  [OR]

16. Prove that  $\cos 10^\circ + \cos 70^\circ = \sqrt{3} \cos 40^\circ$

**UNIT IV**

17. Find  $\frac{dy}{dx}$  if  $y = \frac{ax+b}{cx+d}$  [OR]

18. Find  $\frac{dy}{dx}$  if  $y = \log(\sec x + \tan x)$

**UNIT V**

19. If  $y = A \cos 5x + B \sin 5x$  then show that  $\frac{d^2 y}{dx^2} + 25y = 0$  [OR]

20. Find  $\frac{\partial u}{\partial x}$  &  $\frac{\partial u}{\partial y}$  if  $u = x^2 \sin y + y^2 \sin x$

**PART-C (Answer any one question out of two from each unit (5x10)= 50 marks)**

**UNIT I**

21. a. Solve the equations  $x-2y-z=-6$ ,  $3x+y+2z=11$  and  $2x-3y+2z=2$  using Cramer's Rule.

b. Find the inverse of the matrix  $\begin{bmatrix} 3 & 4 & 1 \\ 0 & -1 & 2 \\ 5 & -2 & 6 \end{bmatrix}$

[OR]

22. a. Find the Rank of the matrix  $\begin{bmatrix} 1 & 1 & 1 & 3 \\ 2 & -1 & 3 & 4 \\ 5 & -1 & 7 & 11 \end{bmatrix}$

b. Find the term independent of x in the expansion  $\left(2x^2 - \frac{1}{x}\right)^{12}$

**UNIT II**

23. a. Find the real and imaginary parts of  $\frac{(1+i)(2+i)}{(3+i)}$

b. Prove that the points  $2-2i$ ,  $8+4i$ ,  $5+7i$  and  $-1+i$  form a rectangle in argand diagram.

[OR]

24. a. Simplify using Demoivre's theorem:  $\frac{(\cos 2\theta - i \sin 2\theta)^4 (\cos 4\theta + i \sin 4\theta)^{-5}}{(\cos 3\theta + i \sin 3\theta)^2 (\cos 5\theta - i \sin 5\theta)^{-3}}$

b. Solve:  $x^4 - 1 = 0$

**UNIT-III**

25. a. If A & B be acute angles and if  $\sin A = \frac{1}{\sqrt{10}}$   $\sin B = \frac{1}{\sqrt{5}}$  then prove that  $A+B = \frac{\pi}{4}$

b. Prove that  $\frac{\sin 3A}{\sin A} - \frac{\cos 3A}{\cos A} = 2$

[OR]

26. a. If  $A+B+C = \pi$  then prove that  $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$

b. Prove that  $(\cos \alpha + \cos \beta)^2 + (\sin \alpha + \sin \beta)^2 = 4 \cos^2 \left(\frac{\alpha + \beta}{2}\right)$

**UNIT - IV**

27. a. Evaluate: (i)  $\lim_{\theta \rightarrow 0} \frac{\sin 7\theta}{\sin 4\theta}$  (ii)  $\lim_{x \rightarrow 3} \frac{x^5 - 243}{x - 3}$

b. Find  $\frac{dy}{dx}$  if (i)  $y = x^5 + 3x^2 + 5 \log x + 2e^x$  (ii)  $y = (3x^2 - 5x + 2) \sin x$

[OR]

28. a. Find  $\frac{dy}{dx}$  if (i)  $y = \frac{x + \cos x}{1 - \sin x}$  (ii)  $y = xe^x \log x$

b. Find  $\frac{dy}{dx}$  if (i)  $y = \sin^{-1} \left(\frac{2x}{1+x^2}\right)$  (ii)  $xy = c^2$

**UNIT - V**

29. a. If  $y = \frac{2x+3}{4x+5}$  then find  $\frac{d^2y}{dx^2}$

b. If  $y = x^2 \cos x$  then prove that  $x^2 y_2 - 4xy_1 + (x^2 + 6) = 0$

[OR]

30. a. If  $u = 2x^3 + 2y^3$  find  $\frac{\partial^2 u}{\partial x^2}$  and  $\frac{\partial^2 u}{\partial y^2}$

b. If  $u = \tan^{-1} \left(\frac{x^3 + y^3}{x+y}\right)$  then show that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$

To be implemented from the academic year 2016- 2017

Course Name : Common to all first year diploma students  
 Subject Code& Name : GEM 13 Engineering Physics - I  
 Semester : First

TEACHING & SCHEME OF EXAMINATION: No of weeks per semester: 15

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours/ Semester	Marks			
			Continuous Assessment	End Semester	Total	
Engineering Physics- I	5	75	25	75	100	3Hrs.

**Topics and Allocation of Hours:**

UNIT	Topic	Time (Hrs)
I	S I UNITS AND STATICS	15
II	PROPERTIES OF MATTER	15
III	DYNAMICS – I	15
IV	DYNAMICS – II	15
V	SOUND AND MAGNETISM	15
Total		75

**RATIONALE:**

The exponential growth of Engineering and Technology has benefited the mankind with extreme sophistication and comfort. To sustain this development, continuous research and development should take place not only in Engineering and Technology but also in Basic Science such as Physics. The various divisions of Physics like Optics, Acoustics, Dynamics, Semiconductor Physics, Surface Physics, Nuclear Physics, Energy Studies, Materials Science, etc provide the Foundation by enlightening the **Fundamental facts, Principles, Laws and Correct sequence of events** to develop the Engineering and Technology field for the prosperity of human beings.

**OBJECTIVES:**

- Understand the importance of SI units and dimensional formulas.
- Acquire broad ideas about resultant, moment of a force and torque of a couple.
- Understand the elastic property and the types of moduli of elasticity.
- Explain the surface tension of liquids and viscosity of fluids.
- Acquire knowledge about projectile motion, circular motion and its application.
- Gain knowledge about rotational kinetic energy and angular momentum.
- Acquire broader ideas about variation of acceleration with respect to height and its importance in launching satellites and concept of weightlessness.
- Understand the propagation of sound and acoustics of buildings.
- Explain the importance of hysteresis of magnetic materials and its uses.



## Detailed syllabus

Unit	NAME OF THE TOPIC	Hours
	<p><b>S I UNITS AND STATICS</b></p> <p><b>1.1 UNITS AND MEASUREMENT</b>            Unit-Definition-Fundamental Quantities-Definition-Seven fundamental quantities; their SI units and symbol for the units-Dimensional formula for length, mass and time -Supplementary quantities-plane angle and solid angle; their SI units and symbol for the units.            Derived physical quantities-Definition-SI units, symbol for the units and derivation of dimensional formula for area, volume, density, velocity, momentum, acceleration, force, impulse, work or energy and power.            Conventions followed in SI-Multiples &amp; sub-multiples and prefixes of units.</p> <p><b>1.2 STATICS</b>            Scalar and vector quantities – Definitions and examples – Concurrent forces and coplanar forces – Definition - Resolution of a vector into two perpendicular components- Resultant and equilibrant – Definitions- Parallelogram law of forces- statement- Expressions for magnitude and direction of the resultant of two forces acting at a point with an acute angle between them - Lami’s theorem- Statement and explanation- Experimental verification of parallelogram law of forces and Lami’s theorem. Simple problems based on expressions for magnitude and direction of resultant. Moment of a force- Clockwise and anti-clockwise moments - Principle of moments- Couple – Torque acting due to a couple – Experimental determination of mass of the given body using principle of moments.</p>	6
I		9
	<p style="text-align: center;"><b>PROPERTIES OF MATTER</b></p> <p><b>2.1 ELASTICITY</b>            Elastic and plastic bodies – Definition - stress, strain - Definitions – Hooke’s law –statement - three types of strain– Elastic and plastic limit – Elastic behavior of a material, stress- strain curve , elastic range, elastic limit, yield point, plastic limit and breaking point - Young’s modulus, Bulk modulus, Rigidity modulus and Poisson’s ratio – Definitions - Uniform and non uniform bending of beams- Explanation. Simple problems based on stress, strain and Young’s modulus.</p> <p><b>2.2 VISCOSITY</b>            Viscosity – Definition - Coefficient of viscosity- Definition, SI unit and dimensional formula - Stream line flow, turbulent flow-Explanation - Critical velocity –Definition- Reynolds number - Experimental comparison of coefficient of viscosity of two low viscous liquids – Terminal velocity – Definition – Experimental determination of coefficient of viscosity of a high viscous liquid by Stokes’ method – Practical applications of viscosity.</p> <p><b>2.3 SURFACE TENSION</b>            Surface tension &amp; angle of contact- Definitions -Explanation for capillary rise and dip - Expression for surface tension of a liquid by capillary rise method - Experimental determination of surface tension of water by capillary rise method – Practical applications of capillarity. Simple problems based on expression for surface tension.</p>	5
II		5
		5

<p style="text-align: center;"><b>III</b></p>	<p><b>DYNAMICS – I</b></p> <p><b>3.1. PROJECTILE MOTION</b></p> <p>Introduction – Newton’s Laws of motion – Fundamental Equations of motion for objects – horizontal motion – falling freely – thrown vertically upwards. Projectile motion, angle of projection, trajectory, maximum height, time of flight, and horizontal range – Definitions - Expressions for maximum height, time of flight and horizontal range – Condition for getting the maximum range of the projectile- Derivation of the equation to show that the trajectory of the projectile is a parabola. Simple problems based on expressions for maximum height, time of flight and horizontal range.</p> <p><b>3.2 CIRCULAR MOTION</b></p> <p>Circular motion, angular velocity, period and frequency of revolutions– Definitions – Relation between linear velocity and angular velocity – Relation between angular velocity, period and frequency – Normal acceleration, centripetal force and centrifugal force – Definitions – Expressions for normal acceleration and centripetal force. Simple problems based on expression for centripetal force.</p> <p><b>3.3 APPLICATION OF CIRCULAR MOTION</b></p> <p>Banking of curved paths – Angle of banking – Definition – Expression for the angle of banking of a curved path. { <math>\tan \theta = v^2 / (r g)</math> } Simple problems based on expression for angle of banking.</p>	<p style="text-align: center;">6</p> <p style="text-align: center;">5</p> <p style="text-align: center;">4</p>
<p style="text-align: center;"><b>IV</b></p>	<p><b>DYNAMICS – II</b></p> <p><b>4.1 ROTATIONAL MOTION OF RIGID BODIES</b></p> <p>Rigid body – Definition - Moment of inertia of a particle about an axis, moment of inertia of a rigid body about an axis – expressions – Radius of gyration – Definition – Expression for the kinetic energy of a rotating rigid body about an axis – Angular momentum – Definition – Expression for the angular momentum of a rotating rigid body about an axis – Law of conservation of angular momentum – Examples.</p> <p><b>4.2 GRAVITATION</b></p> <p>Newton’s laws of gravitation – Acceleration due to gravity on the surface of earth –Difference between mass and weight of a body – Expression for variation of acceleration due to gravity with altitude – Concept of weightlessness.</p> <p><b>4.3 SATELLITES</b></p> <p>Satellites – Natural and artificial – Escape velocity and orbital velocity – Definitions – Expression for escape velocity – Expressions for orbital velocity and period of revolution of a satellite around earth – Geo-stationary and polar satellites – Uses of artificial satellites.</p> <p>Simple problems based on expressions for escape velocity, orbital velocity and period of revolution.</p>	<p style="text-align: center;">6</p> <p style="text-align: center;">4</p> <p style="text-align: center;">5</p>

<b>V</b>	<p><b>SOUND AND MAGNETISM</b></p> <p><b>5.1 SOUND</b></p> <p>Wave motion – Introduction and definition – Progressive waves, longitudinal and transverse waves – Examples and comparison – Amplitude, wave length, period and frequency of a wave – Definitions - Relation between wavelength, frequency and velocity of a wave - Stationary or standing waves.</p> <p>Vibrations - Free &amp; forced vibrations and resonance – definitions and examples –Laws of transverse vibrations of a stretched string – Sonometer – Experimental determination of frequency of a tuning fork.</p> <p>Acoustics of buildings – Echo – Reverberation, Reverberation time Sabine’s formula for reverberation time(no derivation) - Coefficient of absorption of sound energy - Noise pollution. Simple problems based on expression for frequency of vibration.</p>	9
	<p><b>5.2 MAGNETISM</b></p> <p>Coulomb’s laws of magnetism – Pole strength and unit pole – Definitions – Magnetic moment, intensity of magnetization, hysteresis, saturation, retentivity and coercivity – Definitions - Method of drawing hysteresis loop of a specimen using a solenoid – Uses of Hysteresis loop. Simple problem based on intensity of magnetization.</p>	6

**Text Book:**

- 1) Higher secondary Physics – First year – Volume I & II – Tamil Nadu text book Corporation, Chennai.
- 2) Anwar Kamal - Intermediate physics – Volume I & II– Foundation books PrivateLtd.
- 3) P.Indira&M.Eswari-Engineering physics I –Saravana publishers.

**Reference Book:**

- 1) Resnick and Haliday -- Physics — Wisley Toppan publishers – England
- 2) B.L.Theraja- Engineering Physics — S. Chand Publishers, New Delhi.
- 3) R.L. Saighal& H.R. Sarna -- A text book of sound — S. Chand & Co., New Delhi .
- 4) Narayana Kurup --Mechanics — S. Chand Publishers, New Delhi.
- 5) Srivatsava – Electricity and Magnetism - S. Chand & Co., New Delhi.

## MODEL QUESTION PAPER

### GEM 13: ENGINEERING PHYSICS – I

Time: 3 Hrs

Max.Marks: 75

#### Part – A

(Marks 10 x 1 = 10)

**Answer all the questions:**

1. Define fundamental quantities.
2. Give the SI units for Impulse and work.
3. Define coefficient of viscosity.
4. Define angle of contact.
5. Define angle of projection.
6. Define normal acceleration.
7. Define radius of gyration.
8. Define angular momentum.
9. Define reverberation time.
10. Define intensity of magnetization.

#### Part–B

(Marks 5 x 3 = 15)

**Answer any one question from each unit. All questions carry equal marks.**

#### UNIT – I

11. The resultant of two equal forces inclined to each other at  $90^\circ$  is  $10\sqrt{2}$  N. Find the component forces.

[OR]

12. Describe the experiment to determine the mass of the given body using principle of moments.

#### UNIT – II

13. Distinguish between stream line motion and turbulent motion.

[OR]

14. Write a note on practical applications of viscosity.

#### UNIT – III

15. Derive the relation between angular velocity and linear velocity.

[OR]

16. Explain centripetal force and centrifugal force.

#### UNIT - IV

17. Derive an expression for the acceleration due to gravity on the surface of the earth.

[OR]

18. Give any four uses of artificial satellites.

#### UNIT – V

19. The density of sonometer wire of radius 0.25mm is  $7800 \text{ kg m}^{-3}$ . find the linear density of the wire

[OR]

20. The length, breadth and thickness of a bar magnet are 200mm, 15mm and 10mm respectively. If its magnetic moment is  $7.5 \times 10^{-6} \text{ Am}^2$ , calculate the intensity of magnetization

**Part – C**

**(Marks 5 x 10 = 50)**

**Answer any one question from each unit. All the questions carry equal marks.**

**UNIT – I**

21. Write the conventions to be followed in SI units

**[OR]**

22. Describe the experiment to verify parallelogram law of forces.

**UNIT – II**

23. A wire of length 10m and area of cross section  $1.2 \text{ cm}^2$  elongates by 1.6 cm when 5 kg is

suspended from it. Calculate (i) Stress (ii) strain and (iii) Young's modulus of the wire ( $g=9.81 \text{ ms}^{-2}$ )

**[OR]**

24. Derive an expression for the surface tension of a liquid in the case of capillary rise.

**UNIT – III**

25. Prove that the path of projectile is a parabola.

**[OR]**

26. Derive an expression for the angle of banking of a curved path.

**UNIT – IV**

27. Derive an expression for kinetic energy of a rigid body rotating about an axis.

**[OR]**

28. Derive the expressions for the orbital velocity and period of revolution of a satellite.

**UNIT – V**

29. Write a note on acoustics of buildings.

**[OR]**

30. Describe the method of drawing hysteresis loop of a specimen using a solenoid.

**To be implemented from the Academic year 2016-2017**

**Course Name** : Common to all first year diploma students  
**Subject Code& Name** : GEM 14 ENGINEERING CHEMISTRY- I  
**Semester** : First

**TEACHING AND SCHEME OF EXAMINATION:** No of Weeks per Semester: 15

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours/ Semester	Marks			
			Continuous Assessment	End Semester	Total	
Engineering Chemistry- I	5	75	25	75	100	3Hrs.

**Topics and Allocation of Hours:**

Unit No	Topics	Time (Hrs)
I	Atomic Structure, Molecular mass, Acids and Bases and pH scale.	15
II	Solutions, Colloids, Nano –Particles	15
III	Technology of Water, Catalysis, Glass	15
IV	Electrochemistry, Energy Sources, Photochemistry	15
V	Corrosion, Methods of Prevention of corrosion, Organic coatings	15
Total		75

**RATIONALE:**

The subject Engineering Chemistry creates foundation for understanding basic concepts of chemistry and its effects on Engineering Materials. Engineering Chemistry also imparts knowledge of properties of materials and protecting them from corrosion and selecting right types of materials used in various fields of Engineering and Industry.

**OBJECTIVES:**

**The objective of this Course is to make the student:**

- To study about the importance of Engineering Chemistry in industry.
- To acquire knowledge about atomic structure, molecular mass, acids and bases.
- To gain knowledge about solutions, colloidal particles and nano-particles.
- To enhance their knowledge about hardness of water, catalysis and glass.
- To explain the details of electrochemistry, energy sources and photochemistry.
- To study about the importance of corrosion and its prevention methods.

## Detailed Syllabus

Unit	Name of the Topics	Hours
I	<p><b>ATOMIC STRUCTURE, MOLECULAR MASS, ACIDS AND BASES AND pH SCALE</b></p> <p><b>1.1 ATOMIC STRUCTURE</b></p> <p>Atom-Definition-Fundamental particles of Atom-their Mass, charge and location- - Atomic number and Mass number-Definition-Isotopes and Isobars- Definition with suitable examples-Formation of cation and anion by electronic concept of oxidation and reduction-Octet rule- Formation of electrovalent compound (NaCl)- Formation of covalent compound (NH<sub>3</sub>).</p> <p><b>1.2 MOLECULAR MASS</b></p> <p>Molecule - Molecular formula - Molecular Mass – Mole – Definition - Simple calculations - Avogadro's Hypothesis Application - Relationship between Molecular Mass and Vapour Density - Avogadro's Number – Definition - Simple Problems.</p>	5
I	<p><b>1.3 ACIDS &amp; BASES and pH SCALE</b></p> <p>Theories of Acids and Bases – Arrhenius Theory – Lowry Bronsted Theory – Lewis Theory – Advantages of Lewis theory –Definition of pH and pOH – Numerical problems – Indicators – Acid-base concept of indicators (Basic ideas) – Buffer Solution – Definition – Types and examples – Application of pH control in industries</p>	5
II	<p><b>SOLUTIONS, COLLOIDS, NANO-PARTICLES</b></p> <p><b>2.1. SOLUTIONS</b></p> <p>Definition – Methods of Expressing Concentrations of solutions: Percentage by mass and volume, Molarity, Molality, Mole-fraction and Normality – Simple numerical problems.</p> <p><b>2.2 COLLOIDS</b></p> <p>True solutions and colloidal solutions - Definition – Differences between true and colloidal solutions –Types of Colloidal solutions – Sols – Lyophilic and Lyophobic sols and differences between them – Properties – Tyndall Effect, Brownian Movement, Electrophoresis and Coagulation – Industrial applications – Smoke precipitation (Cottrell's Method), Purification of drinking water, Cleaning action of soap, Disposal of sewage and Tanning of leather.</p> <p><b>2.3NANO-PARTICLES</b></p> <p>Definition-Importance of Nano particles-Area of application-Medicine, Electronics and Biomaterials.</p>	7
II	<p><b>2.3NANO-PARTICLES</b></p> <p>Definition-Importance of Nano particles-Area of application-Medicine, Electronics and Biomaterials.</p>	6
II	<p><b>2.3NANO-PARTICLES</b></p> <p>Definition-Importance of Nano particles-Area of application-Medicine, Electronics and Biomaterials.</p>	2
III	<p><b>TECHNOLOGY OF WATER, CATALYSIS, GLASS</b></p> <p><b>3.1 TECHNOLOGY OF WATER</b></p> <p>Sources – depletion of underground water - reasons – Rainwater harvesting (Basic ideas) – advantages – hard and soft water – Hardness of water - carbonate, non-carbonate hardness – methods of expressing hardness – mg/litre, ppm – simple problems – Estimation of total hardness by EDTA method – problems involving total, carbonate, non-carbonate hardness in ppm – softening of hard water – Ion-exchange method, Reverse Osmosis method – Municipal water supply – purification (sedimentation, filtration and sterilization) – Disadvantages of hard water in boilers – Scale formation, Corrosion of boiler metal, Caustic Embitterment – Priming and Foaming.</p>	10

III	<b>3.2 CATALYSIS</b> Catalyst- positive catalyst-Negative Catalyst- Definition-Types of catalysis- Homogeneous and Heterogeneous- promoter-catalyst poison-Definition- Characteristics of a catalyst- Industrial applications of catalyst.	3
	<b>3.3 GLASS</b> Definition- Manufacture of Glass-varieties of Glass-Optical Glass, Windshield Glass and photo chromatic Glass.	2
IV	<b>ELECTROCHEMISTRY, ENERGY SOURCES AND PHOTOCHEMISTRY</b> <b>4.1 ELECTROCHEMISTRY</b> Electrolytes – Differences between metal and electrolyte conduction - Strong and weak electrolytes – Definition – examples – Electrolysis – definition – mechanism – Industrial applications of electrolysis –electroplating –preparation of surface – factors affecting the stability of the coating – Chrome plating – Electroless plating – definition – advantages over electroplating – applications of Electroless plating.	7
	<b>4.2 ENERGY SOURCES</b> Primary, Secondary and fuel batteries – Primary battery – definition and example – Dry cell – construction and working – Secondary battery - definition and example – Lead acid storage cell – construction and working – Nickel/Cadmium battery - construction and working – Fuel cell - definition and example – H <sub>2</sub> /O <sub>2</sub> fuel cell (green cell) –Non conventional Energy sources- Solar cells – Definition-principle, construction, working and uses.	6
	<b>4.3 PHOTOCHEMISTRY</b> Introduction – important terms- charge transfer, electronic energy migration, emission, excited state, frequency, ground state, fluorescence, Phosphorescence, chemiluminescence.	2
V	<b>CORROSION, METHODS OF PREVENTION OF CORROSION, ORGANIC COATINGS</b> <b>5.1 CORROSION</b> Definition –types – Theories of corrosion – Galvanic cell formation theory – Differential aeration theory – Factors influencing rate of corrosion.	5
	<b>5.2 METHODS OF PREVENTION OF CORROSION</b> Control of environment – Alloying, Surface coating – Metal coating – Electroplating, Galvanisation and Tinning – Inorganic coating – Anodising and Phosphating – Cathodic protection – Sacrificial anode and Impressed Voltage methods.	5
	<b>5.3 ORGANIC COATINGS</b> Paints – definition – components of paints and their functions – Varnish – Definition – types – preparation of oil varnish – Difference between paint & varnish – special paints – Luminescent, heat resistant, fire retardant, Anti – fouling paints – cement paint, aluminium paint & distemper.	5

**Text Book:**

Engineering Chemistry I for Polytechnic college-K.Rajalakshmi&T.Kanmani – Saravana Publishers.



## Reference Books

1. Soni PL - Inorganic chemistry – Sultan Chand & sons.
2. Soni PL - Organic chemistry - Sultan Chand & sons.
3. Jain & Jain - Engineering chemistry - Dhanpat rai & co
4. Uppal - Engineering chemistry - Khanna publishers
5. Dara .S.S - Environmental chemistry & Pollution control - S.Chand& co
6. Tripathy .S.N - Environmental Pollution - Sunakar panda – Vrinda Publication
7. Rain water Harvesting-hand book by Chennai Metro Water
8. Higher Chemistry Book Volume I and II, Tamilnadu Text Book Corporation, Chennai.

**GEM 14 ENGINEERING CHEMISTRY I**  
**MODEL QUESTION PAPER**

**Time: 3 Hrs**

**Max Marks: 75**

- Note: 1. Answer all questions in Part-A (1 mark each)  
2. Answer any one question from each Unit in Part-B (3 mark each)  
3. Answer any one question from each Unit in Part-C (10 mark each)

**PART- A** (10 x 1 = 10)

1. Define Isotope.
2. What is a Lewis base?
3. Define normality of a solution.
4. What are nano particles?
5. What is a positive catalyst? Give example.
6. Define non carbonate hardness of water.
7. What is electroless plating?
8. Define a fuel cell.
9. Define tinning.
10. Give the difference between paint and varnish.

**PART- B**(Marks 5x (1 x 3) = 15)

**Unit I**

11. Explain the Lowry Bronsted theory of acids and bases.

**OR**

12. Explain the formation of covalent bond with a suitable example.

**Unit II**

13. Calculate the concentration of a solution of sulphuric acid in normality containing 1.85g of acid in 200ml of the solution.

**OR**

14. List the differences between lyophilic and Lyophobic sols.

**Unit III**

15. Give reasons for the depletion of under ground water.

**OR**

16. Give the characteristics of a catalyst.

**Unit IV**

17. What are solar cells? Explain.

**OR**

18. What is chemiluminescence? Give example.

**Unit V**

19. Name the factors that affect the rate of corrosion.

**OR**

20. Write notes on heat resistant paint.

**PART- C (10x5 = 50)**

**Unit I**

21. a. Explain the formation of sodium chloride.  
b. Calculate the number of molecules of methane present in 5g of Methane.

**OR**

22. a. Give the industrial applications of maintenance of pH.  
b. Derive the relationship between molecular mass and vapour density.

**Unit II**

23. a. Calculate the molarity of a solution containing 2.85 g of urea [CO (NH<sub>2</sub>)<sub>2</sub>] in 150ml of solution.  
b. Describe Cottrell's Electrostatic precipitator with a neat diagram.

**OR**

24. a. Explain the optical and mechanical properties of colloids.  
b. Give the applications nano particles in medical field.

**Unit III**

25. a. How is hard water softened by demineralisation method?  
b. Give the industrial applications of catalyst.

**OR**

26. a. How is hard water softened by reverse osmosis method?  
b. Explain the manufacture of glass.

**Unit IV**

27. a. Define electrolysis. Explain the mechanism of electrolysis with a neat diagram.  
b. Explain chrome plating with a neat diagram.

**OR**

28. a. Define Electrochemical series. Give the significance of electrochemical series.  
b. Explain the construction, working and uses of lead acid storage cell.

**Unit V**

29. a. Explain galvanic cell formation theory of corrosion.  
b. Explain anodisation and phosphating with suitable example.

**OR**

30. a. Describe the cathodic protection methods of prevention of corrosion.  
b. List the components of paint and give its functions.

**To be implemented from the Academic year 2016 - 2017**

**Course Name** : Common to all first year diploma students

**Subject Code& Name** : GEM 15 Engineering Physics –I Practical

**Semester** : First

**Teaching and Scheme of Examination**

**No. of weeks per semester: 15**

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Continuous Assessment	End Semester	Total	
<b>Engineering Physics – I Practical</b>	2	30	25	75	100	3 Hrs

**RATIONALE:**

In diploma level engineering education skill development plays a vital role. The skill development can be achieved by on hand experience in handling various instruments, apparatus and equipment. This is accomplished by doing engineering related experiments in practical classes in various laboratories.

**GUIDELINES:**

- All the Nine experiments given in the list of experiments should be completed and given for the end semester practical examination.
- In order to develop best skills in handling Instruments / Equipments and taking readings in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitting a batch of 30 students during Board Examinations.

**List of Experiments with objectives:**

**1. MICROMETER (SCREW GAUGE).**

To measure the thickness of the given irregular glass plate using micrometer. To determine the area of the glass plate using a graph sheet and to calculate the volume of the glass plate.

**2. VERNIER CALIPERS**

To measure the length and diameter of the given solid cylinder using vernier calipers and to calculate the volume of the solid cylinder.

**3. CONCURRENT FORCES**

To verify the parallelogram law of forces and Lami's theorem.

**4. PRINCIPLE OF MOMENTS**

To determine the mass of the given body using principle of moments.

**5. COMPARISION OF VISCOSITIES**

To compare the coefficient of viscosities of two low viscous liquid by capillary flow method.

## 6. STOKES' METHOD

To determine the coefficient of viscosity of a high viscous liquid.

## 7. SURFACE TENSION

To determine the surface tension of water by capillary rise method.

## 8. SONOMETER

To determine the frequency of the given tuning fork.

## 9. DEFLECTION MAGNETOMETER

To compare the magnetic moments of the two bar magnets using deflection magnetometer in  $\tan A$  position, by equal distance method.

## SCHEME OF EVALUATION

S.No	Allocation	Marks
1	Formula with Explanation	10
2	Figure/ Circuit Diagram with parts & Tabular column with proper Units	15
3	Observations	35
4	Calculations	10
5	Result	05

**GEM 15 ENGINEERING PHYSICS - I PRACTICAL  
MODEL QUESTION PAPER**

**3 HOURS**

1. Measure the thickness of the given irregular glass plate using micrometer. Determine the area of the glass plate using a graph sheet and calculate the volume of the glass plate.
2. Measure the length and diameter of the given solid cylinder using vernier calipers and then calculate the volume of the solid cylinder.
3. Verify the parallelogram law of forces and Lami's theorem using concurrent forces.
4. Determine the mass of the given body using principle of moments.
5. Compare the coefficient of viscosities of two low viscous liquid by capillary flow method
6. Determine the coefficient of viscosity of a high viscous liquid by Stokes' method.
7. Determine the surface tension of water by capillary rise method.
8. Determine the frequency of the given tuning fork using sonometer.
9. Compare the magnetic moments of the two bar magnets using deflection magnetometer in Tan-A position, by equal distance method.

To be implemented from the Academic year 2016-2017

Course Name : Common to all first year diploma students  
Subject Code & Name : GEM16 ENGINEERING CHEMISTRY-I PRACTICAL  
Semester : First

Teaching and Scheme of Examination

No of Weeks per Semester: 15 weeks

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours / Semester	Marks			
			Continuous Assessment	End Semester	Total	
ENGINEERING CHEMISTRY- I PRACTICAL	2	30	25	75	100	3 Hrs

#### RATIONALE:

All matter is made up of chemicals. Knowledge of chemistry is essential to study all branches of Engineering in order to know about the different engineering materials used in day-to-day life and in different branches of study. The amount of chemical substances present in a given sample is taught through Quantitative analysis. The quantity analysis is introduced through Volumetric analysis in the first semester of the study.

#### OBJECTIVE:

- To impart knowledge about volumetric analysis in Acidimetric, Alkalimetry and Permanganometry.
- To give knowledge about estimation of hardness present in the water.
- To give knowledge about measurement of pH in various solutions.
- 

#### Acidimetry and Alkalimetry:

1. Estimation of sodium hydroxide.
2. Estimation of sodium carbonate.
3. Estimation of sulphuric acid.
4. Estimation of oxalic acid.
5. Comparison of Sodium hydroxide solutions.
6. Comparison of Sulphuric acid solutions.
7. Comparison of Hydrochloric acid solutions.

#### Permanganometry

8. Estimation of ferrous sulphate.
9. Estimation of Mohr's salt.
10. Comparison of potassium permanganate.

#### Water Analysis

11. Estimation of total hardness of a water sample using EDTA.
12. Determination of pH using a pH meter and calculation of hydrogen ion concentrations in the solutions.

**Reference Books:**

1. Vogel – Analytical chemistry – Pearson publications.
2. Dr.Sudha rani – Laboratory manual on engineering chemistry Dhanpat rai publications.
- 3.

**SCHEME OF EVALUATION**

S.No	Allocation	Marks
1	Short Procedure	10
2	I Titration (within 2% error)	25
3	II Titration (within 2% error)	25
4	Calculations (3*5=15)	15
Total		75



## GEM 16 ENGINEERING CHEMISTRY I PRACTICAL

### PRACTICAL MODEL QUESTION PAPER

#### MODEL 1:

3 Hours

Estimate the amount of ferrous sulphate present in 500ml of the given solution using a standard solution of ferrous ammonium sulphate of strength 0.0989N and an approximately decinormal solution of potassium permanganate.

#### MODEL2:

Calculate the total hardness of the given sample of water using a standard hard water solution of molarity 0.01 M and an approximately decimolar solution of EDTA.

#### MODEL3:

Determine the pH of five given samples using pH meter and calculate the hydrogen ion concentration of the samples.

**To be implemented from the Academic year 2016-2017**

**Course Name** : Common to all first year diploma students  
**Subject Code & Name** : GEM17 ENGINEERING GRAPHICS – I PRACTICAL  
**Semester** : First

**TEACHING AND SCHEME OF EXAMINATION**

**No. of weeks per semester: 15**

Subject	Instructions		Examination			Duration
	Hours/Week	Hours / Semester	Marks			
			Continuous Assessment	End Semester	Total	
<b>Engineering Graphics Practical-I</b>	6	90	25	75	100	3 Hrs

**Topics and Allocation of Hours**

Topics	Details	Hours
a)	Drawing office practice, Lettering and Dimensions. Introduction to Orthographic Projection, Geometric Constructions, Construction of Polygon (Manual Drafting and Computer Aided Drafting)	15
b)	Practice on CAD	16
c)	Constructions of conic sections. (Manual Drafting and	15
d)	Computer Aided Drafting)	
e)	Constructions of special curves. (Manual Drafting)	10
f)	Projection of points and	
g)	straight lines. (Manual Drafting)	17
h)	Projection of solids. (Manual Drafting and Computer Aided Drafting)	17
	Total	90

**RATIONALE:**

Engineering graphics is a basic subject for all branches of Diploma Engineering and Technology. Since engineering drawing is considered as the language of engineers, the proper understanding and practice is required with proper instruments.

This subject is aimed at providing basic understanding of the fundamentals of Engineering Drawing; mainly visualization, graphics theory, standards & conventions of drawing, the tools of drawing and the use of Drawings in engineering applications.

The topics covered are based on the syllabus for Diploma studies in engineering. The subject is planned to include sufficient practices which would help the student in visualization of three dimensional objects and developing the drawing.

The chapters are arranged in sequence and starts from the basic concepts of geometrical constructions & engineering curves, proceeds to the principles of projection techniques. By the end of the subject it is expected that the students would be matured to visualize any engineering component by reading an engineering drawing.

**OBJECTIVES:**

- Ability to make free-hand sketching of objects.
- Able to dimension the shape details clearly.
- To construct conicsection and special curves in manual and CAD.
- To understand the concepts and draw the projection of solids.

**DETAILED SYLLABUS**

Topics	Details	Hours
<p>a)</p> <p>b)</p>	<p><b>Drawing office practice</b> (Manual Drafting and Computer Aided Drafting)            Importance of engineering drawing – drawing instruments: drawing board, mini drafter, compass, divider, protractor, drawing sheets etc., - layout of drawing sheets.            Importance of legible lettering and numbering – single stroke letters – upper case and lower case letters-general procedures for lettering and numbering – height of letters – guidelines.            Introduction to Orthographic Projection.</p> <p><b>Dimensioning</b>(Manual Drafting and Computer Aided Drafting)            Need for dimensioning – terms and notations as per BIS – Dimension line, Extension line and Leader line – Methods of dimensioning – Importance of dimensioning rules – Exercises.            Scales – Study of scales – full size scale, reduced scale and enlarged scale.</p> <p><b>Geometric Constructions</b>(Manual Drafting)            Geometric constructions: Bisect a line – bisect an arc – bisect given angle – divide straight line into number of equal parts – divide the circle into number of equal divisions – draw an arc touching two lines at any angle – draw an arc touching two arcs.</p> <p><b>Construction of Polygon.</b> (Manual Drafting).            Construct triangle, rectangle, pentagon and hexagon by side distance in various positions – construction by inscribe &amp; circumscribe a circle and by angle.</p>	<p>15</p>
<p>c)</p>	<p><b>Practice on CAD</b>            Starting Auto CAD-Setting up of a new drawing- Creating a new drawing- Drawing units -Limits - Grid and Snap-Menus and Tool Bars-Save-Open and exiting drawing.            Draw command:Line,Circle,Arc,Polygon,Ellipse,Rectangle,Hatch, Mtext, Pline.            Modify Commands- Erase – Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer, Fillet, Explode, Pedit.            Object Snap methods, Dimensions commands.            Other useful commands- Zoom, Plot, Ltype, Block, Insert, and Divide.</p>	<p>16</p>

d)	<b>Constructions of conic sections.</b> (Manual Drafting and Computer Aided Drafting) <b>Conic section:</b> Cone – conic sections- Definition of locus, focus, directrix, axis, vertex and eccentricity- Definition: ellipse and parabola Ellipse: Construction of ellipse by concentric circle method, rectangular method and eccentricity method with tangent and normal when focus and directrix are given - exercises. Parabola: Construction of parabola by rectangular method, parallelogram method and eccentricity method with tangent and normal when focus and directrix are given – exercises.	15
e)	<b>Constructions of special curves.</b> (Manual Drafting ) Special curves: Definition - constructions of cycloid – epicycloid – hypocycloid – exercises. Involutés of a circle – Archimedean spiral – helix – exercises.	10
f)	<b>Projection of points.</b> (Manual Drafting ) Projection of points – points on the different quadrants and on the reference planes.	17
g)	<b>Projection of straight lines.</b> (Manual Drafting ) Projection of straight line – parallel to one plane and perpendicular to other plane –inclined to one plane and parallel to the other plane – parallel to both the planes – inclined to both the planes-exercises.	
h)	<b>Projection of solids</b> (Manual Drafting and Computer Aided Drafting) Introduction – important terms – classification of solids – polyhedron -- solids of revolution. Projections of solids in simple positions – axis parallel to one plane and perpendicular to other plane – axis inclined to one plane and parallel to other plane – axis parallel to both planes – exercises in prisms, pyramids, cylinder and cone.	17

**Text Books:**

1. GEM 17 Engineering Graphics-I, Murugappa Polytechnic College, 2016

**Reference Books:**

1. Gill P.S., “Engineering drawings”, S.K.Kataria& Sons.
2. Bhat N.D. “Engineering drawings”, Charotar Publishing house.
3. Gopalakrishnan.K.R., “Engineering drawing”, (Vol.I and vol.II), Dhanalakshmi publishers, Ed.2, 1970
4. Venugopal.K,Sreekanjana G, “Engineering Graphics” New Age International Publishers.
5. K V Nataraajan “A Text Book of Engineering drawing”.

### LIST OF EXERCISES:

- |  |   |
|--|---|
| a) Lettering Practice:                                 | 1.Exercise on Manual Drawing<br>2. Exercise on CAD    |
| b) Dimensioning Practice & :<br>Geometric construction | 3.Exercise on Manual Drawing<br>4. Exercise on CAD    |
| c) Conic section – I:                                  | 5.Exercise on Manual Drawing<br>6. Exercise on CAD    |
| d) Conic section – II:                                 | 7.Exercise on Manual Drawing<br>8. Exercise on CAD    |
| e) Special curves:                                     | 9. Exercise on Manual Drawing                         |
| f) Projection of points:                               | 10. Exercise on Manual Drawing                        |
| g) Projection of lines:                                | 11. Exercise on Manual Drawing                        |
| h)Projection of solids:                                | 12. Exercise on Manual Drawing<br>13. Exercise on CAD |

### REQUIREMENTS:

Drawing Tables and Computers with AutoCAD software package.

### SCHEME OF EVALUATION

Question No.	Allocation	Marks	
		Manual	CAD
1.	a) Lettering b) Dimensioning	04 06	04 06
2.	CAD Practice (Any one special drawing)	----	10
3.	Conics(Either or Type)	07	07
4.	Special Curves (either or type)	10	----
5.	Projection of Points / Lines (Either or Type)	05	----
6.	Projection of Solids	08	08
<b>Total</b>		<b>40</b>	<b>35</b>

To be implemented from the Academic year 2016-2017

Course Name : Common to all first year diploma students  
Subject Code & Name : GEM18 BASIC COMPUTER APPLICATIONS PRACTICAL  
Semester : First

Teaching and Scheme of Examination

No. of weeks per semester: 15

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours / Semester	Marks			
			Continuous Assessment	End Semester	Total	
Basic Computer Applications Practical	3	45	25	75	100	3 Hrs

### OBJECTIVES:

- To do the basic operations on files and folders in Windows.
- To prepare the documents with pictures in a word processor using MS Office/Open Office.
- To enter the data in row-wise and column-wise including charts in a Spreadsheet
- To find the records based on the criteria in a spreadsheet
- To present the data in various formats using presentation software
- To enter the data and store the data in a database
- To generate the data report from a database

### SYLLABUS

#### OPERATING SYSTEM

Introduction – Hardware, software – types – operating systems – Graphical User Interface (GUI) – Windows – Desktop – Start – Programs – Run – Settings – Control Panel – Display, Sounds & Audio devices, Printer – Windows Explorer – files, folders - copy, paste, move, delete – Recycle bin.

#### WORD PROCESSING

File – create – templates – edit - format – alignment, font settings – Insert - Table, pictures – Page setup - print preview - mail merge

#### SPREADSHEET

Create, format – formulae – freeze - row, column – Filter records – criteria - Charts – types, insert, format, data

#### PRESENTATION

Create simple presentation – templates - Insert – table, pictures – Transitions – Sounds - Slides – insert, delete, sorting, running.

## DATABASE

Creating the database – data types - entering the data – insert, delete, update, view, sorting, filtering - data report generation of an application.

### LIST OF EXERCISES:

1. Setting the user working environments in Windows through the Control Panel.
2. Managing files and folders by using the Windows explorer.
3. Creating and formatting the content of a file in Word processor.
4. Inserting table and pictures in a Word processor files.
5. Creating a Mail-merge application in a Word processor.
6. Creating and formatting the data in a Spreadsheet
7. Calculating row-wise and column-wise data using formulae in a Spreadsheet.
8. Create a separate table based on criteria by using auto filter feature in a spreadsheet.
9. Inserting and formatting Charts for a series of data in Spreadsheet.
10. Creating a simple presentation in Presentation software
11. Prepare a presentation using table and pictures in a Presentation software
12. Creating a presentation using various transitions and sounds in Presentation software
13. Creating an application format and entering the data in a database.
14. Generating a data report of an application in a database.

SCHEME OF EVALUATION		
S.No.	Allocation	Marks
1	<b>Question</b>	
	a. Procedure	15
	b. Execution	15
	c. Output	05
2	<b>Question</b>	
	a. Procedure	15
	b. Execution	15
	c. Output	05
3	Viva voce	05
	Total	75

### Reference:

1. "GEM18 Basic Computer Applications Practical manual", Dept. of Computer Engg.

To be implemented from the academic year 2016- 2017

Course Name : Common to all first year diploma students  
 Subject Code & Name : GEM21 Engineering Mathematics II  
 Semester : Second

**TEACHING AND SCHEME OF EXAMINATION**

**No. of weeks per Semester: 15**

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Continuous Assessment	End Semester	Total	
<b>Engineering Mathematics II</b>	5	75	25	75	100	3 Hrs.

**Topics and Allocation of Hours**

Unit No.	Topics	Hours
I	Analytical Geometry	15
II	Vector Algebra – I	15
III	Vector Algebra – II	15
IV	Integral Calculus – I	15
V	Integral Calculus – II	15
	Total	75

**Rationale:**

In many fields of Engineering, there are situations where in the effects due to various factors can be calculated only in a smaller region. To calculate the total effect or effect over a larger region the Integration concept is used. Integration plays vital role in many fields of Engineering.

**Objectives:**

The student will be able to acquire knowledge of algebra of vectors and its application in finding work done, moment, volumes to acquire knowledge of Integration principles and different methods of Integration.



## DETAILED SYLLABUS

UNIT	NAME OF TOPICS	HOURS
<b>I</b>	<b>ANALYTICAL GEOMETRY</b> <b>1.1 EQUATION OF CIRCLE</b> Equation of circle – given centre and radius. General equation of circle – finding centre and radius. Equation of circle on the line joining the points $(x_1, y_1)$ and $(x_2, y_2)$ as diameter. Simple problems.	5
	<b>1.2 FAMILY OF CIRCLES</b> Concentric circles, contact of two circles (Internal and External) – Simple problems. Orthogonal circles (results only). Problems verifying the condition.	5
	<b>1.3 INTRODUCTION TO CONIC SECTION</b> Definition of a Conic, Focus, Directrix and Eccentricity. General equation of a conic $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ (statement only). Condition for conic (i) for circle: $a=b$ and $h = 0$ (ii) for pair of straight line $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix} = 0$ (iii) for parabola: $h^2 - ab = 0$ (iv) for ellipse: $h^2 - ab < 0$ and (v) for hyperbola: $h^2 - ab > 0$ . Simple problems. Pair of straight line passing through origin – simple problems.	5
<b>II</b>	<b>VECTOR ALGEBRA – I</b> <b>2.1 VECTOR – INTRODUCTION</b> Definition of vector – types, addition and subtraction of vectors. Properties of addition and subtraction. Position vector. Resolution of vector in two and three dimensions. Direction cosines, Direction ratios. Simple problems.	5
	<b>2.2 SCALAR PRODUCT OF VECTORS</b> Definition of Scalar product of two vectors – Properties - Angle between two vectors. Simple problems.	5
	<b>2.3 APPLICATION OF SCALAR PRODUCT</b> Geometrical meaning of scalar product. Work done by Force. Simple problems.	5
<b>III</b>	<b>VECTOR ALGEBRA – II</b>	5
	<b>3.1 VECTOR PRODUCT OF TWO VECTORS</b> Definition of vector product of two vectors. Geometrical meaning. Properties – Angle between two vectors - unit vector perpendicular to two vectors. Simple problems.	5
	<b>3.2 APPLICATION OF VECTOR PRODUCT OF TWO VECTORS &amp; SCALAR TRIPLE PRODUCT</b> Definition of moment of a force. Definition of scalar product of three vectors – Geometrical meaning – Coplanar vectors. Simple problems.	5

	<b>3.3 VECTOR TRIPLE PRODUCT &amp; PRODUCT OF MORE VECTORS</b> Definition of vector triple product, Scalar and Vector product of four vectors. Simple Problems.	
<b>UNIT</b>	<b>NAME OF TOPICS</b>	<b>HOURS</b>
<b>IV</b>	<b>INTEGRAL CALCULUS – I</b> <b>4.1 INTEGRATION – DECOMPOSITION METHOD</b> Introduction – Definition of Integration – Integral values using reverse process of differentiation – Integration using decomposition method. Simple problems.	5
	<b>4.2 INTEGRATION BY SUBSTITUTION</b> Integrals of the form $\int [f(x)]^n f'(x) dx$ , $n \neq -1$ , $\int \frac{f'(x)}{f(x)} dx$ and $\int F[f(x)] f'(x) dx$ . Simple problems.	5
	<b>4.3 STANDARD INTEGRALS</b> Integrals of the form $\int \frac{dx}{a^2 \pm x^2}$ , $\int \frac{dx}{x^2 - a^2}$ , $\int \frac{dx}{\sqrt{a^2 - x^2}}$ and $\int \frac{Ax+B}{ax^2+bx+c} dx$ (denominator can be factorized). Simple Problems.	5
<b>V</b>	<b>INTEGRAL CALCULUS II</b> <b>5.1 INTEGRATION BY PARTS</b> Integrals of the form $\int x \sin nx dx$ , $\int x \cos nx dx$ , $\int x e^{nx} dx$ , $\int x^n \log x dx$ and $\int \log x dx$ . Simple problems.	5
	<b>5.2 BERNOULLI'S FORMULA</b> Evaluation of the integrals $\int x^m \sin nx dx$ , $\int x^m \cos nx dx$ and $\int x^m e^{nx} dx$ where $m \leq 2$ using Bernoulli's formula. Simple problems.	5
	<b>5.3 DEFINITE INTEGRALS</b> Definition of definite integral. Properties of definite integrals – Simple problems.	5

### Text Book

Engineering Mathematics II for polytechnic colleges –E.Geethalakshmi & M. Narayana vadivoo - Saravana publisher

### Reference Book:

1. Engineering Mathematics II& III –E.Geethalakshmi& M. Narayana vadivoo- Saravana publishers.
2. Mathematics for Higher Secondary – I year and II year (Tamil Nadu Text Book Corporation)
3. Engineering Mathematics – Dr.M.K.Venkatraman, National Publishing Co, Chennai.
4. Engineering Mathematics – Dr.P.Kandasamy& Others. S.Chand& Co Ltd, New Delhi

**MODEL QUESTION PAPER**

Time: 3hrs

Max. Marks: 75

**Subject Code and Name : GEM 21 ENGINEERING MATHEMATICS II**

**Note:**

1. Answer ALL the questions in PART –A (1 mark each)
2. Answer any ONE question from each Unit in PART – B (3 marks each)
3. Answer any ONE question from each Unit in PART – C (10 marks each).

**PART-A (Answer all the questions: 10x1=10)**

1. Find the centre and radius of the circle  $x^2+y^2- 22x-4y+25=0$ .
2. Show that the equation  $x^2 + y^2 - 4xy + 4x - 4 = 0$  represents a hyperbola.
3. Find the unit vector along the vector  $3\vec{i}-2\vec{j} +\vec{k}$
4. Show that the vectors  $2\vec{i} + 3\vec{j} -\vec{k}$  and  $3\vec{i}+\vec{j} +9\vec{k}$  are perpendicular.
5. If  $|\vec{a} \times \vec{b}|=3$ ,  $|\vec{a}|=2$  and  $|\vec{b}|=4$  find the value of  $\sin\theta$  if  $\theta$  is the angles between  $\vec{a}$  and  $\vec{b}$ .
6. Find the value of  $[\vec{i} + \vec{j} \quad \vec{j} + \vec{k} \quad \vec{k} + \vec{i}]$
7. Evaluate :  $\int \tan^2 x \, dx$
8. Evaluate:  $\int \frac{dx}{9-x^2}$
9. Integrate :  $\int x e^x \, dx$
10. Evaluate:  $\int_1^3 5x^4 \, dx$

**PART-B (Answer any one question from each unit: 5x3=15 marks)**

**UNIT I**

11. Find the equation of the circle on the line joining the points (2,1) and (4,-1) as diameter.

**[OR]**

12. Prove that the circles  $x^2 + y^2 + 2x + 4y + 1 = 0$  and  $x^2 + y^2 - 5x - 14y - 34 = 0$  cut Orthogonally.

**UNIT II**

13. Show that the points with position vectors  $\vec{i}-2\vec{j} +3\vec{k}$  ,  $-2\vec{i}+3\vec{j} +2\vec{k}$  and  $-8\vec{i}+13\vec{j}$  are collinear .

**[OR]**

14. If the position vectors of the points A and B are  $\vec{i}+\vec{j} +\vec{k}$  and  $2\vec{i}+2\vec{j} +2\vec{k}$  find the modulus and direction cosines of  $\overline{AB}$ .

**UNIT III**

15. Find the volume of the parallelepiped whose co terminus sides are  $\vec{i} - \vec{j} -\vec{k}$ ,  $2\vec{i} +3\vec{j} -\vec{k}$  and  $3\vec{i} +2\vec{j} +5\vec{k}$  **[OR]**

16. If  $\vec{a} =3\vec{i}+2\vec{j} -4\vec{k}$  ,  $\vec{b} =5\vec{i}-3\vec{j} +6\vec{k}$  and  $\vec{c} = 5\vec{i}-\vec{j} +2\vec{k}$  find  $\vec{a} \times (\vec{b} \times \vec{c})$ .

**UNIT IV**

17. Evaluate:  $\int \frac{1}{1+\sin x} \, dx$  **[OR]**

18. Evaluate:  $\int \frac{dx}{(7x+3)^2+16}$ .

**UNIT V**

19. Integrate:  $x \cos 3x$  **[OR]**

20. Evaluate:  $\int x^2 e^x \, dx$

**PART-C Answer any one question out of two from each unit (5x10) = 50 marks)**

**UNIT I**

21. a) Find the equation of the circle passing through the point (2,1) and having its centre at (-3,4) b) If one end of the diameter of the circle  $x^2+y^2-10x-12y+43=0$  is (8,9) find the other end. **[OR]**
22. a) Show that the circles  $x^2+y^2-4x+6y-112=0$  and  $x^2+y^2-10x-6y+14=0$  touch each other.  
 b) Find the value of k such that the equation  $12x^2 + 9xy - 12y^2 - x + 7y + k = 0$  represents a pair of straight lines.

**UNIT II**

23. a) Prove that the points whose position vectors are  $2\vec{i}+4\vec{j}+3\vec{k}$ ,  $4\vec{i}+\vec{j}-4\vec{k}$  and  $6\vec{i}+5\vec{j}-\vec{k}$  form a right angled triangle  
 b) Using scalar multiplication of vectors find the angle between the vectors  $3\vec{i}-2\vec{j}+5\vec{k}$  and  $2\vec{i}+\vec{j}+2\vec{k}$  **[OR]**
24. a) Prove that the vectors  $2\vec{i}-2\vec{j}+\vec{k}$ ,  $\vec{i}+2\vec{j}+2\vec{k}$  and  $2\vec{i}+\vec{j}-2\vec{k}$  are mutually perpendicular vectors.  
 b) If a force  $\vec{i}+3\vec{j}-2\vec{k}$  displaces a particle from the point (1,-1,2) to the point (4,3,5) find the work done by the force.

**UNIT-III**

25. a) Find the unit vector perpendicular to both the vectors  $\vec{i}-\vec{j}+2\vec{k}$  and  $2\vec{i}+3\vec{j}-\vec{k}$ . Find also the value of sine of the angle between them  
 b) Find the torque about the point (4,3,2) of the force represented by  $5\vec{i}-4\vec{j}+2\vec{k}$  acting through the point (0,1,-3). **[OR]**
26. a) If  $\vec{a}=2\vec{i}+3\vec{j}+\vec{k}$ ,  $\vec{b}=\vec{i}-2\vec{j}+3\vec{k}$  and  $\vec{c}=3\vec{i}+2\vec{j}-5\vec{k}$  Verify that  $\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a} \cdot \vec{c}) \vec{b} - (\vec{a} \cdot \vec{b}) \vec{c}$  b) Find the area of the triangle whose position vectors of the vertices are  $2\vec{i}+3\vec{j}+4\vec{k}$ ,  $3\vec{i}+4\vec{j}+5\vec{k}$  and  $4\vec{i}+2\vec{j}+3\vec{k}$ .

**UNIT - IV**

27. a) Integrate: (i)  $(2x-1)(5x^2+6x-7)$  (ii)  $\sin 7x \cos 2x$   
 b) Integrate: (i)  $\frac{\sin^2 x}{1-\cos x}$  (ii)  $\frac{e^x - e^{-x}}{e^x + e^{-x}}$  **[OR]**
28. a) Integrate: (i)  $\frac{\tan^{-1} x}{1+x^2}$  (ii)  $\frac{1}{(x+1)^2-9}$   
 b) Integrate: (i)  $\frac{1}{x^2+5x+7}$  (ii)  $\frac{2x+5}{x^2+3x+2}$

**UNIT - V**

29. a) Integrate: (i)  $x \cos 3x$  (ii)  $x^2 \log x$   
 b) Integrate: (i)  $x^2 \sin x$  (ii)  $x^2 e^{2x}$  **[OR]**
30. a) Integrate: (i)  $x \sin 2x$  (ii)  $x^2 e^{3x}$   
 b) Evaluate:  $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x + \cos x} dx$

To be implemented from the academic year 2016- 2017

Course Name : Common to all first year diploma students  
 Subject Code & Name : GEM22 Applied Mathematics  
 Semester : Second

TEACHING AND SCHEME OF EXAMINATION: No. of weeks per Semester: 15

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Continuous Assessment	End Semester	Total	
Applied Mathematics	5	75	25	75	100	3 Hrs.

### Topics and Allocation of Hours

Unit No.	Topics	Hours
I	Probability Distribution – I	15
II	Probability Distribution – II	15
III	Application of differentiation	15
IV	Application of Integration – I	15
V	Application of Integration – II	15
	Total	75

#### Rationale:

Many of Physical Engineering Problems like vibration of two side tied strings. Heat flow, decaying of radioactive material comes only in the form of differential equation; solution of differential equation gives solution of Physical problems.

#### Objectives:

This subject helps the students to acquire knowledge of finding areas and volumes using Integration and various methods of solving first and second order differential equations. This subject also helps the students to become aware of Binomial, Poisson and Normal distributions which can be used in Quality control. Knowledge can be had in solving electronic oriented problems.

## DETAILED SYLLABUS

UNIT	NAME OF TOPICS	HOURS
<b>I</b>	<b>PROBABILITY DISTRIBUTION – I</b> <b>1.1 RANDOM VARIABLE</b> Definition of Random variable – Types – Probability mass function – Probability density function, simple problems.	5
	<b>1.2 MATHEMATICAL EXPECTATION</b> Mathematical Expectation of discrete random variable, mean and variance. Simple problems.	5
	<b>1.3 BINOMIAL DISTRIBUTION</b> Definition of Binomial distribution $P(X=x) = nC_x p^x q^{n-x}$ where $x = 0, 1, 2, \dots, n$ statement only. Expression for mean and variance. Simple problems.	5
<b>II</b>	<b>PROBABILITY DISTRIBUTION II</b> <b>2.1 POISSON DISTRIBUTION</b> Definition of Poisson distribution $P(X=x) = \frac{e^{-\lambda} \lambda^x}{x!}$ where $x = 0, 1, 2, \dots, n$ (statement only). Expressions of mean and variance. Simple problems.	5
	<b>2.2 NORMAL DISTRIBUTION</b> Definition of normal and standard normal distribution – statement only. Constants of normal distribution (Results only). Properties of normal distribution – simple problems using the table of standard normal distribution.	5
	<b>2.3 CURVE FITTING</b> Fitting of straight line using least square method (Results only). Simple problems.	5
<b>III</b>	<b>APPLICATION OF DIFFERENTIATION</b> <b>3.1 VELOCITY AND ACCELERATION</b> Velocity and Acceleration – simple problems.	5
	<b>3.2 TANGENT AND NORMAL</b> Tangent and Normal – simple problems.	5
	<b>3.3 MAXIMA AND MINIMA</b> Definition of increasing and decreasing functions and turning points. Maxima and Minima of single variable only – simple problems. – Practical problems involving maximum and minimum values.	5
<b>IV</b>	<b>APPLICATION OF INTEGRATION –I</b> <b>4.1 AREA AND VOLUME</b> Area and Volume – Area of circle, Volume of sphere and Cone – Simple problems.	5
	<b>4.2 LINEAR TYPE DIFFERENTIAL EQUATION</b> Solution of linear differential equation. Simple problems.	5
	<b>4.3 FOURIER TRANSFORMS</b> Fourier transforms - Simple problems.	5

<b>V</b>	<b>APPLICATION OF INTEGRATION – II</b> <b>5.1 SECOND ORDER DIFFERENTIAL EQUATION – I</b> Solution of second order differential equation with constant coefficient in the form $a\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = 0$ where a,b and c are constants. Simple problems.	5
	<b>5.2 SECOND ORDER DIFFERENTIAL EQUATION – II</b> Solution of second order differential equation with constant coefficient in the form $a\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = f(x)$ where a,b and c are constants and $f(x) = k e^{mx}$ . Simple problems.	5
	<b>5.3 SECOND ORDER DIFFERENTIAL EQUATION – III</b> Solution of second order differential equation with constant coefficient in the form $a\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = f(x)$ where a,b and c are constants and $f(x) = k \sin mx$ or $k \cos mx$ . Simple problems.	5

**Text Book**

Applied Mathematics –E.Geethalakshmi, & M. Narayana vadivoo - Saravana publisher

**Reference Book:**

- 1.Engineering Mathematics II, III & IV –E.Geethalakshmi, & M. Narayana vadivoo - Saravana publisher
- 2.Mathematics for Higher Secondary – I year and II year Tamil Nadu Text Book corp.
- 3.Engineering Mathematics – Dr.M.K.Venkatraman, National Publishing Co, Chennai.
- 4 .Engineering Mathematics – Dr.P.Kandasamy& Others. S.Chand& Co Ltd, New Delhi

**MODEL QUESTION PAPER**

Time : 3hrs

Max. Marks: 75

**GEM22 APPLIED MATHEMATICS**

**Note:**

1. Answer ALL the questions in PART –A ( 1 mark each)
2. Answer any ONE questions from each Unit in PART – B ( 3 marks each)
3. Answer any ONE question from each Unit in PART – C (10 marks each)
4. Normal table to be distributed

**PART-A (Answer all the questions: 10x1=10)**

1. Define random variable.
2. In a binomial distribution if  $n=9$  and  $p=1/3$ , what is its variance?
3. The variance of poisson distribution is 0.25. Find  $P(X=0)$ .
4. State the normal equations to fit the straight line  $y=mx+c$
5. If  $s= 2t^3+4t-5$ , find the initial velocity.
6. Find the slope of the tangent to the curve  $y^2= 4x$  at the point (1,2)
7. What is the area bounded by the curve  $y=x^3$ , x axis and the ordinates  $x=1$  and  $x=4$ .
8. Find the integrating factor of  $\frac{dy}{dx} + y \cot x = \operatorname{cosec} x$
9. Solve:  $(D^2-9)y=0$
10. Find the complementary function of  $(D^2 -7D+12)y=e^{5x}$

**PART-B (Answer any one question from each unit:5x3=15 marks)**

**UNIT I**

11. The mean and variance of a Binomial distribution are 16 and 8 respectively. Find  $P(x=0)$

**[OR]**

12. If a random variable X has the following probability distribution

X	1	2	3	4	5
P(X=x)	1/9	2/9	4/9	1/9	1/9

Find  $E(4X+7)$

**UNIT II**

13. A Random variable X follows poisson distribution such that  $P(X=2)=P(x=3)$ , find the mean of the distribution. **[OR]**
14. If X is normally distributed with mean 80 and S.D. 10 find  $P(70 < X < 100)$ .

**UNIT III**

15. The distance s described by a particle in time t secs is given by  $s= a \cos \frac{\pi}{2}t + b \sin \frac{\pi}{2}t$ . Show that the acceleration is always varying to distance passed over. **(OR)**
16. Find the minimum value of the function  $y=x^2-10x$

**UNIT IV**

17. Find the volume generated when the area bounded by the curve  $y=\sqrt{x^3}$ , the x axis and the ordinates  $x=0$  and  $x=2$ . **[OR]**
18. Solve:  $\sec^2 y \tan x dy + \tan y \sec^2 x dx=0$

**UNIT V**

19. Solve:  $(D^2 +2D+1)y=0$  **[OR]**
20. Find the particular integral of  $((D^2 +2D+1)y=4e^{3x})$ .
21.  $D^2 -6D+9)y=2e^{3x}$ .

**PART-C (Answer any one question out of two from each unit (5x10)= 50 marks)**

**UNIT I**

22. a. If a random variable X has the following probability distribution

X	0	1	2	3
P(X=x)	1/3	1/6	1/6	1/3

Find the mean and variance.



b. A random variable X has the following probability distribution

X	-2	-1	0	1	2	3
P(X)	4m	6m	7m	5m	5m	12m

Find (i) the value of m (ii)  $P(X > 1)$  (iii)  $P(-1 \leq x \leq 2)$  (iv)  $P(X < 2)$

[OR]

23. a. Show that  $f(x) = \begin{cases} \frac{1}{9}x^2, & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$  is a probability density function

b. Eight coins are tossed simultaneously. Find the probability of getting (i) exactly 5 heads (ii) at least 5 heads.

## UNIT II

24. a. If 3% of the items manufactured by a company are defective, Find the probability that in a sample of 100 items exactly (i) one item is defective (ii) none defective.

b. In an aptitude test administered to 900 students, the mean is 50 and the standard

deviation is 20. Find (i) the number of students securing between 30 and 70 (ii) number of students exceeding the score of 60.

[OR]

25. a. Find the probability that at least 3 defective fuses will be found in a box of 200 fuses

if experience shows that 2% of such fuses are defective.

b. Fit a straight line for the following data by the method of least square:

X	0	1	2	3	4
Y	1	1.8	3.3	4.5	6.3

## UNIT III

26. a. The distance s meters travelled by a particle moving along a straight line is given by  $s = 2t^3 - 9t^2 + 12t - 6$ . Find (i) the velocity when acceleration is zero. (ii) the acceleration when the velocity is zero

b. Find the equation of the tangent and normal to the curve  $y = 6 + x + x^2$  at (2,4).

[OR]

27. a. Find the equation of the tangent to the curve  $y = x^2 - 7x + 12$  at the points where the curve cuts the X axis.

b. Find the maximum and minimum values of the function  $y = 2x^3 - 3x^2 - 36x + 10$

## UNIT IV

28. a. Find the area bounded by the curve  $y = x^2 - x - 6$  and the ordinate axes x- axes.

b. Find the volume of a right circular cone of height h and radius r by integration .

[OR]

28. a. Solve:  $\frac{dy}{dx} - \frac{2xy}{1+x^2} = (1+x^2)^2$

b. Find the fourier transform of  $f(x) = 1$  for modules x less than 1.

## UNIT V

29. a. Solve:  $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 0$  if  $y(0) = 1, y'(0) = 0$

b. Solve:  $(D^2 - 4D + 13)y = e^{2x}$

[OR]

30. a. Solve:  $(D^2 - 5D + 4)y = e^{4x}$

b. Solve:  $(D^2 + 16)y = \sin 9x$

To be implemented from the Academic year 2016 – 2017

Course Name : Common to all first year students  
 Subject Code& Name: GEM23 Engineering Physics - II  
 Semester : Second

**TEACHING AND SCHEME OF EXAMINATION**

No. of weeks per semester: 15

Subject	Instructions		Examination			Duration
	Hours/Week	Hours / Semester	Marks			
			Continuous Assessment	End Semester	Total	
Engineering Physics- II	4	60	25	75	100	3 Hrs

**Topics and Allocation of Hours**

UNIT	Topic	Time(Hrs)
I	HEAT	12
II	THERMODYNAMICS, LIQUEFACTION OF GASES & NON-CONVENTIONAL ENERGY	12
III	LIGHT AND REMOTE SENSING	12
IV	ELECTRICITY	12
V	ELECTRONICS	12
	TOTAL	60

**RATIONALE:**

The exponential growth of Engineering and Technology has benefited the mankind with extreme sophistication and comfort. To sustain this development, continuous research and development should take place not only in Engineering and Technology but also in Basic Science such as Physics. The various divisions of Physics like Optics, Acoustics, Dynamics, Semiconductor Physics, Surface Physics, Nuclear Physics, Energy Studies, Materials Science, etc provide the foundation by enlightening the **Fundamental facts, Principles, Laws and Correct sequence of events** to develop the Engineering and Technology field for the prosperity of human beings.

**OBJECTIVES:**

At the end of the study of II Semester the student will be able to

- Identify good conductors and insulators of heat.
- Analyze the relation between pressure, volume and temperature of gas and to interpret the results.
- Understand the process of Isothermal and Adiabatic changes of gas and basic laws of thermodynamics.
- Acquire knowledge about liquefaction process of gases.

- Realize the inevitable need for tapping Alternate energy to address the looming energy crisis.
- Identify the characteristics and properties of LASER, Photo Electric effect and Optical fibre cable and their engineering applications.
- Acquire broader ideas about the process of remote sensing in tapping the earth resources for human benefits.
- Acquire knowledge about heating, chemical and magnetic effects of electric current.
- Gain broader ideas of capacitors, diodes, transistors, integrated circuits and logic gates.

### DETAILED SYLLABUS

Unit	Name of the topic	Hours
I	<b>HEAT</b> <b>1.1 TRANSFER OF HEAT</b> Concept of Heat and Temperature – Centigrade, Fahrenheit and Kelvin scales of temperature measurement – Conduction, convection and radiation – Definitions and explanations – Coefficient of thermal conductivity – Definition and SI unit – Selection of good and poor thermal conductors – Properties of thermal radiation.	3
	<b>1.2 KINETIC THEORY OF GASES</b> Postulates – Mean square velocity and Root Mean Square (RMS) velocity of molecules – Definitions and expressions – Expression for the pressure of a gas on the basis of postulates of kinetic theory of gases- Relation between pressure and kinetic energy, pressure and absolute temperature of the gas. Simple problems based on the expression for the pressure of a gas.	5
	<b>1.3 SPECIFIC HEAT CAPACITY</b> Specific heat capacity of a substance (solids and liquids) – Definition – Specific heat capacity of a gas at constant volume – Specific heat capacity of a gas at constant pressure – Ratio of specific heat capacities – Explanation for $C_p$ greater than $C_v$ – Derivation of Meyer's relation – calculation of Universal gas constant R from the gas equation $PV = RT$ . Simple problems based on Meyer's relation.	4



IV	<p><b>ELECTRICITY</b></p> <p><b>4.1 ELECTRICAL CIRCUITS</b> Ohm's law – Laws of resistances – Resistivity and Conductivity – Definitions – Kirchoff's current and voltage laws – Condition for balancing the Wheat stone's network .Simple problems based on expression for resistivity.</p> <p><b>4.2 HEATING AND CHEMICAL EFFECTS OF CURRENT</b> Joule's law of heating – Experimental determination of specific heat capacity of a liquid using Joule's calorimeter – Faraday's laws of electrolysis – Electro chemical equivalent (e.c.e) of an element – Definition – Experimental determination of e.c.e. of copper. Simple problems based on expression for e.c.e.</p> <p><b>4.3 MEASURING INSTRUMENTS</b> Motion of a charged particle inside a uniform magnetic field – Expression for the force acting on a current carrying straight conductor placed in a uniform magnetic field – Fleming's Left Hand rule – Expression for the torque experienced by a rectangular current carrying coil placed inside a uniform magnetic field – Working of a moving coil galvanometer and its merits – Conversion of galvanometer into an Ammeter and Voltmeter. Simple problems based on conversion of galvanometer into ammeter and voltmeter.</p> <p><b>4.4 CAPACITORS</b> Capacitance of a capacitor – Definition – 'farad'– Definition – Expressions for effective capacitance when capacitors are connected in series and parallel.Simple problems based on expressions for effective capacitance for series and parallel connections of capacitors.</p>	3 3 4 2
V	<p style="text-align: center;"><b>ELECTRONICS</b></p> <p><b>5.1 SEMI CONDUCTORS</b> Semi conductors – Energy bands in solids – Energy band diagram of good conductors, insulators and semi conductors – Fermi Level – Intrinsic semiconductors - Concept of positive holes - Doping – Extrinsic semiconductors – P type and N type semiconductors.</p> <p><b>5.2 DIODES AND TRANSISTORS</b> P-N junction diode – Forward bias and reverse bias – Rectification action of diode – Working of full wave rectifier using P N junction diodes in bridge type configuration. PNP and NPN transistors – Three different configurations – Advantages of common emitter configuration – working of NPN transistor as an amplifier in common emitter configuration.</p> <p><b>5.3 DIGITAL ELECTRONICS</b> Digital electronics – Introduction – Logic levels – Basic logic gates: OR, AND and NOT gates – Universal logic gates: NAND and NOR gates – Special logic gates: XOR and XNOR gates – Symbolic representation, Boolean expression and Truth table for all above logic gates – Integrated circuits – Levels of integration – SSI, MSI, LSI and VLSI, Advantages of ICs.</p>	3 4 5

**Text Book:**

- 1) Higher secondary Physics – First & Second year– Volume I & II – Tamil Nadu text book Corporation
- 2).Kamal -- Intermediate physics – Volume I & II — Foundation booksprivate Ltd.
- 3) P.Indira & M.Eswari-Engineering physics II – Saravana publishers.

**Reference Book:**

- 1) Brijlal and Subrahmanyam –Heat and Thermodynamics –. S. Chand & co, New Delhi
- 2) D.N. Vasudeva --Fundamentals of Electricity — S. Chand & co.,New Delhi
- 3) G.D. Rai -- Non- Conventional energy sources – Khanna publishers, New Delhi.
- 4) M. Anji Reddy -- Text book of remote sensing and Geographical information systems – BS publications. Hyderabad.

**GEM 23: ENGINEERING PHYSICS - II**  
**MODEL QUESTION PAPER**

**Time: 3 Hrs**

**Max. Marks: 75**

**Part – A**

**(Marks 10x 1=10)**

**Answer all the questions:**

1. What is heat?
2. Write any one property of thermal radiation.
3. Write the zeroth law of thermodynamics.
4. What is the principle used in cascade process?
5. Expand the acronym LASER.
6. Write the Einstein's photo electric equation.
7. Write Joule's law of heating.
8. Write Fleming's Right Hand Rule.
9. What is a 'hole'?
10. Draw the symbol for NOT gate and write the Boolean expression for the same

**Part – B**

**(Marks 5 x 3 =15)**

**Answer any one question from each unit. All the questions carry equal marks.**

**UNIT – I**

11. Explain the process of conduction and convection.

**[OR]**

12. Explain why  $C_p$  is greater than  $C_v$  for a gas?

**UNIT – II**

13. Explain isothermal change.

**[OR]**

14. Write a note on solar energy.

**UNIT - III**

15. List the uses of LASER.

**[OR]**

16. Explain the applications of photocells.

**UNIT - IV**

17. A wire of length 1.5m and area of cross section  $1.9 \times 10^{-7} \text{ m}^2$  has the resistance 3.5 ohm. Calculate the resistivity of the material of the wire.

**[OR]**

18. What is electromagnetic induction? Write Faraday's laws of electro magnetic induction.

**UNIT - V**

19. Explain the formation of Extrinsic P - type semiconductors.

**[OR]**

20. Explain the three possible configurations of a transistor and the advantages of common emitter configuration.

**Part – C**

**Marks 5 x 10 = 50**

**Answer any one question from each unit.  
All the questions carry equal marks.**

**UNIT- I**

21. The density of carbon di-oxide gas at S.T.P is  $1.977 \text{ kg m}^{-3}$ . Find the R.M.S velocity of carbon di-oxide molecules.

**[OR]**

22. Derive Meyer's Relation  $C_p - C_v = R$ .

**UNIT – II**

23. Describe Linde's process for the liquefaction of air.

**[OR]**

24. What are the advantages and disadvantages of renewable sources of energy.

**UNIT - III**

25. Explain the phenomenon of total internal reflections with the help of ray diagram and give the relation between critical angle and refractive index.

**[OR]**

26. Explain the components of remote sensing (data acquisition, data analysis and reference data)

**UNIT – IV**

27. Calculate the current required to deposit 2 gram of copper in a copper voltameter in half an hour. The electro chemical equivalent of copper =  $0.33 \times 10^{-6} \text{ kg C}^{-1}$ .

**[OR]**

28. explain how you will convert a moving coil galvanometer into an ammeter and a voltmeter.

**UNIT – V**

29. Derive the expressions for the effective capacitance of three capacitors when they are connected in (i) Series and (ii) parallel.

**[OR]**

30. Explain the NAND and NOR gates with symbols, Boolean expressions and truth tables.

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**To be implemented from the Academic year 2016-2017**

**Course Name** : Common to all first year diploma students  
**Subject Code& Name** : GEM 24 Engineering Chemistry - II  
**Semester** : Second

**TEACHING AND SCHEME OF EXAMINATION:** No of Weeks per Semester:15 weeks

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours / Semester	Marks			
			Continuous Assessment	End Semester	Total	
Engineering Chemistry- II	4	60	25	75	100	3 Hrs

**Topics and Allocation of Hours:**

Unit No	Topics	Time (Hrs)
I	Air pollution, Water pollution, Solid waste management and green chemistry.	12
II	Fuels and Rocket Propellants, Combustion and Refractories	12
III	Extraction of metals, Powder Metallurgy, Alloys and Abrasives	12
IV	Cement, Ceramics, Lubricants and Adhesives	12
V	Plastics, Rubber, Composite materials	12
<b>Total</b>		<b>60</b>

**RATIONALE:**

Modern development of industries requires more understanding of materials required for engineering and industrial purposes. This part of chemistry explains various aspects with regard to environment, fuels, metals, alloys and polymers. This subject will develop the basic understanding and skill of Engineering Students.

**OBJECTIVES:**

The objective of this Course is to make the student:

1. To acquire knowledge about Environmental Chemistry.
2. To acquire knowledge about fuels, advantages of fuels, rocket propellants combustion of fuels, flue gas analysis and refractories.
3. To know about extraction of metals, powder metallurgy, alloys and abrasives.
4. To acquire knowledge about cement, ceramics, lubricants and adhesives.
5. To know about polymer materials.

### DETAILED SYLLABUS

UNIT	Name of the Topics	Hours
<b>I</b>	<b>AIR POLLUTION, WATER POLLUTION, SOLID WASTE MANAGEMENT, GREEN CHEMISTRY</b> <b>1.1 AIR POLLUTION</b> Pollution and Air pollution- Definition – Air Pollutants (SO <sub>2</sub> , H <sub>2</sub> S, HF, CO Dust) – Sources and harmful effects – Acid rain – formation – Harmful effects – Green House effect – causes – Global Warming – Harmful effects – Ozone layer – importance – causes for depletion of Ozone layer (No equations) – Harmful effects of Ozone layer depletion – Control of air pollution.	4
	<b>1.2 WATER POLLUTION</b> Causes of water pollution– (Sewage, effluents, algae microorganisms) – Harmful effects, sewerage – Definition- Sewage disposal-Industrial effluents – Harmful effects of effluents -Harmful effects of Heavy metal ions- (metals like Lead, Cadmium, Zinc and Copper) – treatment of effluents – Eutrophication –Definition and harmful effects.	4
	<b>1.3 SOLID WASTE MANAGEMENT</b> Solid wastes – definition – problems – types of solid wastes – methods of disposal- landfill – incineration.	3
	<b>1.4 GREEN CHEMISTRY</b> Definition – Goals of green chemistry (Basic ideas). Recycling – Definition-Examples-advantages of recycling (Basic ideas)	1
	<b>FUELS AND ROCKET PROPELLANTS, COMBUSTION,REFRACTORIES</b> <b>2.1 FUELS AND ROCKET PROPELLANTS</b> Fuel and fossil fuel-Definition – Calorific value – classification of fuel- solid fuels – wood, coal – varieties of coal-composition-specific uses-liquid fuels - petroleum – fractional distillation – Fractions and uses, cracking (concept only). Liquid Hydrogen as fuel – gaseous fuels preparation and specific uses of producer gas, water gas,–composition and uses of CNG and LPG –Relative advantages of solid, liquid and gaseous fuels. Rocket propellants – Essential characteristics – classification of propellants with examples – differences between solid and liquid propellants.	5
<b>II</b>	<b>2.2 COMBUSTION</b> Combustion of fuels – Definition – combustion calculation by mass (for solid and liquid fuels) – combustion calculation of gaseous fuels – stoichiometric calculations – volume of air required – excess air – flue gas – flue gas analysis – Orsat Apparatus – simple numerical problems.	5
	<b>2.3 REFRACTORIES</b> Definition –Requirements of a good Refractory – classifications-	2

	Acidic, Basic and Neutral Refractories - with examples and uses of fireclay bricks, Alumina bricks and silica bricks.	
III	<b>EXTRACTION OF METALS, POWDER METALLURGY, ALLOYS AND ABRASIVES</b>	
	<b>3.1 EXTRACTION OF METALS</b> Extraction of Tungsten and Titanium – uses of Titanium and Tungsten.	3
	<b>3.2 POWDER METALLURGY</b> Definition – Preparation of Metal Powder – Atomization – Reduction of metal oxide – Applications of Powder Metallurgy.	3
	<b>3.3 ALLOYS</b> Definition – purpose of Alloying - types –Ferrous alloys - Composition and uses of stainless steel, chromium steel and vanadium steel - Non-Ferrous alloys – Definition – Composition and uses of Nichrome, Dutch metal, German silver, Gun metal and Duralumin.	3
	<b>3.4 ABRASIVES</b> Definition – classification – hardness in Moh’s scale – Natural abrasives – Diamond, Corundum, Emery, and Garnet – Synthetic abrasives – Carborundum – Boron carbide- manufacture – Properties and uses.	3
IV	<b>CEMENT, CERAMICS, LUBRICANTS AND ADHESIVES</b>	
	<b>4.1 CEMENT</b> Definition –Manufacture of Portland cement-wet process-setting of cement (No equation)	3
	<b>4.2 CERAMICS</b> White pottery – Definition – manufacture of White pottery – uses – Definition of glazing – purpose – method – salt glazing.	3
	<b>4.3 LUBRICANTS</b> Definition – characteristics of Lubricants – Types of Lubricants, Solid, Semisolid and liquid lubricants.	3
	<b>4.4 ADHESIVES</b> Definition-Requirements of good adhesives-Natural adhesive-uses of shellac, starch, Asphalt- Synthetic adhesive- uses of cellulose Nitrate, PVC, Phenol-formaldehyde and urea-formaldehyde.	3
	<b>PLASTICS, RUBBER, COMPOSITE MATERIALS</b>	
	<b>5.1 PLASTICS</b> Plastics- Definition-Polymerization – Definition- types of polymerization – Addition polymerization formation of polythene –	5

V	condensation polymerization – formation of bakelite – types of plastics – thermoplastics & thermo set plastics – Differences- mechanical properties of plastics – Advantages of plastics over traditional materials, (wood & metal) – reinforced or filled plastics – definitions – advantages – applications – polymers in surgery- biomaterial – definition – Biomedical uses of polyurethane, PVC, polypropylene and polyethylene. <b>5.2 RUBBER</b> Definition - preparation from latex – defects of natural rubber- compounding of rubber – ingredients & their functions – vulcanization-Definition and purpose –Reclaimed rubber- Definition – process – properties – uses. <b>5.3 COMPOSITE MATERIALS</b> Definition-Examples-Advantages over metals and polymers- General applications.	5  2
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**Text Book:**

Engineering Chemistry II for Polytechnic College -K.Rajalakshmi & T.Kanmani – Saravana Publishers.

**Reference Books:**

1. Engineering Chemistry – Jain & Jain –Dhanpat rai & sons
2. Engineering Chemistry – Uppal – Khanna publishers
3. A text book of Engineering Chemistry – Dara .S.S. – S. Chand publication.
4. A text book of Inorganic Chemistry - Sony PL – S. Chand publication.
5. Chemistry of Engineering Material – C.V. Agarwal, Andranaidu C.Parameswara Moorthy – B.S. Publications

## GEM 24 ENGINEERING CHEMISTRY II

### MODEL QUESTION PAPER

Time: 3 Hrs

Max Marks: 75

Note:

1. Answer all questions in Part-A (1 mark each)
2. Answer any one question from each Unit in Part-B (3 mark each)
3. Answer any one question from each Unit in Part-C (10 mark each)
- 4.

#### **PART- A**(10 x 1 = 10)

1. What is Acid rain?
2. Define Sewage.
3. Define Calorific value of a fuel.
4. What are Rocket propellants?
5. What is an alloy? Give one example.
6. What are abrasives?
7. Define setting of cement.
8. What is grease?
9. Give the uses of Bakelite.
10. What are composite materials?

#### **PART- B** (Marks 5x (1 x 3) = 15)

##### **Unit I**

11. Give the effects of acid rain.

**OR**

12. Explain any one method of disposal of solid wastes.

##### **Unit II**

13. Give the manufacture of water gas.

**OR**

14. A producer gas has the following composition by volume.  $\text{CH}_4 = 3.5\%$ ,  $\text{CO} = 25\%$ ,  $\text{H}_2 = 10\%$ ,  $\text{CO}_2 = 10.8\%$ ,  $\text{N}_2 = 50.7\%$ . Calculate the theoretical quantity of air required for combustion per  $\text{m}^3$  of the gas.

##### **Unit III**

15. How is metal powder formed by reduction method?

**OR**

16. Give the preparation and properties of Norbide.

##### **Unit IV**

17. Give the uses of PVC and phenol formaldehyde.

**OR**

18. Explain the two types of Glazing.

##### **Unit V**

19. Mention the biomedical uses of polypropylene and polyethylene.

**OR**

20. How is rubber prepared from latex?

**PART- C** (5x10 = 50)

**Unit I**

21. a. Define global warming and discuss the bad effects of it.  
b. Define Eutrophication. Give the harmful effects of it.

**OR**

22. a. What are the problems caused by solid wastes?  
b. List the goals of Green chemistry.

**Unit II**

23. a. List out the heavy metal ions and give their harmful effects.  
b. Give the advantages of gaseous fuel over other fuels.

**OR**

24. a. List the essential properties of a good propellant.  
b. State the requirements of a good refractory.

**Unit III**

25. a. How is tungsten extracted from its ores?  
b. State the applications of powder metallurgy.

**OR**

26. a. Give the name, composition and uses of copper alloys.  
b. How is Titanium extracted from its ores?

**Unit IV**

27. a. Give the manufacture of white pottery.  
b. Mention the requirements of a good adhesives.

**OR**

28. a. State the characteristics of a good lubricant.  
b. Give the manufacture of Portland cement.

**Unit V**

29. a. Give the differences between Thermoplastics and Thermo set plastics.  
b. Explain the compounding of rubber.

**OR**

30. a. Discuss the mechanical properties of plastics.  
b. What are the advantages of composite materials over metals and polymers?

To be implemented from the Academic year 2016-2017

**COURSE NAME** : Common to all first year diploma students  
**SUBJECT CODE& NAME** : GEM25 Communication skills in English Practical  
**SEMESTER** : Second

**TEACHING & SCHEME OF EXAMINATION** No. of Weeks per Semester: 15 weeks

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours / Semester	Marks			
			Continuous Assessment	End Semester	Total	
<b>Communication Skills in English Practical</b>	4	60	25	75	100	3 Hrs

### Topics and Allocation of Marks

UNIT	TOPICS	HOURS
I	Fundamental language skill	12
II	Listening	12
III	Reading	10
IV	Speaking	12
V	Writing	14
	<b>Total</b>	<b>60</b>

### DETAILED SYLLABUS

UNIT	TOPICS	EXERCISES	HOURS
I Fundamental Language Skills	1. Transformation of Sentences	Conversion of sentences <ul style="list-style-type: none"> <li>• Statement into Interrogative</li> <li>• Statement into exclamatory</li> <li>• Statement into imperative</li> </ul>	12
	2. Correction of Sentences	Identifying the errors in the sentences	
	3. Homophones	Recognize and distinguish words with similar pronunciation	
	4. Answering Verbal Questions	Answering in affirmative and Negative.	

	5. Clause, Simple, Compound and Complex	Differentiate phrases and clauses. Identify the Main clause and subordinate clause	
II. Listening	6. Listening-I 7. Listening-II	Listening Activities – Day to Day conversation, short story, passages Completion of sentences, objective type questions, etc	12
III Reading	8. Passage-I 9. Passage- II	Interpret and analyze small passages. Comprehend and analyze passage Comprehend and respond to the passage	10
IV. Speaking	10. Pronunciation	Introduction to pronunciation-stress, Intonation Self-Introduction, Introducing Friend and family, Speaking on shot topic	12
V. Writing	11. News paper Report Comprehension 12. Visual Description 13. Visual to Verbal 14. E-Mail	Respond and Interpret to the given article from the newspaper. Describe the given picture Interpret visuals and write paragraph using linkers. Compose e-mails	14

### SCHEME OF EVALUATION

SI.No	Allocation	Marks
1.	Listening	15
2.	Reading	15
3.	Writing	35
4.	Speaking	10
Total		75



**Text Book :**

Communication skills In English Practical, Ms.S.Rajalakshmi & Ms.S.Anandhi,  
Saravana Publishers

**Reference Books:**

1. Spoken English For You - level II,G.Radhakrishnan Pillai, Emerald Publisher.
2. Dr.I.Adhinarayanan,"Spoken English", Neelakamal Publication Pvt. Ltd.,
3. DOTE Text Book "Communication English I&II", Government of Tamil Nadu.

**To be implemented from the Academic year 2016 – 2017**

**Course Name** : Common to all first year diploma students  
**Subject Code & Name** : GEM 26 Engineering Physics – II Practical  
**Semester** : Second

**Teaching and Scheme of Examination** : **No. of weeks per semester 15**

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours / Semester	Marks			
			Continuous Assessment	End Semester	Total	
<b>Engineering Physics-II practical</b>	2	30	25	75	100	3 Hrs

**RATIONALE:**

In diploma level engineering education skill development plays a vital role. The skill development can be achieved by on hand experience in handling various instruments, apparatus and equipment. This is accomplished by doing engineering related experiments in practical classes in various laboratories.

**List of Experiments with objectives**

**1. REFRACTIVE INDEX**

To determine the refractive index of a transparent liquid (water) using travelling microscope.

**2. SPECTROMETER**

To measure the angle of prism and the angle of minimum deviation of the prism using spectrometer and to calculate the refractive index of glass of the prism.

**3. LAWS OF RESISTANCES.**

To verify the laws of resistances by connecting the two given standard resistances (i) in series and (ii) in parallel, using Ohm's law.

**4. POTENTIOMETER.**

To compare the electro motive forces (e.m.fs) of the given two cells.

**5. JOULE'S CALORIMETER.**

To determine the specific heat capacity of water.

**6. COPPER VOLTAMETER.**

To determine the electro chemical equivalent (e.c.e.) of copper.

## 7. P-N JUNCTION DIODE.

To draw the voltage – current characteristics in forward bias and to find the ‘dynamic forward resistance’ & ‘knee voltage’ from the graph.

## 8. P N P TRANSISTOR.

To draw the transfer characteristics of a PNP transistor in common emitter configuration and to find the current gain from the graph.

## 9. LOGIC GATES.

To find the output conditions for different combinations of the input for NOT gate and 2 inputs AND, OR, NAND , NOR & XOR logic gates, using IC chips. ( IC 7404 – NOT Gate, IC 7408 – AND Gate, IC 7432 – OR gate, IC 7400 – NAND Gate, IC 7402 – NOR Gate & IC 7486 – XOR gate.)

S.No	Allocation	Marks
1	Formula with Explanation	10
2	Figure/ Circuit Diagram with parts & Tabular column with proper Units	15
3	Observations	35
4	Calculations	10
5	Result	05
Total		75

## GEM 26 ENGINEERING PHYSICS - II PRACTICAL

### MODEL QUESTION PAPER

3 HOURS

1. Determine the refractive index of the given transparent liquid using travelling microscope.
2. Measure the angle of the prism and the angle of minimum deviation using spectrometer and then calculate the refractive index of glass of the prism.
3. Verify the laws of resistances by connecting the two given standard resistances (i) in series and (ii) in parallel, using Ohm's law.
4. Compare the electro motive forces (e.m.fs) of the given two cells, using potentiometer.
5. Determine the specific heat capacity of water, using Joule's calorimeter.
6. Determine the electro chemical equivalent (e.c.e.) of copper using Copper Voltmeter.
7. Draw the voltage – current characteristics of a P-N junction diode in forward bias and then find the 'dynamic forward resistance' & 'knee voltage' from the graph.
8. Draw the transfer characteristics of a P N P transistor in common emitter configuration and find the 'current gain' from the graph.
9. Find the output conditions for different combinations of the input for NOT gate and 2 inputs AND, OR, NAND, NOR & XOR logic gates using IC chips. ( IC 7404 –NOT Gate, IC 7408 – AND Gate, IC 7432 – OR gate, IC 7400 – NAND Gate, IC 7402 – NOR Gate IC 7486 – XOR gate. )

To be implemented from the Academic year 2016-2017

Course Name : Common to all first year diploma students  
Subject Code & Name : GEM 27 ENGINEERING CHEMISTRY-II PRACTICAL  
Semester : Second

TEACHING AND SCHEME OF EXAMINATION No of Weeks per Semester: 15 weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours / Semester	Marks			Duration
			Continuous Assessment	End Semester Examination	Total	
Engineering chemistry II practical	2	30	25	75	100	3

#### RATIONALE:

At the entry level of introducing practical subjects to Diploma Engineering it is important to introduce chemistry practical where mainly constitution of different chemical is analysed through Qualitative analysis. Qualitative analysis is introduced through simple salt analysis in the second semester of the study.

#### OBJECTIVES:

- ❖ At the end of the programme, the student will be able analyze the given simple salt containing an anion and a cation and to identify its significance and use in day-today life.
- ❖ The student is introduced to chemical methods of analysis of materials.

#### Qualitative Analysis:

Study of the reactions of the following radicals leading to qualitative analysis of the given chemical substance soluble in water or in dilute acids.

**Acid radicals:** Carbonate, Chloride, Nitrate and Sulphate.

**Basic radicals:** Lead, Cadmium, Copper, Aluminium, Zinc, Calcium, Barium, Magnesium and ammonium salts.

#### Simple Salts to be analysed:

1. Lead carbonate
2. Lead nitrate
3. Aluminiumsulphate
4. Zinc carbonate
5. Zinc sulphate
6. Barium Chloride

7. Barium nitrate
8. Calcium carbonate
9. Magnesium sulphate
10. Ammonium chloride
11. Ammonium sulphate

**Effluents to be analysed:**

1. Lead
2. Cadmium
3. Copper
4. Zinc

**SCHEME OF EVALUATION**

<b>S.no</b>	<b>Allocation</b>	<b>Marks</b>
1	Acid Radical	23
2	Basic Radical	23
3	Report	04
4	Effluent Procedure	20
5	Harmful effects	05
Total		75

**Reference Books:**

1. Vogel – Analytical chemistry – Pearson publications.
2. Dr.Sudha rani – Laboratory manual on engineering chemistry Dhanpat rai publications.

## **GEM 27 ENGINEERING CHEMISTRY II PRACTICAL**

### **MODEL QUESTION PAPER**

1. Analyse the given Inorganic simple salt and report the acid radical and basic radical present in it with a complete procedure.
2. Analyse the given sample of effluent and report the metallic pollutant present in it with procedure and its harmful Effects.

**To be implemented from the Academic year 2016-2017**

**Course Name** : Common to all first year diploma students.  
**Subject Code& Name** : GEM28 Engineering Graphics II Practical  
**Semester** : Second

**TEACHING AND SCHEME OF EXAMINATION** No. of weeks per semester: 15 weeks

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours / Semester	Marks			
			Continuous Assessment	End Semester Examination	Total	
<b>Engineering graphics –II practical</b>	6	90	25	75	100	3

**Topics and Allocation of Hours**

Topics	Details	Hours
a)	Section of Solids.(Manual Drafting and Computer Aided Drafting)	20
b)	Development of surfaces.(Manual Drafting and Computer Aided Drafting)	20
c)	Orthographic projection.(Manual Drafting and Computer Aided Drafting)	25
d)	Isometric projections .(Manual Drafting and Computer Aided Drafting)	25
Total		90

**RATIONALE:**

We imagine the machine component or structure to be cut by a plane or planes so that most of the details could be seen. The exterior shape of objects like a connecting rod with elliptical configuration can be conveniently shown by using sectional views. The components parts of a machine and their relative positions will be revealed by the sectionals view of the machine.

The exact size and shape of the sheet to be cut is given by the development of the object concerned. Most of the sheet metal works in engineering industries involve the development of surfaces of solids like cubes, prisms, cylinders, pyramids, cones and spheres with or without cuts and slots. It is essential that sheet metal technicians have a thorough knowledge of preparing developments of various types of surfaces.

Orthographic projection is possible to describe the shape of any object completely by using orthographic projections. These orthographic views are required for the manufacture of object and machine parts .Hence it is necessary to study orthographic projections.

One such system of projection is isometric projection which is a type of pictorial projection showing the three dimensions of an object in one view. Isometric view has the distinct advantage of conveying the real shape of the object in such a way that even those



who are not familiar with the art of reading a drawing can easily visualize its form and shape.

**OBJECTIVES:**

- Able to show the internal details of an object and true shape section.
- Able to achieve the concept of sheet metal fabrication.
- Acquire knowledge about clear vision of the various projections.
- Conveying the real shape of the object using isometric view.

**DETAILED SYLLABUS**

<b>Topics</b>	<b>Details</b>	<b>Hours</b>
a)	<p><b>Section of Solids.</b>(Manual Drafting and Computer Aided Drafting)            Introduction – Section planes – apparent section- true section -sectional view - need for sectional view - cutting plane- cutting plane line.            Section of solids in simple positions with axis parallel to one plane and perpendicular to other plane, Section of solids when axis of the solid parallel to both planes-Section plane parallel to one plane and perpendicular to other plane- Section plane perpendicular to one plane and Inclined to other plane- showing true shape of section- exercises: section of simple solids: prism, pyramid, cylinder and cone .</p>	20
b)	<p><b>Development of surfaces.</b> (Manual Drafting and Computer Aided Drafting)            Development of prisms, pyramids, cylinder and cone—            Development of frustum of prisms, pyramids and cone-            Development of truncated prisms, pyramids, cylinder and cone –exercises.            Development of T-pipe, elbow, duct, tray, lamp shade and funnel-exercises.</p>	20
c)	<p><b>Orthographic projection</b> (Manual Drafting and Computer Aided Drafting)            Introduction – projection terms – Orthographic projection – Co-ordinate planes of projection – Systems of orthographic projection – First angle Orthographic projection – Third angle Orthographic projection -Comparison of first and third angle projections.            Projection of three views (Elevation, Plan and Side view) of simple objects using first angle projection only – Free hand sketch practice – exercises.</p>	25
d)	<p><b>Isometric projections</b> (Manual Drafting and Computer Aided Drafting)            Introduction – isometric view – isometric projection – difference between isometric view and isometric projection – isometric scale – methods of drawing an isometric view – box method. Angles in Isometric view – irregular curves in isometric drawing – circles in isometric method –</p>	25

	four centre method for drawing an ellipse – arcs of circles in isometric – Draw the isometric view of the object from the given orthographic view– exercises.	
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**Text Books:**

1. GEM 28 Engineering Graphics-II, Murugappa Polytechnic College, 2016

**Reference Books:**

1. Gill P.S., “Engineering drawings”, S.K.Kataria & Sons.
2. Bhat N.D. “Engineering drawings”, Charotar Publishing house.
3. Gopalakrishnan.K.R., “Engineering drawing”, (Vol.I and vol.II), Dhanalakshmi publishers, Ed.2, 1970.
4. Venugopal.K,Sreekanjana G, “Engineering Graphics” New Age International Publishers.
5. K V Nataraajan “A Text Book of Engineering drawing.

**LIST OF EXERCISES:**

- |                              |   |
|------------------------------|---|
| a) Section of solids :       | 1.Exercise on Manual Drawing<br>2. Exercise on CAD  |
| b) Development of surfaces : | 3.Exercise on Manual Drawing<br>4. Exercise on CAD  |
| c) Orthographic projection : | 5.Exercise on Manual Drawing<br>6. Exercise on Manual Drawing<br>7. Exercise on CAD<br>8. Exercise on CAD     |
| d) Isometric projection :    | 9. Exercise on Manual Drawing<br>10. Exercise on Manual Drawing<br>11. Exercise on CAD<br>12. Exercise on CAD |

**REQUIREMENTS:**

Drawing Tables and Computers with AutoCAD software packages

<b>SCHEME OF EVALUATION</b>			
<b>Question No.</b>	<b>Allocation</b>	<b>Marks</b>	
		<b>Manual</b>	<b>CAD</b>
1.	Section of solids (either or type)	7	8
2.	Development of Surfaces	8	7
3.	Orthographic projection	10	10
4.	Isometric Projection	15	10
	<b>Total</b>	<b>40</b>	<b>35</b>

To be implemented from the Academic year 2016-2017

Course Name : Common to all first year diploma students

Subject Code & Name : GEM 18 WORKSHOP PRACTICE

Semester : Second

TEACHING AND SCHEME OF EXAMINATION No. of weeks per semester: 15 weeks

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours / Semester	Marks			
			Continuous Assessment	End Semester Examination	Total	
WORKSHOP PRACTICE	3	45	25	75	100	3

### RATIONALE:

Workshop practice is a basic subject for all branches of Diploma Engineering. This subject is aimed at providing basic understanding of the fundamentals of practical sections; mainly planning, marking, cutting, filing, wiring connections, standards & conventions of wiring, the tools, the use of measuring instruments in engineering applications and plumbing tools and practices.

The topics covered are based on the syllabus for Diploma studies in engineering. The subject is planned to include sufficient practices which would help the student to understand the principles of manufacturing.

### OBJECTIVES:

At the end of the practice, the students will be able to,

- Acquire skills in basic engineering practice.
- Identify the hand tools and instruments.
- Study and use measuring instruments.
- Practical skills in the fitting, plumbing and wiring trades.

### WORKSHOP PRACTICE

#### 1. FITTING SECTION 15 HRS.

- General safety precaution inside the workshop.
- Study about first aid.
- Study of hand tools
- Study of instruments- Calipers -Scale – Vernier caliper – Vernier height gauge.
- Marking and punching practice.
- Hacksaw cutting practice.
- Filing and fitting practice.
- Drilling and tapping practice.

## Exercises

**Raw material:** 3mm thick M.S. flat

1. Single piece cutting and filing
2. L-Joint
3. V-Joint
4. Drilling and tapping (Four drills and Two with Taps) **Raw material:** 10mm thick M.S. flat

### Note:

Practices should be given to cover the above area. At the end, the students should be able to do the above exercises for the autonomous practical examinations. Students should mention the variations in the dimensions of their exercises.

## 2. WIRING & SOLDERING 15 HRS

- Study about the safety measures in wiring and soldering.
- Study of tools for wiring and soldering.
- Study about the earthing.
- Identify different electrical fitting and accessories.
- Identify the types of wires with colour code.
- Identify the symbols in circuit diagram.
- Practice simple wiring.
- Uses of multimeter.

## Exercises

### WIRING

1. Two lamps connected in series and parallel measure and check the voltage and current using multimeter.
2. Staircase wiring.

### SOLDERING PRACTICE

1. Parallel joint
2. ST - Joint

### Note:

Students should draw the circuit diagram and joint diagram & collect the components according to their requirement. Only components should be given to the students. The connection should be given from the main switch. Suitable safety precautions should be made before connections.

## 3. PLUMBING 15 HRS

- Plumbing is the skilled trade of working with pipes, tubing and plumbing fixtures for drinking water systems and the drainage of waste.
- The plumbing industry is a basic and substantial part of every developed economy due to the need for clean water, and proper collection and transport of wastes.
- Plumbing also refers to a system of pipes and fixtures installed in a building for the distribution of potable water and the removal of waterborne wastes.
- Plumbing is usually distinguished from water and sewage systems, in that a plumbing system serves one building, while water and sewage systems serve a group of buildings or a city.

- To install pipes and fixtures.
- To repair or replace all kinds of leaks.
- Use personal protective equipments.

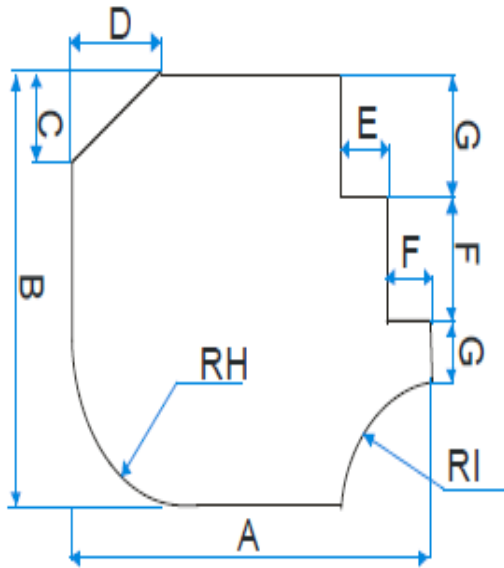
### **Exercises**

1. Install a sink / washbasin with tap using different PVC/GI pipe accessories such as bend, tee and gate valve.
2. Cutting, bending and external threading of GI pipes using Die.
3. Repair a leakage in the water tap and fix water meter.
4. Lay pipes to install rain water harvesting.

**The students should be given training in all the sections. All the exercises should be completed. The students should maintain record notebook for the concerned trades and submit during the Autonomous Practical Examinations.**

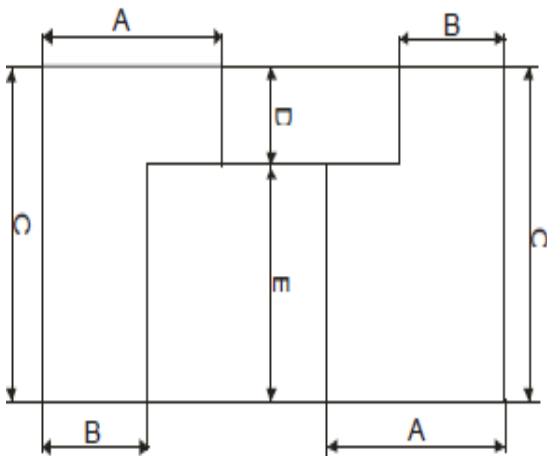
## FITTING EXERCISE

### 1. Single piece cutting and filing



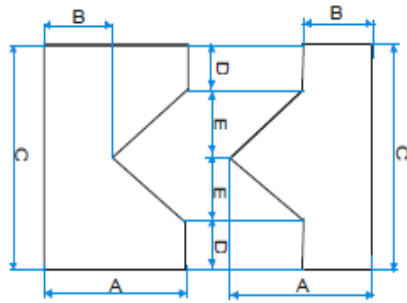
SI.No	PART NAME	ACTUAL	OBTAINED	VARIATION
1	A			
2	B			
3	C			
4	D			
5	E			
6	F			
7	G			
8	RH			
9	RI			

### 2. L-Joint



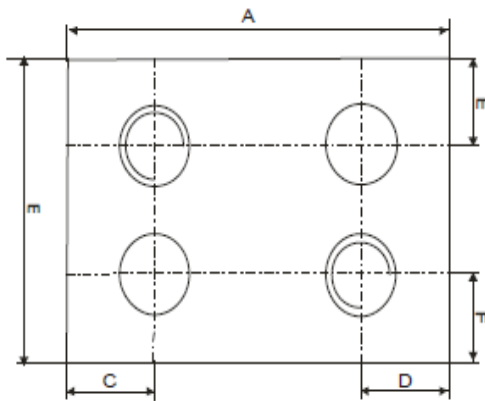
SI.No	PART NAME	ACTUAL	OBTAINED	VARIATION
1	A			
2	B			
3	C			
4	D			
5	E			

3. V-Joint



Sl.No	PART NAME	ACTUAL	OBTAINED	VARIATION
1	A			
2	B			
3	C			
4	D			
5	E			

4. Drilling and tapping (Four drills and Two with Taps)



Sl.No	PART NAME	ACTUAL	OBTAINED	VARIATION
1	A			
2	B			
3	C			
4	D			
5	E			
6	F			
7	Dia			
8	Tapping			

**WORKSHOP PRACTICE**  
**AUTONOMOUS PRACTICAL EXAMINATION**

**Note:** Any two exercises should be carried out for examination. Fitting is compulsory anyone exercise form wiring& Soldering or plumbing. All the exercises should be given in the questionpaper and students are allowed to select by a lot.

**Students should have liberty to do the examination for 3 Hrs. No fixed time for each trade. The number of instrument / equipment facility should be available for each batch strength during examination.**

	<b>Max. Marks</b>
<b>Fitting (Compulsory)</b>	<b>35</b>
Marking & Cutting	- 10
Filing / Dimensions	- 20
Joint / Finish	- 5
<b>Wiring &amp; Soldering</b>	<b>35</b>
Circuit diagram/Joint making	- 15
Connection & Checking /Soldering	- 15
Result	- 5
	<b>(OR)</b>
<b>Plumbing</b>	<b>35</b>
Preparation of material	- 15
Connection / Testing	- 15
Result	- 5
<b>Viva-voce</b>	<b>05</b>
<b>TOTAL</b>	<b>75</b>

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(Implementation Year - From the Academic year 2017 - 2018 onwards)

Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Subject Code: MEM31

Semester : III Semester

Subject Title : STRENGTH OF MATERIALS

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
STRENGTH OF MATERIALS	6	90	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

Sl.No.	TOPICS	TIME (Hrs.)
I.	Statics of particles and friction	17
II.	Mechanical properties, simple stresses and strains	17
III.	Geometrical properties of sections and thin shells	17
IV.	Shear force and bending moment diagrams, theory of simple bending	16
V.	Torsion and springs	16
	Revision & Test	07
	Total	90

**RATIONALE:**

Electronics (Robotics) Engineers must have knowledge about mechanical properties of material, deformation of material subjected to axial load and shear. This will provide adequate knowledge to work as a design engineer.

**COURSE OUTCOME:**

- Define various support reaction and equilibrium.
- To explain laws of static and dynamic friction.
- Evaluate the deformation of materials, which are subjected to axial load and shear.

- Explain the behavior of the materials subjected to an axial & shear load and to compute stress & strain
- Determine the Centroid and Moment of Inertia of simple geometrical sections such as rectangle, circle, triangle, I & T sections
- Estimate the stresses induced in thin shells.
- Draw the shear force and bending moment diagram of the beam for different loads.
- Classify beams and its related applications and design Cantilever & Simply Supported Beam by applying theory of simple bending subjected to point load and uniformly distributed load
- Evaluate the strength of solid and hollow shafts.
- Design closed coil and open coiled helical spring subjected to an axial load

### DETAILED SYLLABUS

Unit	Name of the Topic	Hours
<b>I</b>	<p><b>STATICS OF PARTICLES AND FRICTION:</b></p> <p><b>Statics of Particles:</b> Introduction – Force - effects of a force - system of forces - resultant of force-Principle of transmissibility-parallelgram law of forces-triangular law-resultant of several forces acting on a particle- polygon law-resolution of a force into rectangular components –resultant of a system of forces acting on a particle using rectangular components-equilibrium of particles.</p> <p>External and internal forces-moment of a force-Varignon’s theorem-moment of a couple-equitant couples-addition of couples-simple problems-resolution of a force into a conditions for the equilibrium of rigid bodies in two dimension -Support reaction - types of support - removal of two dimensional supports -Problems involving the equilibrium of rigid bodies in two dimension only - simple problems. force and a couple - Free body diagram - Necessary and sufficient.</p> <p><b>Friction:</b> Introduction-Definition-Force of friction-Limiting friction-Static friction-Dynamic friction-Angle of friction-co-efficient of friction-Laws of static and dynamic friction.</p>	<b>17</b>
<b>II</b>	<p><b>DEFORMATION OF METALS</b></p> <p><b>Mechanical properties of materials:</b> Engineering materials – Ferrous and non-ferrous materials -Definition of mechanical properties --Alloying elements-effect of alloying element - Fatigue, fatigue strength, creep – temperature creep – cyclic loading and repeated loading – endurance limit.</p> <p>Simple stresses and strains: Definition – Load, stress and strain – Classification of force systems – tensile, compressive and shear force systems – Behavior of mild steel in tension up to rupture – Stress – Strain diagram – limit of proportionality – elastic limit – yield stress – breaking stress – Ultimate stress – percentage of elongation and percentage reduction in area – Hooke’s law – Definition – Young’s modulus - working stress, factor of safety, load factor, shear stress and shear strain - modulus of rigidity. Linear strain – Deformation due to tension and compressive force - problems in tension, compression and shear force.</p>	<b>17</b>

	<p><b>Simple Stresses and Strains:</b> Definition – Lateral strain – Poisson’s ratio – volumetric strain – bulk modulus – volumetric strain of rectangular and circular bars – problems connecting linear, lateral and volumetric deformation – Elastic constants and their relationship - Problems on elastic constants - Definition – Composite bar – Problem in composite bars subjected to tension and compression – Temperature stresses and strains – Simple problems – Definition – strain energy – proof resilience – modulus of resilience – The expression for strain energy stored in a bar due to Axial load – Instantaneous stresses due to gradual, sudden, impact and shock loads – Problems computing instantaneous stress and deformation in gradual, sudden, impact and shock loadings.</p>	
III	<p><b>GEOMETRICAL PROPERTIES OF SECTIONS AND THIN SHELLS</b></p> <p><b>Properties of sections:</b> Definition – center of gravity and centroid - position of centroids of plane geometrical figures such as rectangle, triangle, circle and trapezium-problems to determine the centroid of angle, channel, T and I sections only - Definition-centroidal axis-Axis of symmetry. Moment of Inertia – Statement of parallel axis theorem and perpendicular axis theorem. Moment of Inertia of lamina of rectangle, circle, triangle, I and channel sections-Definition-Polar moment of Inertia-radius of gyration – Problems computing moment of inertia and radius of gyration for angle, T, Channel and I sections.</p> <p><b>Thin Shells:</b> Definition – Thin and thick cylindrical shell – Failure of thin cylindrical shell subjected to internal pressure – Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure – simple problems – change in dimensions of a thin cylindrical shell subjected to internal pressure – problems – Derivation of tensile stress induced in a thin spherical shell subjected to internal pressure – simple problems – change in diameter and volume of a thin spherical shell due to internal pressure – problems.</p>	17
IV	<p><b>SF AND BM DIAGRAMS OF BEAMS AND THEORY OF BENDING</b></p> <p><b>SF and BM Diagrams Of Beams:</b> Classification of beams – Definition – shear force and Bending moment – sign conventions for shear force and bending moment – types of loadings – Relationship between load, force and bending moment at a section – shear force diagram and bending moment diagram of cantilever and simply supported beam subjected to point load and uniformly distributed load (udl) – Determination of Maximum bending moment in cantilever beam and simply supported beam when they are subjected to point load and uniformly distributed load.</p> <p><b>Theory Of Bending:</b> Theory of simple bending – Assumptions – Neutral axis – bending stress distribution – moment of resistance – bending equation – <math>M/I=f/y=E/R</math> – Definition – section modulus - rectangular and circular sections – strength of beam – simple problems involving flexural formula for cantilever and simple supported beam.</p>	16

V	<p><b>THEORY OF TORSION AND SPRINGS</b></p> <p><b>Torsion:</b> Theory of torsion – Assumptions – torsion equation <math>\frac{T}{J} = \frac{f_s}{R} = \frac{C\theta}{l}</math> – strength of solid and hollow shafts – power transmitted – Definition – Polar modulus – Torsional rigidity – strength and stiffness of shafts – comparison of hollow and solid shafts in weight and strength considerations – Advantages of hollow shafts over solid shafts – Problems.</p> <p><b>Springs:</b> Types of springs – Laminated and coiled springs and applications – Types of coiled springs – Difference between open and closely coiled helical springs – closely coiled helical spring subjected to an axial load – problems to determine shear stress, deflection, stiffness and resilience of closed coiled helical springs</p>	16
<b>Revision and Test</b>		<b>07</b>

**Text Books:**

- 1) Strength of Materials, R. S. Khurmi, , S.Chand & Co., Ram Nagar, New Delhi.
- 2) Strength of Materials, S. Ramamrutham, 15<sup>th</sup> Edn 2004, Dhanpat Rai Pub. Co., New Delhi.

**Reference Books:**

- 1) Strength of Materials, R.K.Bansal,, Laxmi Publications Pvt. Ltd., New Delhi, 3<sup>rd</sup> Edition, 2010.
- 2) Strength of materials, S.S.Rattan, Tata Mcgraw hill, New Delhi,2008, ISBN 9780070668959,
- 3) Strength of Materials, B K Sarkar, I Edition, 2003 Tata Mcgraw hill, New Delhi.
- 4) Engineering mechanics, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 2<sup>nd</sup> Edition, 2007

**MODEL QUESTION PAPER**  
**MEM31 STRENGTH OF MATERIALS**

Time: 3 Hrs

Maximum Marks: 75

**Note:**

1. Answer ALL the questions in PART-A (1 mark each)
2. Answer any ONE question from each unit in PART-B (3 marks each)
3. Answer any ONE question from each unit in PART-C (10 marks each)
4. The question paper contains TWO Pages

**PART-A** (1x10=10)

1. What is limiting friction?
2. What is moment of a couple?
3. Define factor of safety.
4. What is composite bar?
5. What is radius of gyration?
6. Write the formula for tensile stress in thin spherical shell.
7. Define flexural rigidity of beam.
8. Define bending moment.
9. Define polar modulus.
10. Write any two types of spring.

**PART-B** (3x5=15)

UNIT-I

11. State law of parallelogram of forces.
12. State the law of static and dynamic friction.

UNIT-II

13. Define ductility and malleability.
14. What is percentage of elongation and percentage reduction in area?

UNIT-III

15. A channel section is of size 300mm x 100mm overall. The base as well as the flanges of the channel is 10mm thick. Determine centroid.
16. What working pressure may be allowed in a boiler shell 1.8m diameter with plates 15mm thick if the permissible tensile stress in the solid is not to exceed 70 N/mm<sup>2</sup>.

UNIT-IV

17. Draw SFD and BMD of a cantilever beam of length 'l' carrying UDL of W over its entire length.
18. Write the assumption made for theory of simple bending.

UNIT-V

19. State the advantages of hollow shaft over solid shaft.
20. A closely coiled helical spring made of steel wire 10mm diameter has 15 coils of 100 mm mean diameter. Calculate deflection and stiffness of spring under an axial load of 200N. Take  $N = 0.8 \times 10^6$  N/mm<sup>2</sup>.

**PART-C** (10X5=50)

UNIT-I

21. Two like parallel forces of 10N and 30N act at the ends of a rod 200mm long. Find the magnitude of the resultant force and the point where it acts.
22. Define the following: (i) Force of friction (ii) Angle of friction (iii) Limiting friction.

UNIT-II

23. A steel tube 100mm internal diameter and 12.5mm thick is surrounded by a brass tube of the same thickness in such a way that the axis of the two tubes coincide. The compound tube is loaded by an axial compressive load of 5KN. Determine the load carried by each tube. Assume that there is no buckling of the tube. Take  $E$  for steel = 200 KN/mm<sup>2</sup> and for brass as 100 KN/mm<sup>2</sup>. Tubes are of same length.
24. A bar of steel 28mm diameter and 250mm long is subjected to an axial load of 80KN. It is found that the diameter has contracted by 1/240mm. if the modulus of rigidity is 80 KN/mm<sup>2</sup>. Calculate (i) Poisson's ratio (ii) Young's modulus and (iii) Bulk modulus.

UNIT-III

25. Find  $I_{xx}$  and  $I_{yy}$  for the 'T'- section flange of 150mm and overall depth of 250mm with the thickness of 20mm for both web and flange.
26. A cylindrical shell 2.4m long, 600mm in diameter is made up of 15mm thick plates. Find the changes in length, diameter and volume of the cylinder when the shell is subjected to an internal pressure of 2 N/mm<sup>2</sup>,  $E = 200$  kN/mm<sup>2</sup>,  $\nu = 0.3$ .

UNIT-IV

27. A beam 8m long is simply supported at its ends. It carries an UDL of 1 kN/m run over the length of left half of its span, together with concentrated loads 2 KN, 3 KN and 2 KN situated at 2m, 4m and 6m respectively from the left hand support.
28. A rectangular beam of 200mm deep and 100mm wide is simply supported over a span of 8m and carries a point load of 25KN. Determine the maximum stress in the beam. Also calculate the values of longitudinal fiber stress at a distance of 25mm from the top surface of the beam.

UNIT-V

29. A solid shaft has to transmit 10KW at 210 rpm. The maximum torque in each revolution exceeds the mean by 30%. If the shear stress is not to exceed 80MPa. Find a suitable diameter of the solid shaft. Calculate the angle of twist for a length of 2m. Take  $C = 0.8 \times 10^5$  N/mm<sup>2</sup>.
30. A closely coiled helical spring made of steel wire 100mm diameter has 10 coils of 120 mm mean diameter, calculate the deflection under an axial load of 100N, what is the stiffness of the spring? Take  $C = 1.2$  MPa.

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Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Subject Code: ERM32

Semester : III Semester

Subject Title: ELECTRONIC DEVICES & CIRCUITS

**TEACHING AND SCHEME OF EXAMINATION:**

No. of Weeks per Semester: 15

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours/ week	Hours / semester	Marks			Duration
ELECTRONIC DEVICES & CIRCUITS	5	75	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS**

SL.NO.	TOPICS	TIME (HRS.)
I.	Electronic components, Semiconductor and Diodes	14
II.	Bipolar Junction Transistor	14
III.	Transistor oscillators and FET and UJT	14
IV.	SCR, DIAC, TRIAC and MOSFET	14
V.	Opto Electronic Devices and Wave shaping Circuits	14
	Revision and Test	05
	Total	75

## RATIONALE:

Every Electronics Engineer should have sound knowledge about the components used in Electronics Industry. This is vital in R&D Department for chip level troubleshooting. To meet the industrial needs, diploma holders must be taught about the most fundamental subject, Electronic devices and Circuits. By studying this subject, they will be skilled in handling all types of electronic devices and able to apply the skill in electronics system.

## COURSE OUTCOME:

On completion of the following units of syllabus contents, the students must be able to:

- Familiarize various passive and active components
- Categorize the concepts of rectifiers, filters and voltage multipliers
- Paraphrase about the bipolar junction transistors and its configuration
- Paraphrase the different types of biasing and amplifiers
- Explain the concept of oscillators and wave shaping circuits
- Recognize the working principle of different types of FET & UJT
- Study the performance of SCR, DIAC, TRIAC, and MOSFET AND IGBT
- Realize the construction and working principle of optoelectronic devices
- Study the working principle of clippers and clampers
- Interpolate the wave shaping circuits in various industries

### DETAILED SYLLABUS CONTENTS

UNIT	NAME OF THE TOPIC	Hours
I	<b>ELECTRONIC COMPONENTS , SEMICONDUCTOR AND DIODES:</b>  <b>Components:</b> Electronic components - passive components –active components. Resistors – Fixed and variable – Color coding – Uses – Capacitors – Fixed and Variable – Uses. Inductors – Fixed and Variable – Factors affecting the inductance - Switch –definition– Types – Switch function- Push to ON – Push to Off – SPST – SPDT – Relay (Construction details not required), Limit Switch.  <b>Semiconductor:</b> Definition, classification, intrinsic and extrinsic N type & p type – drift current &diffusion current-PN junction diode – forward and Reverse bias characteristics – specification – Zener diode construction & working Principle-characteristics- Zener break down-avalanche break down- Zener Diode as a voltage regulator –applications- specifications.  <b>Rectifier:</b> Definition-classification of rectifiers-half wave rectifier, full wave Rectifier (center tapped), bridge rectifier (no mathematical equations)-comparison-Applications. <b>Filters:</b> Definition-types-C, LC and PI filters	14



<p><b>II</b></p>	<p><b>BIPOLAR JUNCTION TRANSISTOR:</b></p> <p><b>Transistor:</b> Definition-NPN and PNP transistor – operation-transistor as an amplifier-transistor as a switch – transistor biasing – fixed bias, collector base bias, self-bias.</p> <p><b>Transistor configuration:</b> CB, CE, CC configurations – input and output characteristics - comparison between three configurations in terms of input impedance, output impedance, current gain, voltage gain.</p> <p><b>Amplifier:</b> Definition-classification of amplifiers-RC coupled amplifier – emitter follower and its application.</p> <p><b>Feedback:</b> Definition-types- Concept of negative feedback- effect of negative feedback.</p>	<p><b>14</b></p>
<p><b>III</b></p>	<p><b>TRANSISTOR OSCILLATORS AND FET AND UJT:</b></p> <p><b>Transistor oscillator:</b> Definition-Classifications – Condition for oscillations (Barkhausen criterion) – General form of LC oscillator – Hartley Oscillator – Colpitts Oscillator – RC Phase shift oscillator- Crystal oscillator.</p> <p><b>Field Effect Transistor:</b> classification of FET – construction – working principle of FET – difference Between FET and BJT – characteristics of FET – FET amplifier (common source amplifier)-FET as a chopper.</p> <p><b>Uni-Junction Transistor</b> :construction – equivalent circuit – operation – Characteristics – UJT as a relaxation oscillator</p>	<p><b>14</b></p>
<p><b>IV</b></p>	<p><b>SCR, DIAC, TRIAC , MOSFET &amp; IGBT:</b></p> <p><b>SCR:</b> Introduction – working – VI-characteristics - Two transistor analogy of SCR – SCR as a switch, controlled rectifier- Applications.</p> <p><b>DIAC:</b> Construction – Working – Characteristics- Applications – DIAC as bi-directional switch.</p> <p><b>TRIAC:</b> Basic working principle – Characteristics- Applications – Speed control of fan using DIAC and TRIAC.</p> <p><b>MOSFET:</b> Types- Construction – Characteristics- Applications – MOSFET as a Switch – CMOS</p> <p><b>IGBT:</b> basic concept – Basic principle – IGBT as a Switch.</p>	<p><b>14</b></p>

<b>V</b>	<p><b>OPTO ELECTRONICS DEVICES AND WAVE SHAPING CIRCUITS:</b></p> <p><b>OPTO ELECTRONICS DEVICES:</b> Definition-Classification of opto electronic devices – LDR, LED, 7-segment LED, LCD, Opto coupler, Opto interrupter – Infrared transmitter &amp; Receiver - Laser diode.</p> <p><b>WAVE SHAPING CIRCUITS:</b> Clipper, Clamper Circuits and Voltage doubler and waveforms only – Solar Cell.</p> <p><b>MULTI VIBRATORS:</b> Astable, Monostable and Bi-stable Multivibrators using Transistors -Schmitt Trigger using Transistors.</p>	<b>14</b>
<b>Revision and Test</b>		<b>05</b>

**Text Books:**

1. Electronics Devices & Circuits by Salivahanan S, N.Suresh Kumar, A.Vallavaraj Tata McGraw Publication 3rd Edition 2016
2. Electronics Devices and circuit theory by Boyestad&Nashelsky, PHI , New Delhi 2009

**Reference Books:**

1. Electronic Principles by Malvino,-Tata McGraw Hill Publication 2010.
2. Electronic Devices & Circuits by Allen Mottershed *An Introduction*, PHI
3. Electronics Devices & Circuits by Jacob Millman and Halkias 3rd Edition 2010, Tata McGraw – Hill publication
4. Optical Fiber Communication by Gerd Keise 5<sup>th</sup> Edition, Tata McGraw – Hill Publication

## MODEL QUESTION PAPER

### ERM 32 – ELECTRONIC DEVICES & CIRCUITS

Time: 3 Hrs.

Maximum marks: 75

- Note:
1. Answer ALL the questions in PART-A (1 mark each)
  2. Answer any ONE question from each Unit in PART-B (3 marks each)
  3. Answer any ONE question from each Unit in PART-C (10 marks each)
  4. The question paper contains TWO pages

#### **PART-A**

**(1 X 10= 10)**

1. Define Semiconductor.
2. Define rectifier efficiency.
3. Mention the three types of transistor configuration.
4. Define transistor biasing?
5. Define transistor Oscillator.
6. Define FET.
7. State the types of MOSFET?
8. Expand IGBT.
9. List any one type of Multivibrators.
10. What is LDR?

#### **PART-B**

**(3 X 5 = 15)**

##### **UNIT-I**

11. How will you find the resistance of the wire using color code.
12. Differentiate between Zener breakdown & Avalanche breakdown.

##### **UNIT-II**

13. Write short notes on transistor as an amplifier.
14. Draw the circuit diagram of self-bias of transistor.

##### **UNIT-III**

15. Derive the Barkhausen criterion for oscillations.
16. Differentiate FET and BJT

##### **UNIT-IV**

17. Draw the two transistor analogy of SCR.
18. Explain how DIAC can be used as bi-directional switch.

##### **UNIT-V**

19. Write short notes on laser diode.
20. Write short notes on Solar cell.

**UNIT-I**

21. With neat sketch, explain the VI characteristics of PN Junction Diode.
22. With neat sketch, explain the operation of Full wave rectifier using Centre tapped transformer.

**UNIT-II**

23. With neat sketch, explain the characteristics of transistor in CE Configuration.
24. Draw & Explain the working of RC Coupled amplifier.

**UNIT-III**

25. Explain the working principle of Field Effect Transistor.
26. With neat sketch, explain the UJT as a relaxation oscillator.

**UNIT-IV**

27. Explain the working principle of TRIAC.
28. Explain the operation of IGBT with neat sketch

**UNIT-V**

29. Draw the circuit diagram and explain the working of monostable multivibrator using transistor.
30. (i) Explain the clamper circuit using diode.  
(ii) Explain the clipper circuit using diode.

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**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**

**Semester : III**

**Subject Code: ERM33**

**Subject : ELECTRICAL CIRCUITS AND MACHINES**

**TEACHING AND SCHEME OF EXAMINATIONS:**

**No. of Weeks per Semester: 15**

SUBJECT	INSTRUCTION		EXAMINATION			
	Hours/Week	Hours/Semester	Marks		Duration	
ELECTRICAL CIRCUITS AND MACHINES	4	60	Internal Assessment	Board Examination	Total	3Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

SL.NO.	TOPICS	TIME (HRS.)
I.	DC circuits and DC Networks Theorems	11
II.	AC circuits	11
III.	Resonance and Three phase AC circuits	11
IV.	DC Machines	11
V.	AC Machines and Transformers	11
	Revision and Test	05
	Total	60

**RATIONALE:**

The fundamental knowledge about Electrical circuits both AC and DC is essential for all diploma holders. The working principle of DC AND AC machines, transformer is a prerequisite for technicians in their workplace. This subject helps in this way.

## COURSE OUTCOME:

- Define voltage, current, resistance, resistivity, power, energy and their units.
- Explain ohm's law and Kirchoff's law and solve simple problems
- Recall equivalent resistance of series and parallel circuits
- Solve problems in mesh current and nodal voltage method
- Measure  $\square\square$  power measurement by two watt meter method
- Explain constructional details of dc machines
- Explain construction, working and starting methods of 1 $\square\square\square\square$  induction motor
- Summarize working principle of different types of induction motor
- Explain working principle of working of transformer

## DETAILED SYLLABUS

### CONTENTS

UNIT	NAME OF THE TOPIC	Hours
I	<b>DC CIRCUITS AND DC NETWORK THEOREMS</b>  Concept of electrical quantities – Voltage – current – resistance – power – energy – ohm's law – Resistances in series – Resistances in parallel – series parallel circuits – Kirchhoff's laws – Mesh Current Method  Super position, Thevenin's, Norton's and maximum power transfer theorems – Statement and explanations – Simple problems.	11
II	<b>AC CIRCUITS</b>  AC fundamentals – AC waveform – sinusoidal and non-sinusoidal – period – frequency – cycle – amplitude – phase – peak value – average value – RMS value (effective value) – form factor – crest factor – Rectangular and polar forms.  AC Through pure resistor, inductor and Capacitor – Concept of impedance – vector diagram. Capacitors in series and parallel – energy stored in a capacitor– derivation – simple problems. Power in AC circuits – power factor– RL, RC and RLC series and parallel circuits – simple problems. Introduction of Harmonics - Effects of Harmonics	11

<b>III</b>	<p><b>Resonance and 3<math>\phi</math> AC circuits</b></p> <p>Resonance – condition for resonance – series and parallel resonance – resonance curve – effect of resistance on resonance curve – selectivity – Q factor and bandwidth – applications of resonance – simple problems in resonance.</p> <p>Concept of 3<math>\phi</math> supply – line and phase voltage and current in star and delta connected circuits – three phase power – Measurement of three phase power by two watt meter method – simple problems – advantages of three phase over single phase system</p>	<b>11</b>
<b>IV</b>	<p><b>D.C Machines</b></p> <p>DC machines – Types – constructional details of DC machines – DC generators – principle – types – emf equation – characteristics of shunt, series and compound generators</p> <p>DC motor – types – motor action – back emf – torque speed characteristics – starting of motors using 3 and 4 point starters – speed control of DC motor-applications.</p>	<b>11</b>
<b>V</b>	<p><b>AC machines and Transformers</b></p> <p>AC machines – 3<math>\phi</math> alternator – construction and working – relation between speed and frequency. 3<math>\phi</math> Induction motor – construction – types – principle of operation – methods of starting of 3<math>\phi</math> induction motor – slip. Single phase induction motor – principle of operation – split phase and capacitor start motors – Applications – principle of operation -Stepper motor</p> <p>Transformer – Ideal transformer – principle of working – constructional details – emf equation – turns ratio – core loss – copper loss – efficiency – regulation – SC and OC tests – simple problems. Transformer on No load – Transformer on load – condition for maximum efficiency All-day efficiency (simple problems). Auto transformer – construction and working – applications.</p>	<b>11</b>
<b>Revision and Test</b>		<b>05</b>

**Text books:**

1. Theraja. B.L., A text book of Electrical Technology, Vol. I & II”, S.Chand & Co.
2. Nagoor kani , Circuit Theory ,RBA Publications

**Reference books:**

1. Arumugam & Prem kumar, Circuit Theory, Khanna Publishers
2. Louis M.M. ,Elements of Electrical Engineering , Khanna Publishers
3. Gupta M.L., S.K.Kataria & Sons, Elementary of Electrical Engineering.

## MODEL QUESTION PAPER

### ERM33- ELECTRICAL CIRCUITS AND MACHINES

Time: 3 Hrs  
75

Maximum Marks:

- Note:
1. Answer ALL the questions in PART-A (1 mark each)
  2. Answer any ONE question from each Unit in PART-B (3 marks each)
  3. Answer any ONE question from each Unit in PART-C (10 marks each)
  4. The question paper contains TWO pages

#### PART-A

(1X10=10)

1. State Ohm's Law
2. State the condition for maximum power transfer from source to load
3. Define form factor
4. Define impedance
5. Convert  $5+j9$  into polar form
6. State the condition for resonance
7. Define Q- factor
8. State the Relationship between the frequency and number of poles.
9. What is the function of Commutator in DC machine
10. Write any one type of single phase induction motor

#### PART-B

(3X5=15)

#### UNIT-I

11. Three resistors of 3, 4, 5 ohms respectively are connected in parallel. This combination is put in series with a 2.5 ohm resistor. Determine the equivalent resistance of the combination.
12. State and explain Kirchoff's law.

#### UNIT-II

13. Find the Rectangular forms for the given complex number  $50 \angle 37^\circ$
14. Derive an expression for energy stored in a capacitor.

#### UNIT-III-

15. Explain series resonance.
16. State the advantages of three phase system over single phase system

#### UNIT-IV

17. State the applications of different types of DC Generators.
18. Draw the Schematic diagram of D.C. compound Motor.

#### UNIT-V

19. Explain the working principle of capacitor start induction motor.
20. Explain the working principle of transformer.

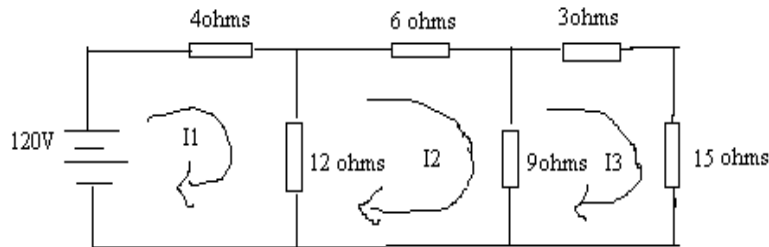


## PART-C

(10X5=50)

### UNIT-I

21. Find the currents supplied by the batteries by using Mesh Analysis.



22. A wheat stone bridge consists of  $AB=10$  ohms,  $BC=10$  ohms,  $CD = 4$  ohms,  $DA= 5$  ohms .A galvanometer of  $20$  ohms resistance is connected across  $BD$ . Calculate the current through the galvanometer when a potential difference of  $10V$  is maintained across  $AC$

### UNIT-II

23. Three capacitors  $10$  MFD , $25$  MFD,  $50$  MFD are connected in series .find the equivalent capacitance and energy stored, when capacitors are connected across a  $500V$
24. Prove the power in a R-L Series circuit is  $VI \cos\phi$

### UNIT-III

25. With neat diagram explain the measurement of three phase power two wattmeter method
26. Derive the  $q$ - factor for series resonance and parallel resonance

### UNIT-IV

27. Explain the methods of speed control of DC shunt motor
28. Draw the constructional details and Explain the working of DC generator

### UNIT-V

29. Explain the construction and working of three phase squirrel cage induction motor
30. Explain the Open circuit and short circuit test in transformers.

Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Subject Code: ERM34

Semester : III Semester

Subject Title : MACHINE SHOP TECHNOLOGY

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours/ week	Hours / semester	Marks		3 Hrs.	
MACHINE SHOP TECHNOLOGY	4	60	Internal Assessment	Board Examination		Total
			25	75		100

**TOPICS AND ALLOCATION OF HOURS:**

SI.No.	TOPICS	TIME (Hrs.)
I.	Lathe, Planer, Shaper	11
II.	Drilling machines, Milling machines	11
III.	Grinding machine, Broaching, Boring and Jig boring	11
IV.	Unconventional Machining Processes	11
V.	Fundamentals of measurement	11
	Test & Revision	05
	Total	60

**RATIONALE:**

The Working principle of various machines like Planer, Shaper, Lathe, Drilling machine, Milling Machine is necessary for supervisors and Heads of Manufacturing industries. Usage of machines & Maintenance of Machines are important for plant Engineers. Knowledge of Unconventional machining processes & measurement methods are necessary for Electronics (Robotics) Engineer.

**COURSE OUTCOME:**

On completion of the following syllabus contents, the students must be able to

- Explain the working of machine tools Lathe, planer, shaper
- Compare various work holding devices
- Explain the working of machine tools drilling machine, Milling machine
- Distinguish various types of milling cutter
- Explain the various types of boring machines
- Classify different types of grinders and grinding wheels
- Analyze the broaching operation and their application
- Explain the working of various unconventional machines
- Classify the various types of Measuring instruments

**DETAILED SYLLABUS**

**CONTENTS**

UNIT	NAME OF THE TOPICS	HOURS
<b>I</b>	<p><b>LATHE, PLANER, SHAPER</b></p> <p><b>Lathe:</b> Types, specification, sketch, principle parts-headstock, tailstock, carriage, and tool post. Operations performed on Lathe: turning, thread cutting, drilling, boring, reaming, tapping, knurling, forming, thread cutting, taper turning.</p> <p><b>Planer:</b> Types of planers-description of double housing planer – specifications-principles of operation-drives-quick return mechanism-feed mechanism-types, work holding devices and special fixtures-types of tools-various operation.</p> <p><b>Shaper:</b> Types of shaper-specifications-standard-plain-universal principles of operations-drives-quick return mechanism –crank and slotted link-feed mechanism-work holding devices-tools and fixtures.</p>	<b>11</b>
<b>II</b>	<p><b>DRILLING MACHINES, MILLING MACHINES</b></p> <p><b>Drilling machines:</b> Drills-flat drills-twist drills-nomenclature-types of drilling machines-bench type-floor type-radial type-gang drill –multi spindle type-principle of operation in drilling-speeds and feeds for various materials-drilling holes-methods of holding drill bit-drill chucks-socket and sleeve-drilling-reaming-counter sinking counter boring-spot facing-tapping-deep hole drill-drill jigs.</p> <p><b>Milling machines:</b> Types-column and knee type-plain-universal milling machine vertical milling machine-specification of milling machines principles of operation-work and tool holding devices-arbor-stub arbor-spring collets-adaptors-milling cutters-plain milling cutters lab milling cutter-slitting saw-side milling cutter-angle milling cutter-T-slot milling cutter woodruff milling cutter-fly cutter nomenclature of milling cutter-milling process-conventional milling-climb milling-milling operations-straddle milling-gang milling-vertical milling attachment-types of milling fixtures</p>	<b>11</b>

III	<p><b>GRINDING MACHINE, BROACHING, BORING AND JIG BORING</b></p> <p><b>Grinding machines:</b> Types and classification-specifications-rough grinders-floor mounted hand grinders-portable grinders-belt grinders-precision grinders-cylindrical, surface, center less grinders-internal grinders planetary grinders-principles of operations-grinding wheels- abrasives-natural and artificial-dressing and truing of wheels balancing of grinding wheels-diamond wheels-types of bonds-grit, grade and structure of wheels-wheels shapes and sizes-standard marking systems of grinding wheels-selection of grinding wheel mounting of grinding wheels.</p> <p><b>Broaching:</b> Types of broaching machine-horizontal vertical and continuous broaching-principles of operation-types of broaches classification-broach tool nomenclature-broaching operations simple examples.</p> <p><b>Boring and Jig boring:</b> Boring machines-horizontal and vertical types-fine boring machines-boring tools-jig boring machine-measuring system-hole location procedure-deep hole boring.</p>	11
IV	<p><b>Unconventional Machining Processes</b></p> <p>Unconventional machining process-need – classification-Abrasive jet machining (AJM) working principle -applications – water jet machining (WJM) – working principle –applications- Abrasive water jet machining (AWJM) – working principle – applications- Electric discharge machining (EDM) - wire cut EDM- working principle -applications –Chemical machining and Electro chemical machining – working principle -applications -Laser beam machining and drilling- working principle -applications Plasma arc machining- working principle -applications - Electron beam machining –working principle -applications</p>	11
V	<p><b>Fundamentals of Measurement</b></p> <p>Introduction –Metrology – Inspection – Definition of terms-Accuracy – Precision – Tolerance – Surface finish – Quality – Reliability – Interchangeability – optical fundamentals – optical instruments – principles of operation- interference band - Measurement of Length – Classification of measuring instruments – Radius measurement – Measurement of Angles – Sine bar and slip gauges, Sine bar and spirit level , Angle gauges Measurement of Tapers –vernier bevel protractor, Tool room microscope, Autocollimator, External taper – Ring gauge measurement by balls and slip gauges –ring gauge measurement by unequal balls – Screw threads Inspection –Elements of a thread-gauging of screw threads – thread gauges – Measurement of individual elements of a screw thread – Measurement of External threads</p>	11
<b>Revision and Test</b>		<b>05</b>

**Text Books:**

- HajraChoudhry “work shop technology” Vol.II Media Promoters andPublishers Pvt Ltd.,  
1. Jain R.K “Production Technology” Khanna Publishers

## **Reference Books**

M I khan, ErajulHaque "Manufacturing Science" PHI Learning Pvt Ltd.

1. Vijay K Jain –"Advanced machining processes" Allied publishers pvt Ltd., New delhi 2007
2. Pandey p.c and shan H.S "Modern machining processes" Tata Mcgraw hill, New delhi 2007

**MODEL QUESTION PAPER**  
**ERM34- MACHINE SHOP TECHNOLOGY**

Time: 3 Hrs.

Maximum Marks: 75

- Note:
1. Answer ALL the questions in PART-A (1 mark each)
  2. Answer any ONE question from each unit in PART-B (3 marks each)
  3. Answer any ONE question from each unit in PART-C (10 marks each)
  4. The question paper contains TWO Pages

**PART- A**

(1x10=10)

1. What is the purpose of knurling?
2. What is taper turning?
3. Mention any one operation done on drilling machine.
4. List any one type of milling machines.
5. List any one type of bonds used in grinding wheel.
6. List any one application of Broaching.
7. What is the purpose of unconventional machining process?
8. List any one application of laser beam machining.
9. Define accuracy.
10. What is the purpose of sine bar?

**PART-B**

(3x5=15)

**UNIT-I**

11. Draw the neat sketch of tailstock and name its parts.
12. Write the specification of a shaper.

**UNIT-II**

13. Explain the nomenclature of twist drills.
14. With a neat sketch explain any one work holding devices used in milling machines.

**UNIT-III**

15. List out the various types of grinding machines.
16. Name the various parts of push broach with a neat sketch.

**UNIT-IV**

17. Give the classification of Unconventional machines.
18. What are the uses of plasma arc machining?

**UNIT-V**

19. List out the various measuring instruments.
20. With a neat sketch explain Vernier bevel protractor.

**UNIT-I**

21. List out the various machining operations done on a lathe. Explain any two of them with simple sketches..
22. Explain with a neat sketch the quick return mechanism in a planer.

**UNIT-II**

23. Explain the principle and working of Radial drilling machine with a neat sketch.
24. With a neat sketch explain the plain column and knee type milling machine.

**UNIT-III**

25. Explain with a neat sketch the principle of operation of internal grinder.
26. Explain with a neat sketch the working principle of jig boring machine.

**UNIT-IV**

27. Sketch and explain Electric discharge machining.
28. Explain with a neat sketch the working principle of Abrasive water jet machining. and state its advantages and disadvantages.

**UNIT-V**

29. With a neat sketch explain Autocollimator.
30. With a neat sketch Explain any two type of measurement.

**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**

**Subject Code: ERM35**

**Semester : III Semester**

**Subject Title: ELECTRONIC DEVICES AND CIRCUITS PRACTICAL**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks		Duration	
ELECTRONIC CIRCUITS AND DEVICES PRACTICAL	5	75	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**COURSE OUTCOME:**

- Illustrate the working principle of PN Junction Diode and Zener Diode
- Categorize the different types of rectifier with and without filter
- Learn about I/O characteristics of CE configuration of transistor
- Learn the frequency response characteristics of RC coupled amplifier
- Learn the characteristics of JFET
- Study the characteristics of SCR ,DIAC and TRIAC
- Empathize in working of clipper, clamper and voltage doubler
- Familiarize the characteristics of Opto electronic devices.

**LIST OF EXPERIMENTS**

1. Construct and plot the VI characteristics of PN junction diode and find the cut-in voltage.
2. Construct and plot the VI characteristics of Zener diode and find the break down voltage.
3. Construct and plot the regulation characteristics (by varying either load or line voltage) of Half wave rectifier with and without filters.
4. Construct and plot the regulation characteristics (by varying either load or line voltage) of Full wave rectifier with and without filters.
5. Construct and plot the regulation characteristics (by varying either load or line voltage) of Bridge rectifier with filters.
6. Construct and draw the Input and output characteristics of CE Transistor configuration and find its input & output resistance.



7. Construct and draw the frequency response of RC coupled amplifier and determine the 3-dB bandwidth.
8. Construct and plot the drain characteristics of JFET and find its pinch off voltage.
9. Construct and plot UJT characteristics and find its  $I_p$  and  $V_v$ .
10. Construct and draw SCR characteristics and find its break over voltage.
11. Construct and plot the DIAC and TRIAC characteristics.
12. Construct and draw the waveforms of positive clipper, clamper and voltage doubler.
13. Construct and draw the characteristics of LDR and a photo transistor.
14. Construct and verify the VI characteristics of solar cell
15. Simulate the half wave, full wave and bridge rectifier using simulation tool
16. Simulate the Astable and mono stable multi vibrator using simulation tool
17. Develop a mini project.

## EQUIPMENT REQUIREMENTS

S.No	Name of the Equipments	Range	Quantity
1	DC Regulated power supply	0-30v 1A	10 Nos.
2	Power Supply	0-250V, 1A	1 No
3	Signal Generator	1MHz	4 Nos.
4	Cathode Ray Oscilloscope	30MHz	4 Nos.
5	Digital Multi meter	-	10 Nos.
6	DC Voltmeter (Analog/Digital)	Different Ranges	15 Nos.
7	DC Ammeter (Analog/Digital)	Different Ranges	15 Nos.
8	Desktop / Laptop Computer	-	15 Nos.

## SOFTWARE REQUIREMENT

Matlab R2014

## QUESTION PAPER PATTERN

<b>ALLOCATION</b>	<b>MARKS</b>
Circuit diagram	20
Connection	25
Execution & Handling of equipment	15
Output / Result	10
Viva – Voce	5
<b>Total</b>	<b>75</b>

**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**

**Subject Code: ERM36**

**Semester : III Semester**

**Subject Title : ELECTRICAL CIRCUITS AND MACHINES PRACTICAL**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks		Duration	
ELECTRICAL CIRCUITS AND MACHINES PRACTICAL	5	75	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**COURSE OUTCOME:**

- Verify the Thevenin's Theorem
- Verify Ohms law and super position theorem
- Verify maximum power transfer theorem
- Demonstrate the frequency response plot for series and parallel resonance
- Conduct load test on single phase transformer
- Conduct Load test and No Load test on DC generator

**LIST OF EXPERIMENTS**

1. Verify Ohm's law
2. Verify Kirchhoff's current Law
3. Verify Kirchhoff's Voltage Law
4. Test and verify the super position theorem
5. Test and Verify Thevenin's theorem
6. Test and Verify Norton theorem
7. Test and Verify maximum power transfer theorem
8. Determine the Frequency response of Series resonance
9. Determine the Frequency response of Parallel resonance
10. Measurement of power and power factor of  $1\phi$  load (Fluorescent lamp) and plot the graph

11. Determination of Open Circuit Characteristics of DC shunt generator
12. Conduct Load test on DC shunt generator
13. Perform the Speed control of DC shunt motor
14. Perform the Speed control of A.C motors using DIAC and TRIAC
15. Predetermine the efficiency and regulation by open circuit and short circuit tests on single phase transformer
16. Conduct the Load test on single phase Transformer

## EQUIPMENT REQUIREMENTS

S.NO	Name of the Equipments	Range	Quantity
1.	Regulated power supply	0-30V	5 Nos.
2.	Signal Generator	1MHz	4 Nos.
3.	Cathode Ray Oscilloscope	30MHz	2 Nos.
4.	Transformer	12-0-12V	5 Nos.
5.	DC motor-shunt generator	220 V, 21A	1 Nos.
6.	Digital Multi meter	-	10 Nos.
7.	DC Motor	2.2KW, 220V, 12.6 A	1 Nos.
8.	AC Motor	1 HP, 230V	1 Nos.
9.	Ohm's law kit	-	1 Nos.
10.	Kirchoff's law kit	-	1 Nos.
11.	Super position theorem kit	-	1 Nos.
12.	Norton power theorem kit	-	1 Nos.
13.	Maximum power transfer theorem kit	-	1 Nos.
14.	Series, parallel resonance kit	-	1 Nos.
15.	Ammeter	Different ranges	10 Nos.
16.	Voltmeter	Different ranges	10 Nos.

## QUESTION PAPER PATTERN

<b>Allocation</b>	<b>Marks</b>
Circuit diagram	20
Connections & procedure	20
Tabulation & Graph	20
Result	10
Viva Voce	5
<b>TOTAL</b>	<b>75</b>

**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG.**

**Subject Code: ERM 37**

**Semester : III Semester**

**Subject Title: MACHINE SHOP TECHNOLOGY PRACTICAL**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours/ week	Hours/ semester	Marks			
MACHINE SHOP TECHNOLOGY PRACTICAL	5	75	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**RATIONALE:**

The Working principle of various machines like Planer, Shaper, Lathe, Drilling machine, Milling Machine is necessary for supervisors and Heads of Manufacturing industries. Usage of machines & Maintenance of Machines are important for plant Engineers. Knowledge of Unconventional machining processes & measurement methods are necessary for an Electronics (Robotics) Engineer.

**COURSE OUTCOME:**

- Analyze the parts of a Lathe and Shaper.
- Identify the Parts of a Milling machine.
- Modify a component using Lathe
- Machine a component using Shaper
- Grind a job to the given specification
- Utilize a dividing head and indexing plate
- Maintenance of Machines

**LIST OF EXPERIMENTS**

**Exercises in Lathe:**

1. Plain turning
2. Step turning
3. Step and Taper turning
4. Knurling and thread cutting
5. Boring (Straight and taper)

## Exercises in milling machine

1. Plain milling
2. Spur gear milling
3. Pocket milling

## Exercises in cylindrical grinding:

1. Shaft grinding
2. Plug gauge grinding
3. Progressive type Plug Gauge (cylindrical grinding)

## Exercises in Surface Grinding:

1. Square surface grinding

## Exercises in Tool and Cutter Grinding:

1. Prepare a Facing Tool using Tool and Cutter Grinder
2. Prepare a Parting Tool using Tool and Cutter Grinder

## Exercises in Shaper:

1. Shaping round to Square.
2. Shaping a 'V' block

## EQUIPMENT REQUIREMENTS

S.No	Name of the Equipments	Quantity
1.	Lathe	15 Nos
2.	Milling Machine	3 Nos
3.	Cylindrical Grinding Machine	1 No
4.	Surface Grinding Machine	1 No
5.	Tool and Cutter Grinding Machine	1 No
6.	Shaper	2 Nos

## QUESTION PAPER PATTERN

ALLOCATION	MARKS
Lathe/Milling	45
Drilling/Grinding	25
Viva Voce	5
Total	75

Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Subject Code: ERM41

Semester : IV

Subject Title: MEASURING INSTRUMENTS AND SENSORS

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
MEASURING INSTRUMENTS AND SENSORS	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

Sl.No.	TOPICS	TIME (Hrs.)
I.	Analog Instruments	11
II.	CRO and Bridges	11
III.	Digital Instruments, Displays & Recorders	11
IV.	Basic Sensors	11
V.	Advanced Sensors	11
	Revision and Test	05
	Total	60

**RATIONALE:**

Basic knowledge about instruments, usage of instruments, debugging faults, maintenance of instruments are most important for an Electronics(Robotics) Engineer. Types of Transducers, Measurement methods & procedures are essential to work in the field of Automation & process industries.



## COURSE OUTCOME:

On completion of the following units of syllabus contents, the student must be able to

- Define the characteristics of instruments.
- List out the classification of instruments.
- Explain the principle and working of analog instruments.
- Draw and explain the block diagram of CRO.
- Understand the functioning of Digital Storage Oscilloscope.
- Explain the working of various bridges.
- Understand the various types of Digital instruments.
- Explain the principle of operation of various recorders and displays.
- List various types of sensors.
- Explain inductive, capacitive, ultrasonic, hall effect, pyro electric sensors for various measurements.
- Study advanced sensors for various measurements.
- Infer recent trends in sensors technologies.

### DETAILED SYLLABUS

#### CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	<b>ANALOG INSTRUMENTS</b> <b>Characteristics of Instruments</b> – True value, Accuracy, Precision, Sensitivity, Reproducibility, Drift, Static Error and Correction, Resolution. <b>Classification of Instruments</b> – Primary and Secondary Instruments – Indicating, Recording & Integrating instruments. <b>Operating forces</b> – Deflecting, Controlling and Damping force. <b>Instruments-</b> Permanent Magnet Moving Coil instrument, Moving Iron Instrument – attraction and repulsion type, Analog Multimeter, Dynamometer Watt meter, Single phase induction type Energy meter.	11
II	<b>CRO &amp; BRIDGES</b> <b>CRO</b> - Block diagram of oscilloscope, construction and working of CRT, Horizontal deflection, Vertical deflection, Delay line, Time base generator, Electrostatic focusing and Electrostatic deflection(No derivation), applications of CRO, Digital Storage Oscilloscope. <b>Bridges</b> – Construction, working, balance equation (derivation not required) & applications of – measurement of resistance by wheat stone bridge, measurement of capacitance by Schering Bridge, measurement of inductance by Maxwell's bridge.	11

III	<p><b>DIGITAL INSTRUMENTS, DISPLAYS AND RECORDERS</b></p> <p><b>Digital Instruments</b> – Digital Vs Analog Instruments – Auto ranging – Auto zeroing – Auto Polarity – Block diagram of Digital Multimeter, Digital frequency counter, Digital Tachometer.</p> <p><b>Displays</b> –Seven Segment Display, Alpha Numeric display, Liquid Vapour display (LVD).</p> <p><b>Recorders</b> –Strip-chart recorder, X-Y recorder, CD recording and reproduction.</p>	11
IV	<p><b>BASIC SENSORS</b></p> <p>Sensors and Transducers – definition, difference between sensors and transducers, classification – Active and Passive sensors.</p> <p><b>Inductive Sensors:</b> LVDT, RVDT, Proximity Switch</p> <p><b>Capacitive Sensors:</b> The parallel plate capacitive sensors, Variable permittivity capacitive sensors, advantages and disadvantages, Capacitive sensors for liquid level measurement.</p> <p><b>Ultrasonic Sensors:</b> for Level Measurement and Distance Measurement.</p> <p><b>Hall effect Sensors:</b> Hall effect, Hall effect sensors for Displacement measurement, Fluid level measurement.</p> <p><b>Pyro electric Sensors:</b> Pyro electric Sensors as Thermal Detector</p>	11
V	<p><b>ADVANCED SENSORS</b></p> <p><b>Fiber optic Sensors:</b> Temperature sensors, Liquid level sensing, Fluid flow sensing, Micro bend sensors, Advantages of fiber optic sensors</p> <p><b>Smart Sensors:</b> Primary sensors, Excitation, Amplification, filter, converters, information coding/processing, data communication, the automation.</p> <p><b>Automotive Sensors (On-Board automobile sensors):</b> Flow-rate sensors, pressure sensors, oxygen sensors, torque and position sensors.</p> <p><b>Recent trends in Sensor Technologies</b> Film sensors- Thick film and Thin film sensors-MEMS – Advantages and Applications of MEMS, micro machining, MEMS Accelerometer- Nano sensors.</p>	11
<b>Revision and Test</b>		<b>05</b>

**Text books:**

1. A Course in Electrical and Electronics Measurements and Instrumentation – A.K.Sawhney, Dhanpat Rai & Co private limited, Eighteenth Edition 2007.
2. Sensors and Transducers - D.Patranabis, PHI Learning Private Limited, New Delhi – 110 001, Second Edition 2010.

**Reference Books:**

1. Electrical and Electronics Measurement and Instrumentation – R.K. Rajput, S.Chand & co.,
2. Electrical and Electronics Measurement and Instrumentation – Umesh Sinha, Satyaprakasan, Tech. India Pub 1992.
3. Modern Electronics Instrumentation and Measurement Techniques – Albert D. Helfrick.
4. A Treatise on Instrumentation Engineering – Prof. K. Padmanabhan and S.Ananthi, lk International Publishers, New Delhi, 2010.

**Model Question Paper**  
**ERM 41 – MEASURING INSTRUMENTS & SENSORS**

Time: 3 Hrs.

Maximum marks: 75

- Note:
1. Answer ALL the questions in PART-A (1 mark each)
  2. Answer any ONE question from each Unit in PART-B (3 marks each)
  3. Answer any ONE question from each Unit in PART-C (10 marks each)
  4. The question paper contains TWO pages

**PART-A**

**(1X10=10)**

1. Define damping force.
2. Define resolution.
3. List any one application of CRO.
4. List the types of bridges
5. Define digital instruments.
6. Define display devices.
7. Define transducer.
8. Expand RVDT.
9. List one of the applications of MEMS.
10. Define primary sensor.

**PART-B**

**(5 X 3 =15)**

**UNIT-I**

11. List any three characteristics of an analog instrument.
12. Write short notes on dynamometer watt meter.

**UNIT-II**

13. Write short notes on digital storage oscilloscope.
14. List any three applications of wheat stone bridge.

**UNIT-II**

15. Differentiate analog and digital instruments.
16. Write short notes on auto polarity.

**UNIT-IV**

17. Explain how pyro electric sensor can be used as thermal detector
18. Write short notes on parallel plate capacitive sensor.

**UNIT-V**

19. List any three advantages of fiber optic sensors.
20. Write short notes pressure sensor.

**PART-C**

**(10×5=50)**

**UNIT-I**

21. Explain with neat sketch the working principle of PMMC instrument.
22. Explain with neat sketch the working principle of moving iron instrument.

**UNIT-II**

23. Draw the block diagram of oscilloscope and explain the function of each block.
24. Explain the measurement of inductance by Maxwell's bridge.

**UNIT-III**

25. With neat sketch, explain strip chart recorder.
26. Explain digital multimeter with block diagram.

**UNIT-IV**

27. With neat sketch, explain the working of LVDT.
28. Explain how ultrasonic sensor can be used for (i) level measurement (ii) Distance measurement.

**UNIT-V**

29. Explain with neat sketch micro bend sensor.
30. With neat sketch, explain the flow-rate sensor.

**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**  
**Subject Code: ERM42**

**Semester : IV Semester**

**Subject Title: SENSOR PRACTICAL**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours/ week	Hours / semester	Marks			Duration
SENSOR PRACTICAL	3	45	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**RATIONALE:**

Sound Knowledge about Various types of sensors are most important for an Electronics (Robotics) Engineers. Familiarization about sensors is necessary in the field of automation.

**COURSE OUTCOME:**

- Measure the sensing range of Inductive, Capacitive & Magnetic proximity sensors.
- Measure the sensing range of Optical Sensors.
- Measure the sensing range of Fiber Optic Sensor.
- Familiarize in working of Strain gauge for Force measurement.
- Measure the sensing range of Analog Ultrasonic sensor
- Measure the sensing range of Retro, diffuse reflective sensor.
- Measure the sensing range of IR sensor.
- Familiarize in working of load cell measurement.
- Measure the sensing range Of Hall effect sensor, Piezo electric sensor & smoke sensor.
- Measure the Liquid level using capacitive level transducer.
- Measure the temperature using temperature sensor ( Thermocouple OR RTD)

**LIST OF EXPERIMENTS**

1. Measure the sensing range of Inductive proximity sensor.
2. Measure the sensing range of capacitive proximity sensor.
3. Measure the sensing range of Ultrasonic proximity sensor.
4. Measure the sensing range of one way light barrier sensor.
5. Measure the sensing range of Retro reflective sensor.

6. Measure the sensing range of diffuse reflective sensor.
7. Measure the sensing range of Fiber optic sensor.
8. Detect the Object using IR sensor
9. Measure the force using Strain gauge experiment module.
10. Measure the load using Load cell experiment module.
11. Measure the sensing range of Analog Ultrasonic sensor module.
12. Measure the pressure using Piezo Electric transducer.
13. Study the operation of Hall Effect transducer.
14. Study the operation of smoke sensor
15. Measure the temperature using temperature sensor ( Thermocouple OR RTD)

## EQUIPMENT REQUIREMENTS

S.No	Name of the Equipments	Quantity
1.	Power Supply (0 – 30 V)	10 Nos.
2.	Inductive Proximity Sensor	1 Nos.
3.	Capacitive Proximity Sensor	1 Nos.
4.	Ultrasonic Proximity Sensor	1 Nos.
5.	One way light barrier sensor	1 Nos.
6.	Retro reflective sensor	1 Nos.
7.	Diffuse reflective sensor	1 Nos.
8.	Fiber optic sensor	1 Nos.
9.	IR sensor	1 Nos.
10.	Strain gauge experimental setup	1 Nos.
11.	Load cell experimental setup	1 Nos.
12.	Analog ultrasonic sensor	1 Nos.
13.	Piezo electric transducer	1 Nos.
14.	Hall effect transducer	1 Nos.
15.	Smoke sensor	1 Nos.
16.	Temperature sensor	1 Nos.

## QUESTION PAPER PATTERN

<b>ALLOCATION</b>	<b>MARKS</b>
Diagram	25
Execution	25
Result & Graph	20
Viva – Voce	5
Total	75



## ERM 43 INDUSTRIAL TRAINING – I

The students are expected to gain a working experience in various departments of an industry / organization and hence learning the industrial management in a practical way.

The students have to undergo a six months industrial training (PHASE I) during the IV semester in a related industry / organization. During the training period the students are maintaining an Industrial diary to record their observation and learning. On completion of training, a training report should be submitted to the Head of the Department. Industrial training of Sandwich students will be evaluated based on Continuous Assessment of two periodical reviews and an End semester Examination on Assessment of Training Report and viva-voce.

### SANDWICH DIPLOMA COURSE - INDUSTRIAL TRAINING

#### 1. Introduction

The main objective of the Sandwich Diploma Course is to mould a well-rounded technician acclimated with industrial environment while being a student in the institution.

The Sandwich Diploma Course study is pursued by students, in 7 semesters of 3½ years duration, the subjects of 3 years - Full Time Diploma Course being regrouped for academic convenience.

While in the 4<sup>th</sup> semester students undergo Industrial Training-I for 6 months (December through May). They also do course work in the institution for one day in a week, while in the 7<sup>th</sup> semester they undergo another spell of 6 months (June through November) Industrial training-II.

The Apprenticeship (Amendment) Act 1973 is followed in regulating the Industrial training procedure for Sandwich Course.

I SEM	II SEM	III SEM	IV SEM	V SEM	VI SEM	VII SEM
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Institutional study



Industrial Training

First Spell - IV Semester (December - May)

Second Spell - VII Semester (June - November)

#### 2. Attendance Certification

Every month students have to get their attendance certified by industrial supervisor in the prescribed form. Students have also to put their signature on the form and submit it to the institutional staff in-charge. Attendance and submission of Review reports will be duly considered while awarding the Continuous Assessment mark.

### 3. Training Reports

The students have to prepare two types of reports:

- Weekly report in the form of diary to be submitted to the concerned staff in-charge of the institution. This will be reviewed while awarding Continuous Assessment mark.
- Comprehensive report at the end of each phase of Industrial Training will be reviewed while awarding End semester Examination marks.

#### 3.1 Industrial Training Diary

Students are required to maintain the record of day - to- day work done. Such record is called Industrial training Diary. Students have to write this report regularly. All days of the week should be accounted for clearly giving attendance particulars (Presence, Absence, Leave, and Holiday etc.). The concerned Industrial supervisor is to check periodically these progress reports.

#### 3.2 Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organization where the training was undergone after attestation by the supervisors. The comprehensive report should be incorporating study of plant/ product /process/ construction along with intensive in-depth study on any one of the topics such as processes , methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc should be incorporated with the consent of the Organization.

### 4. Scheme of Evaluation

Components	SCHEME OF EVALUATION		
	No.	Allocation	Marks
Continuous Assessment Mark	1	First review	20
	2	Second review	20
	3	Attendance	10
End Examination	4	Comprehensive Training Report	20
	5	Viva-Voce	30
<b>Total</b>			<b>100</b>

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Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Semester : V

Subject Code: ERM51

Subject : ANALOG AND DIGITAL ELECTRONICS

**TEACHING AND SCHEME OF EXAMINATIONS:**

No. of Weeks per Semester: 15

Subject Name	Instruction		Examination			Duration
	Hours/Week	Hours/Semester	Marks		Total	
Analog and Digital Electronics	5	75	Internal Assessment	Board Examination		100
			25	75		

**TOPICS AND ALLOCATION OF HOURS:**

Sl.No.	TOPICS	TIME (Hrs.)
I.	Linear ICs: Op. amp. Voltage regulator, Timer and their applications	14
II.	Boolean Algebra	14
III.	Combinational Logic	14
IV.	Sequential Logic	14
V.	D/A, A/D and Memory	14
	Revision and test	05
	Total	75

**RATIONALE:**

Digital electronics replaces the analog circuits in many fields. Using digital circuits is easier. Diploma holders must have knowledge about the fundamental laws used in digital electronics and the working principle of digital circuits. Operational amplifiers find application in timer circuits. This subject deals with both analog and digital electronic circuits.

**COURSE OUTCOME:**

- Explain the characteristics and applications of operational amp.
- Explain about Voltage Regulators
- Learn the concepts of Astable and Monostable Multivibrator using 555.
- Recognize the different number systems such as binary, BCD, Octal, Hexadecimal
- Construct logic circuits for given Boolean expressions.

- Familiarize the Truth Table and symbol of Logic gates
- Familiarize the reduction technique using Karnaugh map( 2 variable to 4 variable)
- Learn the operation of Adders and subtractor
- Familiarize the concept of multiplexer, Demultiplexer , encoder and decoder
- Distinguish between Combinational Logic and Sequential Logic
- Explain various Flip flops , registers and counters
- Study the different types of ADC and DAC.
- Explain the concept PAL and PLA.

### DETAILED SYLLABUS

### CONTENTS

UNIT	NAME OF THE TOPIC	HOURS
<b>I</b>	<p><b>Linear ICs: OP-AMP, voltage regulator, timers and their applications</b></p> <p><b>OP-AMP:</b> Operational Amplifier – Ideal Operational Amp. – Block diagram and characteristics of Operational amp. – parameters of Operational amp. – CMRR – Slew rate – Virtual ground – Applications of Operational amp. – Inverting amplifier — Non inverting amplifier- Integrator – Differentiator- Summing amplifier – Voltage follower – Comparator – Zero crossing detector– Specifications of Operational Amp.</p> <p><b>Voltage regulator:</b> 3 pin IC regulator-78xx,79xx,LM317</p> <p><b>TIMERS:</b> 555 Timer – Functional Block diagram – Astable, Monostable and Schmitt Trigger – Sequence timer, 555 timer as PWM.</p>	<b>14</b>
<b>II</b>	<p><b>BOOLEAN ALGEBRA</b></p> <p><b>NUMBER SYSTEMS :</b> Decimal – Binary – Octal – Hexadecimal – BCD – Conversion from one number system to other</p> <p><b>BOOLEAN ALGEBRA:</b> Basic laws -Demorgan's Theorems-Simplification of Boolean expression using Boolean algebra (up to three variables).</p> <p><b>LOGIC GATES:</b> definition- NOT – AND- OR – NAND – NOR– EX-OR - EX-NOR its Symbol, Truth table and Boolean expression – Realization of gates using Universal gates- logic circuits for the given Boolean expressions -Boolean expressions for given logic circuits.</p> <p><b>KARNAUGH MAP:</b> Simplification of Boolean expression using Karnaugh map (up to 4 variable)</p>	<b>14</b>

<p><b>III</b></p>	<p><b>COMBINATIONAL LOGIC</b></p> <p>Definition-Arithmetic circuits – Binary addition – Binary Subtraction – 1’s complement and 2’s complement – Signed binary numbers – Half adder – Full adder – Half subtractor – Full subtractor – Parity Generator and checker – Digital comparator – Arithmetic Logic Unit Encoder-Decoder – Multiplexer-Demultiplexer -BCD to Seven Segment Decoder.</p> <p><b>Digital Logic Families:</b> Types –Definition of Fan In, Fan Out, Propagation Delay, Noise Immunity-Basic Gates Using TTL &amp; CMOS Technology.</p>	<p><b>14</b></p>
<p><b>IV</b></p>	<p><b>SEQUENTIAL LOGIC</b></p> <p><b>FLIP FLOPS:</b> Definition– RS – D – T – JK – Master Slave Flip Flops – Edge triggered flip flop.</p> <p><b>COUNTER:</b> Definition-4-bit Asynchronous up Counter-4-bit Asynchronous down Counter- 4-bit Asynchronous Up Down Counter –4-bit Synchronous up Counter- 4-bit Synchronous down Counter- 4-bit Synchronous Up Down Counter – Mod n counter- Presetable counter- Decade counter – Ring counter – Johnson counter –State diagram .</p> <p><b>SHIFT REGISTER:</b> Definition-types-4 bit shift register – Serial In Serial Out – Serial In Parallel Out – Parallel In Parallel Out-Parallel In Serial Out.</p>	<p><b>14</b></p>
<p><b>V</b></p>	<p><b>D/A, A/D AND MEMORY</b></p> <p><b>DAC:</b> Basic concepts – Weighted Resistor D/A converter – R-2R Ladder D/A converter – Specification of DAC.</p> <p><b>ADC:</b> Ramp method Successive approximation method – Dual slope method, simultaneous method- Specification of ADC.</p> <p>Sampling and quantization – voltage to frequency converter – Frequency to voltage converter.</p> <p><b>MEMORY :</b> Definition –types-RAM ,ROM, PROM, EPROM, EEPROM, Static RAM – Dynamic RAM– Static Memory organization in terms of address lines, control lines and data lines — SDRAM – DDR RAM-Basic concept of PAL and PLA.</p>	<p><b>14</b></p>
<p><b>Revision and Test</b></p>		<p><b>05</b></p>

**Text Books:**

1. D.Roy Choudhury, Shail B.Jain, Linear Integrated Circuits - 4<sup>th</sup> Edition
2. S.Salivahanan, S.Arivazhagan, Digital Circuits and Design – 4<sup>th</sup> Edition

**Reference Books:**

1. Albert Paul Malvino and Donald P. Leach, Digital Principles and Applications MH.
2. Roger L. Tomasi Macmillan, Digital Electronics-McGraw – Hill
3. William H.Goth Mann, Digital Electronics–An introduction to theory and practice – PHI.
4. Satnam P.Mathur and others ,Electronic devices, Applications and Integrated Circuits – Umesh Publications

## MODEL QUESTION PAPER

### ERM 51 – ANALOG & DIGITAL ELECTRONICS

Time: 3 Hrs.

Maximum marks: 75

- Note:
1. Answer ALL the questions in PART-A (1 mark each)
  2. Answer any ONE question from each Unit in PART-B (3 marks each)
  3. Answer any ONE question from each Unit in PART-C (10 marks each)
  4. The question paper contains TWO pages

#### **PART-A**

**(1X10=10)**

1. What is operational amplifier?
2. Define Slew Rate
3. Define Logic Gate.
4. State the types of Number System?
5. What is combinational logic circuit?
6. Define Propagation Delay.
7. What is a flip-flop?
8. What are the types of Shift Register?
9. What is meant by sampling?
10. What is meant by quantization?

#### **PART-B**

**(5 X 3 =15)**

##### **UNIT-I**

11. State the characteristics of an ideal Op-amp.
12. Draw the basic block diagram of IC555 timer.

##### **UNIT-II**

13. Draw the logic diagram for the Boolean function  $Y=A'B+C$ .
14. State De-morgan's Law

##### **UNIT-III**

15. Write short notes on Half Adder with truth table.
16. Write short notes on Digital Comparator

##### **UNIT-IV**

17. Write short notes on D-Flip Flop.
18. Draw the circuit diagram of Johnson Counter.

##### **UNIT-V.**

19. Differentiate static RAM and dynamic RAM.
20. Draw the circuit diagram of voltage to frequency converter.

## **PART-C**

**(10×5=50)**

### **UNIT-I**

21. With neat sketch, explain the operation of Astable Multivibrator.
22. (i) List any two applications of OP-AMP  
(ii) Derive the output for Non-inverting & Inverting amplifier.

### **UNIT-II**

23. Simplify the given logic function by using K-map and simulate its output  
 $F = \Sigma(0,1,2,3,4,5,8,9,10,11,12,14)$
24. What is Logic Gate? Draw the symbol & truth table for AND, OR, NOT, NAND gates.

### **UNIT-III**

25. Draw the logic diagram of BCD to 7 segment decoder and explain its working.
26. Explain in detail about 8X1 Multiplexer.

### **UNIT-IV**

27. Explain the working of a 4-bit binary up counter with neat diagram
28. Explain the working of JKMS flip-flop with neat sketch.

### **UNIT-V**

29. Explain the successive approximation type analog to digital converter with neat diagram.
30. Draw & Explain the Static Memory Organization in terms of address line, control line and data line.



Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Subject Code: ERM52.1

Semester : V

Subject Title: INDUSTRIAL INSTRUMENTATION & AUTOMATION.

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours/ week	Hours / semester	Marks			
INDUSTRIAL INSTRUMENTATION & AUTOMATION.	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

SI.No	TOPICS	TIME (Hrs.)
I.	Temperature, flow and force measurement	11
II.	Torque, Pressure and strain Measurements	11
III.	Basic Concepts of PLC	11
IV.	Programming and Applications of PLC	11
V.	Industrial Communication and SCADA	11
	Test & Revision	05
	Total	60

**RATIONALE:**

Sound Knowledge about transducers, Various Transducer types, measurement methodologies are most important for an Electronics (Robotics) Engineers. Familiarization of PLC AND SCADA, Knowledge about Developing ladder diagrams, usage of timer & counter is necessary in the field of automation. Knowledge about industrial communication and network topologies are necessary for Electronics (Robotics) Engineers.

## COURSE OUTLINE:

- Understand the various types of strain Measurement.
- Understand the various types of force measurement.
- Understand the Various types of transducers.
- Summarize the various pressure measuring devices.
- Understand the Various Flow measuring devices.
- Explain the Basic concepts of PLC.
- Build the ladder diagram for basic gates
- Develop the ladder diagram for different applications of PLC

## DETAILED SYLLABUS

### CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	<b>TEMPERATURE, FLOW AND FORCE MEASUREMENT</b>  <b>Temperature measurement:</b> Temperature scales-temperature measuring instruments-liquid in glass thermometer- Bi-metallic thermometers-filled system- thermocouples - resistance thermometers-Thermistor - total radiation Pyrometer  <b>Flow measurements:</b> Venturi flow meter-pilot tube current meter- turbine meter-rotor meter  <b>Force measurements:</b> Force – work – torque – scales & balances – equal arm beam balance – pendulum scale – proving ring – hydraulic load cell – pneumatic load cell – strain gauge load cell	11
II	<b>TORQUE , PRESSURE AND STRAIN MEASUREMENTS</b>  <b>Torque measurement :</b> Torsion meter – mechanical, optical & electrical types – strain gauge torsion meter –Dynamometer – mechanical, hydraulic & electric motor generator dynamometers  <b>Pressure measurement:</b> Terminology – atmospheric – absolute - gauge-static- total pressures-Manometers-U tube manometer-Single column manometers- ring balance-bourdon gauge-bellow gauge-low pressure gauge - pirani vacuum gauge  <b>Strain Measurements:</b> Strain transducers-Strain measuring techniques-resistance strain gauge-Strain gauge materials – metal resistance strain gauges – bonded and unbounded type – wire type strain gauges – metal foil gauges – semiconductor strain gauge.	11

III	<p><b>BASIC CONCEPTS OF PLC</b></p> <p>Introduction to Programmable Logic controller – Hardwired circuits versus PLC control – Advanatages of PLC control – Relays – Parts of PLC – Processor – Memory – Input and output modules – Digital and Analog I/O's – Communication with PLC – Logic functions (OR, AND, NAND &amp; EX –OR)- Remote I/O – The operator interface – Message display – operator input and display –Printed reports – Traffic Displays – Time and Date – Computer boards – Talking to other PLC and computers</p>	11
IV	<p><b>PROGRAMMING AND APPLICATIONS OF PLC</b></p> <p>Ladder Programming Bit instruction – timer- counter – program control instruction – data handling instruction – math instruction – simple ladder diagrams for star- delta starter – Ladder diagrams for DOL starter – Cylinder sequence Application – Cylinder sequence using counter – Ladder diagram using Latch circuit – Ladder diagram using Timer – Ladder diagram using counter – sequence of the operation and ladder diagram for multicylinder application – sequence of the operation and ladder diagram for clean room air lock</p>	11
V	<p><b>INDUSTRIAL COMMUNICATION AND SCADA</b></p> <p><b>Industrial Communication</b></p> <p>Introduction-Evolution of Industrial Control Process-Types of Communication Interface- Parallel Communication Interface-Serial communication Interface-communication mode- Synchronization and Timing in Communication-Comparison between Synchronous and Asynchronous Transmission-Standard interface-software protocol-Industrial Network-Network Topology-Media Access method-Open system interconnection network model-Network components-Advantages of standardized industrial network Remote terminal unit-Wireless communication-Satellite communication-Fiber optic communication</p> <p><b>SCADA</b></p> <p>Evaluation of SCADA- Channel Scanning- Conversion to Engineering Units Interrupt Scanning-Data Processing- Distributed SCADA System- -Any one application of SCADA</p>	11
<b>Revision and Test</b>		<b>05</b>

**Text Books:**

1. D.Patranabis, "Principles of industrial instrumentation", tatamcgraw hill, ii edition
2. Electrical and Electronic measurements and instrumentation – A. K SAWHENY, DHANPAT RAI & sons
3. Programmable Logic Controllers, Frank D.Petruzella, Third Edition, Tata McGraw-Hill
4. Programmable Logic Controllers and Industrial Automation –Madhuchhanda Mitra, Samarjit Sen Gupta

**Reference Books:**

1. Modern Electronic Instrumentation & Measurements Techniques – Albert D. Helfrick and William David Cooper – PHI
2. R.K.Jain, "Mechanical and Industrial Measurements", Khanna Publishers, 11<sup>th</sup> Edition
3. Instrumentation – Devices & Systems – C.S.Rangan, G.R.Sarma, VSV.Mani, G.K.Mithal, TMH
4. Instrumentation Measurement and Analysis, B. C. NAKRA, K. K. CHAUDRY, 2nd Edition, Tata McGraw Hill Publishing company
5. The PLC Workbook,- K.Clements-Jewery & W.Jeffcoat, Prentice Hall of India (P) Ltd., New Delhi.

**MODEL QUESTION PAPER**  
**ERM 52.1 – INDUSTRIAL INSTRUMENTATION & AUTOMATION**

Time: 3 Hrs.

Maximum marks: 75

- Note:
1. Answer ALL the questions in PART-A (1 mark each)
  2. Answer any ONE question from each Unit in PART-B (3 marks each)
  3. Answer any ONE question from each Unit in PART-C (10 marks each)
  4. The question paper contains TWO pages

**PART-A**

**(1X10=10)**

1. Mention any one type of strain gauge
2. Define dynamometer.
3. Mention any one type of meter for flow measurement.
4. Define seeback voltage in thermocouple.
5. Define PLC
6. Mention any one input elements of PLC.
7. Develop ladder logic for expression  $Y = A.B$
8. Mention any two applications of PLC.
9. Expand SCADA.
10. Mention any one type of data transmission.

**PART-B**

**(5 X 3 =15)**

**UNIT-I**

11. Describe the U-tube manometer with neat sketch.
12. Write short notes on semiconductor strain gauge.

**UNIT-II**

13. Write short notes on liquid in glass thermometer.
14. Draw the diagram of pilot tube meter.

**UNIT-III**

15. Compare hardwired circuits Vs PLC.
16. Write short notes on memory organization in PLC.

**UNIT-IV**

17. Draw ladder logic to flicker a lamp for 10 times.
18. Write the sequence operation for box conveyor.

**UNIT-V**

19. Write short notes on synchronous transmission.
20. Draw a diagram for distributed SCADA structure.

**PART-C**

**(10X5=50)**

**UNIT-I**

21. a) Explain turbine flow meter  
b) Explain Rotameter with neat diagram.
22. Explain the working of total radiation pyrometer with a neat sketch.

**UNIT-II**

23. Explain hydraulic types of dynamometer with a neat sketch
24. Explain with neat sketch the metal resistance strain gauges

**UNIT-III**

25. Draw the block diagram of PLC and give brief account on each block.
26. Explain PLC Scan in detail.

**UNIT-IV**

27. Explain with ladder diagram the sequence of operation for multi cylinder Sequence application using latch circuit.
28. Explain with ladder diagram the sequence of operation for clean room air lock.

**UNIT-V**

29. Explain different types of network topologies used in industrial network.
30. Explain data processing in SCADA.

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Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Subject Code: ERM52.2

Semester : V

Subject Title : TOTAL INTEGRATED AUTOMATION

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
TOTAL INTEGRATED AUTOMATION	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

SI.No	TOPICS	TIME (Hrs.)
I.	Integrated Automation	11
II.	HMI Systems	11
III.	Supervisory Control And Data Acquisition (SCADA)	11
IV.	Communication Protocols of SCADA	11
V.	Distributed Control Systems (DCS)	11
	Revision and Test	05
	Total	60

**RATIONALE:**

Familiarization of SCADA in the field of automation. Knowledge about HMI systems and its applications are necessary for Electronics (Robotics) Engineers. Understand the various electrical and electronic programmable automations and their Applications

**COURSE OUTCOME:**

- Summarize the various electrical and electronic programmable automations
- Understand the Concept of HMI systems
- Categorize the Various communication protocols of SCADA
- Understand Basic concepts of DCS
- Explain the Applications of PLC

## DETAILED SYLLABUS

### CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	<b>INTEGRATED AUTOMATION</b> Need, components of TIA systems, advantages, Programmable Automation Controllers (PAC), Vertical Integration structure.	11
II	<b>HMI SYSTEMS</b> Necessity and Role in Industrial Automation, Need for HMI systems. Types of HMI- Text display -Operator panels - Touch panels - Panel PCs - Integrated displays (PLC & HMI). Check with PLC 502 and remove.	11
III	<b>SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)</b> Overview – Developer and runtime packages – architecture – Tools – Tag – Internal & External graphics, Alarm logging – Tag logging – structured tags– Trends – history– Report generation, VB & C Scripts for SCADA application.	11
IV	<b>COMMUNICATION PROTOCOLS of SCADA</b> Proprietary and open Protocols – OLE/OPC – DDE – Server/Client Configuration – Messaging –Recipe – User administration – Interfacing of SCADA with PLC, drive, and other field device	11
V	<b>DISTRIBUTED CONTROL SYSTEMS (DCS)</b> DCS – architecture – local control unit- programming language – communication facilities – operator Interface – engineering interfaces. Applications of PLC & DCS: Case studies of Machine automation, Process automation, Introduction to SCADA Comparison between SCADA and DCS.	11
	<b>Revision and Test</b>	<b>05</b>

#### Text Books:

1. John.W.Webb & Ronald A. Reis, “Programmable logic controllers: Principles and Applications”, Prentice Hall India, 2003.
2. Michael P. Lukas, “Distributed Control systems”, “Van Nostrand Reinhold Company”1995

#### Reference Books:

1. Win C Software Manual, Siemens, 2003
2. RS VIEW 32 Software Manual, Allen Bradly, 2005
3. CIMPLICITY SCADA Packages Manual, Fanuc India Ltd, 2004



**MODEL QUESTION PAPER**  
**ERM 52.2 – TOTAL INTEGRATED AUTOMATION**

Time: 3 Hrs.

Maximum marks: 75

- Note:
1. Answer ALL the questions in PART-A (1 mark each)
  2. Answer any ONE question from each Unit in PART-B (3 marks each)
  3. Answer any ONE question from each Unit in PART-C (10 marks each)
  4. The question paper contains TWO pages

**PART-A**

**(1X10=10)**

1. What is the need for totally integrated automation?
2. Why PAC is preferred for process industries?
3. Mention any one type of HMI
4. What is the necessity of HMI system in industrial automation?
5. Define tag
6. What is meant by alarm logging?
7. What is open protocol?
8. Define DDE
9. What is the function of Local control unit in DCS?
10. Mention any one application of DCS

**PART-B**

**(5 X 3 =15)**

**UNIT-I**

11. What are the Different components of TIA?
12. What are the difference between PLC and PAC?

**UNIT-II**

13. List the requirements of HMI for industrial automation
14. Explain Integrated displays

**UNIT-III**

15. Differentiate between internal and external tags with a practical example
16. Explain Alarm logging and tag logging

**UNIT-IV**

17. Explain the concept of messaging
18. Discuss server client configuration

**UNIT-V**

19. Write the difference between DCS and SCADA system
20. Illustrate any one case studies in machine automation

**UNIT-I**

21. Draw and explain the architecture of totally integrated automation
22. Explain the components used in Field level for totally automated integration

**UNIT-II**

23. Explain the HMI configuration procedure with neat flow diagram
24. With neat sketches explain any one typical application using HMI

**UNIT-III**

25. Explain about Modern wind farm and implementation of SCADA screens and features in it
26. Explain SCADA screens and Configuration required for Smart grid and renewable application

**UNIT-IV**

27. Explain how OPC solves automation data connectivity problem
28. With neat diagram explain the interfacing of SCADA with PLC

**UNIT-V**

29. Draw and explain the block diagram of Commercial distributed control system
30. Explain the architecture of DCS with neat sketches

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**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**

**Subject Code: ERM52.3**

**Semester : V**

**Subject Title: VIRTUAL INSTRUMENTATION**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
VIRTUAL INSTRUMENTATION	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

SI.No	TOPICS	TIME (Hrs.)
I.	Review of Virtual Instrumentation	11
II.	Programming Techniques	11
III.	Data Acquisition Basics	11
IV.	Common Instrument Interfaces	11
V.	Use Of Analysis Tools	11
	Revision and Test	05
	Total	60

**RATIONALE:**

Familiarization of Programming techniques in Virtual instrumentation in the field of automation. Knowledge about Virtual instrumentation and its historical Perspectives. Common instrument interfaces and analysis tools are necessary for Electronics (Robotics) Engineers

**COURSE OUTCOME:**

- Understand the Concept of Virtual instrumentation
- Define the Programming techniques
- Understand the Various communication protocols of SCADA
- Define Basic concepts of Data Acquisition system
- Illustrate the common Instrument interfaces

**DETAILED SYLLABUS**  
**CONTENTS**

<b>UNIT</b>	<b>NAME OF THE TOPICS</b>	<b>HOURS</b>
<b>I</b>	<b>REVIEW OF VIRTUAL INSTRUMENTATION</b> Historical perspectives, advantages, block diagram and architecture of a virtual instrument, data -flow techniques, graphical programming in data flow, comparison with conventional programming.	<b>11</b>
<b>II</b>	<b>PROGRAMMING TECHNIQUES</b> VIS and sub-VIS loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O	<b>11</b>
<b>III</b>	<b>DATA ACQUISITION BASICS</b> AOC.OAC. 010. Counters & timers. PC Hardware structure, timing. Interrupts OMA, software and hardware installation.	<b>11</b>
<b>IV</b>	<b>COMMON INSTRUMENT INTERFACES</b> Current loop, RS.232C/RS.485, GPIB, System buses, interface buses: USB, PCMCIA, VXI, SCXI, PXI, etc., networking basics for office & Industrial applications, Visa and IVI, image acquisition and processing. Motion control.	<b>11</b>
<b>V</b>	<b>USE OF ANALYSIS TOOLS</b> Fourier transforms, power spectrum correlation methods, windowing & filtering, VI application in various fields.	<b>11</b>
	<b>Revision and Test</b>	<b>05</b>

**Text Books:**

1. Gupta ,” Virtual Instrumentation Using Lab view 2E” Tata McGraw-Hill Education, 2010

**Reference Books:**

1. Gary Jonson, Labview Graphical Programming, Second Edition, McGraw Hill, New York, 1997
2. Sokoloff; Basic concepts of Labview 4, Prentice Hall Inc., New Jersey 1998.
3. Gupta S., Gupta J.P: , PC interfacing for Data Acquisition & Process Control, Second Edition, Instrument Society of America, 1994Win C Software Manual, Siemens, 2003

## MODEL QUESTION PAPER

### ERM 52.3 – VIRTUAL INSTRUMENTATION

Time: 3 Hrs.

Maximum marks: 75

- Note:
1. Answer ALL the questions in PART-A (1 mark each)
  2. Answer any ONE question from each Unit in PART-B (3 marks each)
  3. Answer any ONE question from each Unit in PART-C (10 marks each)
  4. The question paper contains TWO pages

#### **PART-A**

**(1X10=10)**

1. Define virtual instrumentation
2. What is the use of icon connector pane?
3. How does a while loop vary from for loop
4. State the difference between local and global variable
5. Mention any one major component in PC based data acquisition system
6. What is the use of signal conditioning?
7. What is an instrument driver?
8. Define XCSI
9. Mention any one tips for working in LABVIEW
10. What is the role of VI in engineering process?

#### **PART-B**

**(5 X 3 =15)**

##### **UNIT-I**

11. What are the advantages of virtual instrumentation?
12. Draw the block diagram of virtual instrumentation

##### **UNIT-II**

13. Create a VI for converting Celsius to Fahrenheit
14. Explain auto indexing

##### **UNIT-III**

15. What are the major components in PC based data acquisition system?
16. Explain the function of counters and timers in data acquisition system

##### **UNIT-IV**

17. Compare PXI and VXI
18. Explain the concept of image acquisition

##### **UNIT-V**

19. Explain windowing and filtering
20. State graphical system design model

## **PART-C**

**(10X5=50)**

### **UNIT-I**

21. Draw and explain the basic difference between the traditional instruments and software based instruments
22. With a neat diagram , explain the layers of Virtual instrumentation software and the hardware role

### **UNIT-II**

23. Explain about shift registers and feedback nodes with neat block diagram
24. Explain the functions of format strings and List its uses

### **UNIT-III**

25. Draw and explain the various functions in the DAQ device
26. How the DAQ hardware is configured in real time?

### **UNIT-IV**

27. Explain the architecture of PXI with neat sketches
28. With neat sketch explain in detail about motion control

### **UNIT-V**

29. Illustrate the front panel objects and their functions in detail with an example
30. Enumerate the editing and debugging techniques in Lab View programming

**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**

**Subject Code: ERM53**

**Semester : V**

**Subject Title : HYDRAULIC AND PNEUMATIC SYSTEMS**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours/ week	Hours / semester	Marks		3 Hrs.	
HYDRAULIC AND PNEUMATIC SYSTEMS	4	60	Internal Assessment	Board Examination		Total
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

Sl.No.	TOPICS	TIME (Hrs.)
I.	Fluid Power and Pumps	11
II.	Linear Actuators, Rotary Actuators, Hydraulic Turbines, Centrifugal	11
III.	Directional Control Valve, Pressure Control Valve and Flow Control Valve	11
IV.	Hydraulic Components, Instrumentation and measurement, Conduits and Fittings, Hydraulic Circuits	11
V.	Pneumatics System, Electronic Control for Fluid Power Reciprocating pumps	11
	Revision and Test	05
	Total	60

**RATIONALE:**

Hydraulics and pneumatics systems play a vital role in the Automation world. Adequate Knowledge in hydraulic and pneumatic components, principle of working, usage of components & maintenance of components is necessary in the field of automation.

## COURSE OUTCOME:

- Classify various types of piston pumps.
- Explain various types gear pumps.
- Estimate various linear actuators.
- Discuss the various rotary actuators.
- Classify the various directional control valves.
- Explain various pressure control valves.
- Discuss the various Hydraulic components.
- Utilize the Various Directional Control valves.
- Explain the various Pneumatic system.
- Compare the hydraulic and pneumatic systems

## DETAILED SYLLABUS

### CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
<b>I</b>	<p><b>FLUID POWER, PUMPS</b></p> <p>Fluid Power –Definition –Pascal’s Law- Basic Properties of Hydraulic Fluids- Mass , Weight, Density, Specific Weight, Specific Gravity, Viscosity, Bulk Modulus. Hydraulic Pumps Classification -Pump Types- Piston Pumps –Axial Piston Pump- Radial Piston Pumps- Graphical Symbols – Working Principles only. Gear Pumps-External Gear Pump- Internal Gear Pumps. Graphical Symbols – Working Principles only. Vane Pump: Unbalanced Vane Pump – Balanced Vane Pump- Graphical Symbols – Working Principles only.</p>	<b>11</b>
<b>II</b>	<p><b>LINEAR ACTUATORS, ROTARY ACTUATORS, HYDRAULIC TURBINES, CENTRIFUGAL</b></p> <p><b>Linear Actuators:</b> Hydraulic Cylinders - Cylinder Types-Single Acting cylinder - Gravity Return cylinder–Spring Return cylinder Telescopic Cylinder – Hydraulic Ram –Tandem Cylinder , Symbols and working principles only- Rotary actuators-motor types –gear motor-balanced vane motor-piston motor –two vane rotor actuator-rack AND pinion rotary actuator-motor torque – speed – power –efficiency –symbols –applications – specifications.</p> <p><b>Hydraulic turbines, centrifugal:</b> Hydraulic turbines – classifications - Pelton wheel - components and working - speed regulation (theory only) - Francis and Kaplan turbines - components and working - draft tube - functions and types - surge tank - differences between impulse and reaction turbines. Centrifugal Pumps – classifications - construction and working of single stage centrifugal pumps - components with types - theory only - multi stage pumps – advantages - priming – cavitation.</p>	<b>11</b>



<p><b>III</b></p>	<p><b>DIRECTIONAL CONTROL VALVE, PRESSURE CONTROL VALVE AND FLOW CONTROL VALVE</b></p> <p><b>Directional Control Valves:</b> Check Valve-Shuttle Valves-Two Way Directional Control Valves -Three Way Directional Control Valves -Four Way Directional Control Valves – Directional Control Valves Actuation types-Symbols- Working Principles.</p> <p><b>Pressure Control Valve:</b> Pilot Operated, Pressure Relief Valve –Pressure Reducing Valve –Sequence Valve – Symbols- Working Principles</p> <p><b>Flow Control Valve:</b> Type –Needle Valve –Pressure Compensated Flow Control Valve-Cushioned Cylinders –Flow Dividers –Balanced Spool Flow Divider- Rotary Flow Divider.</p>	<p><b>11</b></p>
<p><b>IV</b></p>	<p><b>HYDRAULIC COMPONENTS, INSTRUMENTATION AND MEASUREMENT, CONDUITS AND FITTINGS, HYDRAULIC CIRCUITS</b></p> <p><b>Hydraulic Components</b> –Accumulators – types –Diaphragm - Spring Loaded - Weight Loaded -Pressure Intensifiers – Hydraulic Reservoirs-Heat Exchanger types- Air cooled –Water cooled - Filters.</p> <p><b>Instrumentation and Measurement:</b> Pressure Gauges-Flow meters- Temperature Gauges.</p> <p><b>Conduits and Fittings:</b> Pipe - Tubing –Hose - Seals and Bearings – Hydraulic Fluids.</p> <p><b>Hydraulic Circuits:-</b>Counter Balance Circuit –Sequence Circuit- Speed Control Circuit-Meter in Circuit –Meter Out Circuit Intermittent Feed Control-Speed Control For Continuous Processing – Booster and Intensifier Circuits-Force Multiplication –Pressure Intensification</p>	<p><b>11</b></p>
<p><b>V</b></p>	<p><b>PNEUMATICS SYSTEM, ELECTRONIC CONTROL FOR FLUID POWER, RECIPROCATING PUMPS</b></p> <p><b>Pneumatics system:</b> Basic principles of pneumatics-difference between hydraulics and pneumatics-compressor types-two stage piston compressor – rotary vane compressor-rotary screw compressor – vacuum pumps- double acting pneumatic cylinder–gear motor pressure regulator –filters-lubricators-FRL unit-water removal – air preparation and distribution – Electronic control of fluid power solenoid valves-servo valves pump controls.</p> <p><b>RECIPROCATING PUMP:</b> Reciprocating Pumps – classifications - construction and working of single acting and double acting reciprocating pumps - plunger and piston pumps - discharge of a reciprocating pump - theoretical power required - coefficient of discharge – slip – problems - negative slip - indicator diagram – separation - air vessel (functions and working) - Special pumps - Jet pump - Turbine pump - Submersible pump.</p>	<p><b>11</b></p>
<p><b>Revision and Test</b></p>		<p><b>05</b></p>

**Text Books:**

1. Industrial Hydraulics –Third Edition John J.PippengerTyler,G.Hicks.Mc.Graw-Hill Book Companys.
2. Introduction to Fluid Power--James L. Johnson.-Delmar Thomson Learning Inc.

**References:**

1. Fluid Power Technology-Robert P. Kokernale-Library Of Congress Cataloging-Publication Data.
2. Basic Fluid Power - Dudleyt, A Pease and John J Pippenger - Prentice Hall 1987.
3. Fluid Power With Applications - Antony Esposito, Prentice Hall 1980.
4. Hydraulics And Pneumatics - (HB) Adrewparr –Jaico Publishing House.
5. Pneumatic And Hydraulic Systems - Bolton W. Butterworth-Heinemann-1987

**MODEL QUESTION PAPER**  
**ERM53- HYDRAULIC AND PNEUMATIC SYSTEMS**

Time: 3 Hrs.

Maximum Marks: 75

- Note: 1. Answer ALL the questions in PART-A (1 mark each)  
2. Answer any ONE question from each unit in PART-B (3 marks each)  
3. Answer any ONE question from each unit in PART-C (10 marks each)  
4. The question paper contains TWO Pages

**PART-A**

(1x10=10)

1. Define Bulk modulus.
2. What is Displacement?
3. What is the use of hydraulic Ram?
4. Define priming.
5. Mention any two types of DCV.
6. What is the use of flow divider?
7. Define accumulator.
8. Sketch Bourdon tube gauge.
9. Define compressor.
10. Define Turbine pump.

**PART-B**

(3x5=15)

**UNIT-I**

11. Explain the working of radial piston pump.
12. Define i) Specific gravity ii) Viscosity.

**UNIT-II**

13. Explain the working of Rotary actuator.
14. Write short notes on surge tank.

**UNIT-III**

15. Explain the working of Sequence valve.
16. Sketch and explain cushioned cylinder.

**UNIT-IV**

17. With a neat sketch explain diaphragm type accumulator.
18. Briefly explain Meter-in-speed control circuit.

**UNIT-V**

19. State any three differences between hydraulic and pneumatic system.
20. Write short notes about Submersible pump

**PART-C**

(10X5=50)

**UNIT-I**

21. With a neat sketch explain the working of axial piston pump.
22. Explain with a neat sketch i) Balanced vane pump ii) Unbalanced vane pump.

**UNIT-II**

23. With a neat sketch explain the construction and working of Double acting cylinder.
24. Explain the construction and working of single stage centrifugal pump with a neat sketch

**UNIT-III**

25. Illustrate the operation of 2/2 and 4/2 DCV with neat sketch.
26. Sketch and explain the construction and working of i) PRV ii) FCV

**UNIT-IV**

27. Briefly explain about i) pressure intensifier ii) reservoir with the help of neat diagram.
28. With a neat sketch explain i) Hoses ii) Heat exchanger

**UNIT-V**

29. Explain the construction and working of i) Two stage piston compressor ii) Rotary screw compressor with a neat sketch.
30. Explain the construction and working of any two type of reciprocating pump with a neat sketch.

**Course Name : DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**

**Semester : V**

**Subject Code : ERM54**

**Subject : ANALOG AND DIGITAL ELECTRONICS PRACTICAL**

### TEACHING AND SCHEME OF EXAMINATIONS:

**No. of Weeks per Semester: 15**

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Analog and Digital Electronics	5	75	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

### RATIONALE:

As instrumentation signal conditioning circuits are constructed using analog and digital ICs it is mandatory for Electronics (Robotics) engineer to get practice with constructing and testing fundamental Digital circuit. Also analog to Digital and Digital to Analog conversion is also learnt in this subject practically.

### COURSE OUTCOME:

- Illustrate the working Operational Amplifier, Differentiator and Integrator.
- Realize about the different types of three pin IC Regulators
- Familiarize the truth table of logic gates
- Construct the Logic circuit of Boolean Expression.
- Compare the operation of Adder and subtractor
- Verify the truth table of multiplexer, Demultiplexer, decoder and encoder.
- Verify the truth table of D- flip flop, T flip flop & J-K flip flop.
- Learn the operation of shift registers and counters.
- Study the operation of A/D and D/A converters

### LIST OF EXPERIMENTS:

1. Construct and test Inverting Amplifier and Non inverting amplifier with dc signal using op-amp.
2. Construct and test Integrator and Differentiator using operational Amplifier
3. Construct and test Astable multivibrator using IC 555
4. Experimentally obtain the output of IC voltage regular power supplies using IC 7805 and 7812.

5. Experimentally verify the Truth table of OR, AND, NOT, NOR NAND and XOR gate using 7432, 7408, 7404, 7402 and 7486.
6. Experimentally verify the universal property of NAND and NOR gates.
7. Construct and test Half adder, full adder using discrete ICs.
8. Construct and test half subtractor, full subtractor using discrete ICs.
9. Construct and verify the truth table for Encoder using 74148
10. Construct and verify the truth table for Decoder using 74138
11. Realize the Multiplexer using CMOS 4051.
12. Realize the Demultiplexer using CMOS 4051.
13. Design a circuit for Single digit counter using 7490, 7475, 7447 and seven segments LED.
14. Construct and test 4 bit ripple counter using Flip Flop with feedback.
15. Experimentally verify the truth table of D, T and JK Flip Flop.
16. Construct and verify the DAC circuit using R-2R Network, Binary weighted register network.
17. Construct and verify A/D convertor using ADC 0808 IC.

**EQUIPMENTS REQUIRED:**

S.No	Name of the Equipment	Quantity
1.	IC trainer with power supply facility	10 Nos.
2.	Cathode ray oscilloscope	2 Nos.
3.	Signal Generator	2 Nos.
4.	Dual Power supply	5 Nos.
5.	A/D Converter Kit	1 No.
6.	D/A Converter Kit	1 No.
7.	Multimeter	10 Nos.

**QUESTION PAPER PATTERN**

ALLOCATION	MARKS
Circuit diagram & truth table	20
Connection & Procedure	20
Tabulation & graph	20
Result	10
Viva Voce	05
Total	75

**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**

**Subject Code: ERM 55**

**Semester : V Semester**

**Subject Title: HYDRAULIC, PNEUMATIC AND PLC PRACTICAL**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours/ week	Hours / semester	Marks			
HYDRAULIC, PNEUMATIC AND PLC PRACTICAL	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**RATIONALE:**

Hydraulics and pneumatics systems plays a vital role in the Automation world. Adequate Knowledge in hydraulic and pneumatic components and PLC principle of working, usage of components & maintenance of components is necessary in the field of automation.

**COURSE OUTCOME:**

- Analyze basic pneumatic system and it's functioning.
- Discuss hydraulic system and it's functioning.
- Design application oriented pneumatic circuits.
- Discuss application oriented hydraulic system.
- Analyze the operation and use of special purpose valves.
- Compare working of directional control valves.
- Trouble shoots in pneumatic and hydraulic circuits.
- Discuss PLC system and its elements for process control

**LIST OF EXPERIMENTS**

**PNEUMATIC SYSTEM:**

Study of pneumatic system and its elements – FRL unit – Pressure relief valve – Directional control valves – Flow control valve.

1. a) Direct operation of a single acting cylinder (SAC)

b) Direct operation of a double acting cylinder (DAC)

2. Impulse pilot operation of a single acting cylinder
3. Maintained pilot operation of a single acting cylinder
4. Operation of a Double Acting cylinder using solenoid operated Directional control valve
5. Operation of a single acting cylinder controlled from two different positions using shuttle valve.
6. Operation of a double acting cylinder with quick return using quick exhaust valve.
7. Controlling of the speed of DAC using metering – in and metering – out circuit.
8. a) Automatic operation of DAC in single cycle using limit switch and memory valve.  
b) Automatic operation of DAC in multi cycles using limit switches and memory valve.

### **HYDRAULIC SYSTEM:**

1. Study of basic hydraulic system and its elements – Filter, pressure relief valve, DCV and FCV – Hydraulic system Vs pneumatic system hydraulic oil and its properties.
2. a) Direct operation of double acting cylinder (DAC)  
b) Direct operation of hydraulic motor.
3. Controlling the speed of DAC using meter- in and metering – out type controls.
4. Controlling the speed of hydraulic motor using metering – in and metering – out type controls.
5. a) Operation of DAC using solenoid operated control valve. (4/2 DCV, solenoid – spring)  
b) Operation of DAC using solenoid operated control valve (4/3 DCV, solenoid – solenoid – spring centered)
6. Sequencing of two cylinders using sequence valve.
7. Regenerative circuit
8. Counter balance circuit.

### **PLC:**

Study of PLC system and its elements.

1. Direct operation of a motor using latching circuit, AND logic control, OR logic control.
2. Direct operation of a motor using On Delay control and Off Delay control of a motor.
3. control the operation of a motor using up-counter
4. a) Develop a ladder logic for single cycle Operation of Double acting cylinder  
b) Develop ladder logic for Multi cycle Operation of Double acting cylinder



## EQUIPMENT REQUIREMENTS

### PNEUMATICS

S.No	Name of the Equipment	Quantity
1.	Basic trainer kit	2 Nos.
2.	Electro pneumatic trainer kit with PLC	1 Nos.

### HYDRAULICS

S.No	Name of the Equipment	Quantity
1.	Basic trainer kit	2 nos
2.	Electro hydraulic trainer kit With PLC	1 no

### PLC

S.No	Name of the Equipment	Quantity
1.	Basic Level Electro Pneumatic trainer	1 Nos.
2.	PLC (Siemens, Allen Bradley)	3 Nos.

### SOFTWARE REQUIREMENT:

Rockwell RS Logix Software

### QUESTION PAPER PATTERN

ALLOCATION	MARKS
Circuit diagram	30
Connection and Execution	40
Viva Voce	05
Total	75

**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG.**

**Subject Code: ERM 56**

**Semester : V**

**Subject Title: COMPUTER AIDED MACHINE DRAWING PRACTICAL**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours/ week	Hours / semester	Marks		Duration	
COMPUTER AIDED MACHINE DRAWING PRACTICAL	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**RATONALE:**

As per the latest requirements in the industries, this enables to learn the assistance of computer in the field of design and manufacturing areas. The application of material handling equipment is learnt based on the automation in the industries.

**COURSE OUTCOME:**

- Appreciate the need for sectional view and types of sections.
- Draw sectional views using different types of sections.
- Explain the use of threaded fasteners and the types of threads.
- Compare whole basis system with shaft basis system.
- Select different types of fits and tolerance for various types of mating parts.
- Appreciate the importance of fits and tolerance.

**LIST OF EXPERIMENTS**

UNIT	NAME OF THE TOPIC	HOURS
I	<b>SECTIONAL VIEWS</b> Review of sectioning – Conventions showing the section – symbolic representation of cutting plane- types of section – full section, half section, offset section, revolved section, broken section, removed section – section lining.	<b>3</b>

<b>II</b>	<b>LIMITS, FITS AND TOLERANCES</b> Tolerances – Allowances – Unilateral and Bilateral tolerances. Limits – Methods of tolerances – Indication of tolerances on linear dimension of drawings – Geometrical tolerances – application – Fits – Classifications of fits – Selection of fits – examples	<b>4</b>
<b>III</b>	<b>SURFACE TEXTURE</b> Surface texture – importance – controlled and uncontrolled surfaces – Roughness – Waviness – lay – Machining symbols	<b>4</b>
<b>IV</b>	<b>KEYS, SCREW THREADS AND THREADED FASTENERS</b> Types of fasteners – temporary fasteners – keys – classification of keys – Heavy duty keys – light duty keys. Screw thread – Nomenclature – different types of thread profiles – threads in sections – threaded fasteners – bolts – nuts – through bolt – tap bolt, stud bolt – set screw – cap screws – machine screws – foundation bolts	<b>4</b>
<b>V</b>	<b>CAD DRAWING PRACTICE</b> Detailed drawings of following machine parts are given to students to assemble and draw the Elevations / Sectional elevations / Plan / and Side views with dimensioning and bill of materials using CAD Software <ul style="list-style-type: none"> <li>• Sleeve &amp; Cotter joint</li> <li>• Knuckle joint</li> <li>• Screw Jack</li> <li>• Foot step bearing</li> <li>• Plummer Block</li> <li>• Universal coupling</li> <li>• Simple Eccentric</li> <li>• Machine Vice</li> <li>• Protected type flanged coupling</li> <li>• Stuffing box</li> <li>• Connecting rod</li> <li>• Swivel Bearing</li> </ul>	<b>40</b>

### EQUIPMENT REQUIREMENTS

Name of the Item	Quantity
Desktop/Laptop Computer	15 Nos
Software	CAD software

## QUESTION PAPER PATTERN

	SCHEME OF EVALUATION		
	Sl.No.	Allocation	Marks
<b>Part-A</b>	1	Written Theory Questions (Unit-I to Unit-IV) – 3 out of 4 Questions	15
<b>Part-B</b>	2	Assemble and Draw 2 or 3 views with Dimensioning and bill of materials (2D)	55
	3	Viva-Voce	05
		Total	75

**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**

**Subject Code: GEM 57**

**Semester : V Semester**

**Subject Title : LIFE AND EMPLOYABILITY SKILLS PRACTICAL**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
LIFE AND EMPLOYABILITY SKILLS PRACTICAL	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS & ALLOCATION OF HOURS**

UNIT	TOPICS	HOURS
I	LISTENING	15
II	SPEAKING	25
III	READING	5
IV	WRITING	10
V	PROJECT OUTLINE	5
	TOTAL	60

**RATIONALE**

Good Communication Skills plays a vital role in one's career. There are adequate Employment opportunities in all the sectors. Students need to enhance their Communication skills in English in order to cope with the tough competition. Besides, mastery in their specific domains students are expected to overcome the supply - demand mismatch.

**COURSE OUTCOMES**

- Emphasis and Enhance speaking skills
- Increase Ability to express views and Opinions
- Develop Employability skills
- Induce Entrepreneurship and Plan for the future.
- Expose and Induce Life Skills for Effective Managerial Ability.

UNIT	TOPICS	ACTIVITY	HOURS
I	LISTENING	<ul style="list-style-type: none"> <li>• Taking notes</li> <li>• Answering verbal questions</li> <li>• Fill in the blanks with words heard</li> </ul>	15
II	SPEAKING	<ul style="list-style-type: none"> <li>• Say expressions / phrases</li> <li>• Self-Introduction / others</li> <li>• Describe / Explain product</li> <li>• Group Discussion</li> <li>• Dialogue</li> <li>• Presentation</li> </ul>	25
III	READING	<ul style="list-style-type: none"> <li>• Productivity – Comparison with developed Countries</li> <li>• House Keeping in Industries</li> <li>• Occupational Safety and Hazard &amp; Occupational Accident and First Aid</li> <li>• Marketing Analysis, Support &amp; Procurement</li> <li>• Entrepreneurship</li> <li>• National Commission for Protection of Child Rights (NCTCR)</li> <li>• Protection of Children from sexual Offenses (POCSO Act and Rule of POCSO Rules, 2012)</li> </ul>	5
IV	WRITING	<ul style="list-style-type: none"> <li>• Instant Sentence Making</li> <li>• Framing questions</li> <li>• Resume writing</li> <li>• Make Sentence using pattern</li> <li>• Important Constitutional and Legal Provision for women in India</li> <li>• The Harassment of women at workplace (Prevention and Prohibition &amp; Redressal ) Act 2013)</li> <li>• Guidelines and Norms laid down by the Honourable Supreme Court in VISHAKA and Others</li> </ul>	10
V	PROJECT OUTLINE	<ul style="list-style-type: none"> <li>• Prepare an outline of project to obtain loan from bank</li> </ul>	5

#### FOR RECORD NOTE WRITING -

##### General Topics:

1. Productivity in Industries – Comparison with Developed Countries.
2. House-keeping in Industries.
3. Occupational Safety and Hazard & Occupational Accident and First Aid.
4. Entrepreneurship.
5. Marketing Analysis, Support and Procurement.

##### Writing Exercises:

1. Taking Down Notes (Listening)
2. Framing Questions
3. Making Sentences
4. Resume Writing

5. Project Outline
6. Instant Sentence Making
7. Say in phrases/Expressions

**Speaking Exercise: Presentation Skills**

1. Decision Making
2. Problem Solution
3. Creative Thinking/Lateral Thinking
4. Critical Thinking/ Perspicacity
5. Effective Communication
6. Interpersonal relationships
7. Self-awareness/Mindfulness
8. Assertiveness
9. Empathy
10. Equanimity
11. Coping with Stress, Trauma and Loss

NOTE: Students can choose any topic and present in Quality Tools, Quality Circles and Quality Consciousness depicting these topics.

**Text Book:** “ LIFE AND EMPLOYABILITY SKILLS PRACTICAL BOOK” , Ms.S.Rajalakshmi,  
Ms.S.Anandhi

<b>SCHEME OF EVALUATION</b>		
No.	Allocation	Marks
1	Listening	25
2	Speaking	25
3	Writing and Reading	20
4	Viva Voce	5
Total		75

**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**

**Subject Code: ERM58**

**Semester : V Semester**

**Subject Title : PROGRAMMING IN C PRACTICAL**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
Programming in C Practical	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**COURSE OUTCOME:**

At the end of the course the students will be able to

- Recognize the various operators and functions with decision making statements.
- Exploit various loops in the programming and also different types of arrays.
- Exploit functions on strings and other statements, also explaining the structures and union
- Familiarize in functions of pointers and applying on practical programs.
- Develop programs using input and output operations, functions with decision making Statements.
- Proficient to write programs in C and execute it.

**THEORY:**

**Keywords, Constants, Variables and Data types:**

Character Set – Constants – Integer Constants – Character Constants – String Constants; Variables – Declaration of Variables; Assigning value to Variables.

**Operations and Expressions:**

Arithmetic, Relational, Logical, Assignment, Increment, Decrement, Conditional, Bitwise Operator, Arithmetic Expressions, Evaluation of Expression.

**I/O Statements:**

printf() and scanf() functions (Unformat and formatted), getchar() and putchar() functions.

**Functions:**

Predefined functions – isdigit, isupper, islower and ispunct functions in header file <ctype.h> ; cos, tan, exp, ceil, floor, abs, pow and sqrt functions in header file <math.h>; strlen, strcpy, strcmp and strcat in header file <string.h>.



## **Decision Making, Branching, Looping and Arrays**

**Introduction:** simple if statement.

### **Decision Making & Branching:**

The if...else statement; Nesting of if...else statement; else...if ladder; switch case statement; go to statement.

### **Looping:**

While statement; do...while statement; for statement, break & continue statement.

### **Arrays:**

One Dimensional Arrays; Two Dimensional Arrays – Initializing One dimensional & Two Dimensional Arrays; Multidimensional Arrays.

## **Character String and Functions**

### **Character Strings:**

Introduction – declaring & initializing string variables; Reading Strings; Writing Strings; Comparison of two Strings; String handling functions.

### **User Defined Functions:**

Function – declaration, function – definition, function call, passing arguments, returning values, return statement.

### **Structures & Unions:**

Structure definition; Structure Initialization; Arrays of Structures; Structure within structure; Union.

## **Pointers and File Management**

Macro Substitution; File Inclusion; Compiler Controlled Directives.

### **Pointers**

Understanding Pointers: Accessing the address of Variables; Declaring and Initializing Pointers; Accessing a variable through its pointer; Pointer Expressions; Pointer Increments; Pointers and Arrays; Pointer and character Strings; Pointer and functions; Pointers and Structures.

## List of Exercises

1. Write a Sample program (E.g. Printing your name, addition, subtraction, multiplication, division, square, cube, square root)
2. Write a Program to calculate simple interest and compound interest.
3. Write a Program to find the roots of a Quadratic Equation.
4. Write a Program for Pay bill calculation.
5. Write a Program to compute sum of series using While loop.
6. Write a Program to Print the multiplication table using do-While loop.
7. Write a Program to find whether the given number is a positive number, negative number or zero.
8. Write a Program to sort a list of numbers
9. Write a Program to sort the strings.
10. Write a Program to prepare the rank list of a class of students.
11. Write a Program to implement Matrix addition.
12. Write a Program to implement Matrix Multiplication.
13. Write a Program to implement Fibonacci series.
14. Write a Program to find factorial of given N numbers without recursion.
15. Write a Program to find factorial of given N numbers with recursion.
16. Write a program to implement a command line argument.

### HARDWARE REQUIRMENT:

S.no	Name of the equipments	Quantity
1.	Desktop/Laptop computers	15 Nos
2.	Laser printer	1 Nos

### SOFTWARE REQUIREMENT:

C-COMPILER AND EDITOR

## QUESTION PAPER PATTERN

<b>ALLOCATION</b>	<b>MARKS</b>
Writing program	30
Execution	30
Result	10
Viva Voice	5
<b>Total</b>	<b>75</b>

Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG.(SW)

Subject Code: MEM61

Semester : VI

Subject Title: INDUSTRIAL ENGINEERING AND MANAGEMENT

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours/ week	Hours / semester	Marks			
INDUSTRIAL ENGINEERING AND MANAGEMENT	5	75	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**Topics and Allocation of Hours:**

Unit	Topic	Hours
I	Plant Engineering and Plant Safety	14
II	Work study, Method study and Work Measurement	14
III	Production Planning and Quality Control	14
IV	Principles, Personnel Management and Organizational behavior	14
V	Financial and Material Management	14
	Revision and test	05
TOTAL		75

**RATIONALE:**

In the Indian Economy, Industries and enterprises always find prominent place. After globalization, the government of India has announced liberalization policy of starting enterprises. Student must be trained not only in manufacturing process but also in managing activities of industries. Student must be trained to work as a good Manager. The knowledge about plant, safety, work study techniques, personnel Management and financial management will definitely mould the students as managers to the industries.

## COURSE OUTCOME:

- Explain the types of plant layout, plant maintenance, safety laws and settlement of industrial dispute
- Apply various concepts of work study to compile standard time and to improve standard of living through various means of productivity enhancement
- Explain the various functions of production planning and control, total quality management and implement QC and SQC tools
- Compare traditional and scientific management including leadership styles
- Illustrate various functions of personnel management and compute wages and incentives
- Explain and distinguish various sources of capital to find the selling price of a product by implementing various costs
- Demonstrate various tools and techniques related to material management

## DETAILED SYLLABUS

UNIT	NAME OF THE TOPIC	HOURS
I	<b>PLANT ENGINEERING AND PLANT SAFETY</b>  <b>Plant Engineering:</b> Plant – Selection of site of industry – Plant layout – Principles of a good layout – types – process, product and fixed position – cellular manufacturing - techniques to improve layout – Principles of material handling equipment – Plant maintenance – importance – Break down maintenance, preventive maintenance and scheduled maintenance.  <b>Plant Safety:</b> Importance –Incident/accident-causes and cost of an accident-accident proneness-prevention of accidents-Safety laws and regulations – Hazardous work environment -Industrial disputes-settlement of Industrial disputes-Collective bargaining, conciliation, Mediation, arbitration-Indian Factories Act 1948 and its provisions related to health, welfare and safety.	14
II	<b>WORK STUDY, METHOD STUDY AND WORK MEASUREMENT</b>  <b>Work Study:</b> Productivity – Standard of living – method of improving productivity– Objectives – Importance of good working conditions.  <b>Method Study:</b> Definition – Objectives – Selection of a job for method study –Basic procedure for conduct of method study – Tools used – Operation process chart, Flow process chart, two handed process chart, Man machine chart, String diagram and flow diagram – Introduction to Ergonomics.	14

	<p><b>Work Measurement:</b> Definition – Basic procedure in making a time study – Employees rating factor – Application of time allowances – Rest, Personal, and Process, Special and Policy allowances – Calculation of standard time – Problems – Basic concept of production study – Techniques of work measurement-Ratio delay study, Synthesis from standard data, analytical estimating and Pre determined Motion Time System (PMTS).</p>	
III	<p><b>PRODUCTION PLANNING AND QUALITY CONTROL</b></p> <p><b>Production Planning and Control:</b> Introduction – Major functions of production planning and control – Pre planning – Methods of forecasting – Routing and scheduling – Dispatching and controlling – Concept of Critical Path Method (CPM)-Description only. Production – types-Mass production, batch production and job order production- Characteristics – Economic Batch Quantity (EBQ) – Principles of product and process planning – make or buy decision – problems – Lean manufacturing</p> <p><b>Quality Control:</b> Definition – Objectives – Types of inspection – First piece, Floor and centralized inspection – Advantages and disadvantages. Quality control – Statistical quality control – Types of measurements – Method of variables – Method of attributes – Uses of X, R, p and c charts – Operating Characteristics curve (O.C curve) – Sampling inspection – single and double sampling plan – Concept of ISO 9001:2008 Quality Management System – Benefits of ISO to the organization.</p>	14
IV	<p><b>PRINCIPLES, PERSONNEL MANAGEMENT AND ORGANIZATIONAL BEHAVIOR</b></p> <p><b>Principles of Management:</b> Definition of management – Administration - Organization – F.W. Taylor’s and Henry Fayol’s Principles of Management – Functions of Manager – Directing – Leadership -Styles of Leadership – Qualities of a good leader – Motivation – Positive and negative motivation – Total Quality Management (TQM) – Quality circle – 5S Concept- SWOT Analysis</p> <p><b>Personnel Management:</b> Responsibility of human resource management – Selection procedure – Training of workers – Apprentice training – On the job training and vestibule school training – Job evaluation and merit rating – objectives and importance – wages and salary administration – Components of wages – Wage fixation – Type of wage payment – Halsey’s 50% plan, Rowan’s plan and Emerson’s efficiency plan – Problems.</p>	14

	<p><b>Organizational behavior:</b> Definition – organization--Types of Organization – Line, Staff, Taylor’s Pure functional types – Line and staff and committee type –Organizational Approaches, individual behavior—causes—Environmental effect—Behavior and Performance, Perception-organizational implications.</p>	
V	<p><b>FINANCIAL AND MATERIAL MANAGEMENT</b></p> <p><b>Financial Management:</b> Fixed and working capital – Resources of capital – shares preference and equity shares – debentures – Type of debentures – Public deposits, Factory costing – direct cost – indirect cost – Factory overhead – Selling price of a product – Profit – Problems. Depreciation – Causes – Methods - Straight line, sinking fund and percentage on diminishing value method – Problems.</p> <p><b>Material management:</b> Objectives of good stock control system – ABC analysis of inventory – Procurement and consumption cycle – Minimum Stock, Lead Time, Reorder Level-Economic order quantity problems – supply chain management – Introduction – Purchasing procedure – Store keeping – Bin card.</p>	14
<b>Revision and test</b>		<b>05</b>

**Text Books :**

- 1) Industrial Engineering and Management, O.P. Khanna, Revised Edition Publications (P) Ltd – 2004, 67/4 Madras House, Daryaganj, New Delhi – 110002.
- 2) Engineering Economics and Management, T.R. Banga & S.C. Sharma, McGraw Hill Edition. 2 – 2001, New Delhi.
- 3) Herald Koontz and Heinz Wehrich, 'Essentials of Management', McGraw Hill Publishing Company, Singapore International Edition. Latest

**Reference Books:**

- 1) Management, A global perspective, Heinz Wehrich, Harold Koontz, 10<sup>th</sup> Edition, McGraw Hill International Edition.Latest.
- 2) Essentials of Management, 4th Edition, Joseph L.Massie, Prentice-Hall of India, New Delhi 2004.
- 3) S.Chandran,Organizational Behaviours, Vikas Publishing House Pvt. Ltd. Latest
- 4) M.Govindarajan and S.Natarajan, Principles of Management, Prentce Hall of India Pvt. Ltd., New Delhi Latest.

**MODEL QUESTION PAPER**  
**MEM 61- INDUSTRIAL ENGINEERING AND MANAGEMENT**

Time: 3 Hrs.

Maximum Marks: 75

- Note: 1. Answer ALL the questions in PART-A (1 mark each)  
2. Answer any ONE question from each unit in PART-B (3 marks each)  
3. Answer any ONE question from each unit in PART-C (10 marks each)  
4. The question paper contains TWO Pages

**PART-A**

(1x10=10)

1. State the various methods of plant maintenance.
2. What is industrial dispute?
3. What are the uses of man-machine chart?
4. What is PMTS?
5. What is Economic Batch Quantity?
6. Define: Total Productive Maintenance.
7. Define: Management.
8. What is Merit rating?
9. What is the advantage of equity share over debentures?
10. What is the purpose of finding EOQ?

**PART-B**

(3x5=15)

**UNIT-I**

11. Explain briefly break down maintenance.
12. What is industrial legislations?

**UNIT-II**

13. What are the objectives of method study?
14. Compare fly back and continuous methods of timing using stop watch.

**UNIT-III**

15. Explain the master schedule with the help of Gantt chart.
16. Explain briefly about six sigma.

**UNIT-IV**

17. Describe the three dimensions of motivation.
18. State and explain the various components of wages.

**UNIT-V**

19. Explain the sinking fund method of depreciation.
20. What are the objectives of good stock control system?



**UNIT-I**

- 21. Explain the different types of plant layout with neat sketches.
- 22. Briefly describe the different methods available for solving industrial disputes.

**UNIT-II**

- 23. With an example describe two handed process chart. Enumerate the guide lines for preparing the chart.
- 24. Write short notes on the following: (i) Ratio delay study. (ii) Analytical estimation.

**UNIT-III**

- 25. What is forecasting? Explain the different techniques of forecasting.
- 26. Describe the operating characteristics curve of a sampling plan.

**UNIT-IV**

- 27. State the principles of management enumerated by Henry Fayol. Explain any four of them.
- 28. What is job evaluation? Describe any one method of job evaluation.

**UNIT-V**

- 29. Calculate selling price of one flange from the data given below.

No. of flanges produced	= 600
Material cost	= Rs.5000
Manufacturing cost	= Rs.3000
Factory overheads	= 100% of direct labour cost
General overheads	= 12.5% of Factory cost
Profit	= 10% of total cost.

- 30. Explain the procurement and consumption cycle of stock control system.

Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Subject Code: MEM 62

Semester : VI

Subject Title : COMPUTER AIDED DESIGN AND MANUFACTURING

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / week	Hours / semester	Marks			
Computer Aided Design and Manufacturing	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

UNIT	TOPICS	TIME (HRS.)
I	Computer Aided Design	11
II	Computer Aided Manufacturing	11
III	CNC machine and its components	11
IV	CNC Programming, Rapid Prototyping	11
V	Computer Integrated Manufacturing, Flexible Manufacturing Systems, Automatic Guided Vehicle, Robot	11
	Revision and Test	05
	Total	60

**RATIONALE:**

As per the latest requirements in the industries, This enables to learn the assistance of computer in the field of design and manufacturing areas. The application of material handling equipment is learnt based on the automation in the industries.

**COURSE OUTCOME:**

- Explain the features of CAD, geometric modeling techniques and need for Graphic standard
- Describe the function and benefits of CAM and the concept of GT,CAPP,MPS,MRP and RP in CAM

- Compare NC and CNC machines and their functions & applications
- Write part program for CNC turning and milling machine G codes and M codes
- Illustrate various Rapid proto typing techniques and their applications
- Explain the working principle of FMS,AGV and robot

**DETAILED SYLLABUS**

Unit	Name of the Topic	Hours
I	<p><b>COMPUTER AIDED DESIGN</b></p> <p><b>Computer Aided Design:</b> Introduction – definition – Shigley’s design process – Ohsuga Model - CAD activities – benefits of CAD - CAD software packages.</p> <p><b>Transformations:</b> 2D &amp; 3D transformations – translation, scaling, rotation and concatenation.</p> <p><b>Geometric modelling:</b> Techniques - Wire frame modelling – applications – advantages and disadvantages. Surface modelling – types of surfaces – applications – advantages and disadvantages – Solid modelling – entities – advantages and disadvantages – Boolean operations - Boundary representation – Constructive Solid Geometry – Comparison.</p> <p><b>Graphics standard:</b> Definition – Need - GKS – OpenGL - IGES – DXF.</p> <p><b>Finite Element Analysis:</b> Introduction – Development - Basic steps – Advantage.</p>	11
II	<p><b>COMPUTER AIDED MANUFACTURING</b></p> <p><b>Computer Aided Manufacturing:</b> Introduction - Definition – functions of CAM – benefits of CAM. <b>Group technology:</b> Part families - Parts classification and coding - coding structure – Opitz system, MICLASS system and CODE System.</p> <p><b>Process Planning:</b> Introduction – Computer Assisted Process Planning (CAPP) – Types of CAPP - Variant type, Generative type – advantages of CAPP.</p> <p><b>Production Planning and Control (PPC):</b> Definition – objectives - Computer Integrated Production management system – Master Production Schedule (MPS) – Capacity Planning – Materials Requirement Planning (MRP) – Manufacturing Resources Planning (MRP-II) – Shop Floor Control system (SFC) - Just In Time manufacturing philosophy (JIT) - Introduction to Enterprise Resources Planning (ERP).</p> <p><b>Product Development Cycle:</b> Product Life Cycle - New product development processes. <b>Concurrent Engineering:</b> Definition – Sequential Vs Concurrent engineering – need of CE – benefits of CE.</p> <p><b>Quality Function Deployment (QFD):</b> Definition – House of Quality (HOQ) – advantages – disadvantages. Steps in Failure Modes and Effects Analysis (FMEA) – Value Engineering (VE) – types of values – identification of poor value areas – techniques – benefits. Guide lines of Design for Manufacture and Assembly (DFMA).</p>	11

III	<p><b>CNC MACHINE AND ITS COMPONENTS</b>  <b>CNC Machines:</b> Numerical control – definition – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centre – machine axes conventions turning centre and machining centre – Coordinate measuring machine – construction and working principle.</p>	
	<p><b>Components of CNC machine:</b> Slide ways – requirement – types – friction slide ways and antifriction slide ways - linear motion bearings – recirculation ball screw – ATC – tool magazine – feedback devices – linear and rotary transducers – Encoders - in process probing - tool material – tool inserts.</p>	11
IV	<p><b>CNC PROGRAMMING, RAPID PROTOTYPING</b>  <b>CNC Part Programming:</b> Manual part programming - coordinate system – Datum points: machine zero, work zero, tool zero - reference points - NC dimensioning – G codes and M codes – linear interpolation and circular interpolation - CNC program procedure - sub-program – canned cycles - stock removal – thread cutting – mirroring – drilling cycle – pocketing.  <b>Rapid prototyping:</b> Classification – subtractive – additive – advantages and applications - materials. Types - Stereo lithography (STL) – Fused deposition model (FDM) – Selective laser sintering (SLS) - three dimensional printing (3D) – Rapid tooling.</p>	11
V	<p><b>COMPUTER INTEGRATED MANUFACTURING, FLEXIBLE MANUFACTURING SYSTEMS, AUTOMATIC GUIDED VEHICLE, ROBOT</b>  <b>CIM:</b> Introduction of CIM – concept of CIM - evolution of CIM – CIM wheel – Benefits – integrated CAD/CAM.  <b>FMS:</b> Introduction – FMS components – FMS layouts – Types of FMS: Flexible Manufacturing Cell (FMC) – Flexible Turning Cell (FTC) – Flexible Transfer Line (FTL) – Flexible Machining System (FMS) – benefits of FMS - introduction to intelligent manufacturing system.  <b>AGV:</b> Introduction – AGV - working principle – types – benefits.  <b>Augmented Reality (AR)</b> – Introduction - concept – Applications.  <b>ROBOT:</b> Definition – robot configurations – basic robot motion – robot programming method – robotic sensors – end effectors – mechanical grippers – vacuum grippers - Industrial applications of Robot: Characteristics - material transfer and loading – welding - spray coating - assembly and inspection.</p>	11
<b>Revision and Test</b>		<b>05</b>

**Text Books :**

1. CAD/CAM/CIM, R.Radhakrishnan, S.Subramanian, New Age International Pvt. Ltd.
2. CAD/CAM, Mikell P.Groover, Emory Zimmers, Jr.Prentice Hall of India Pvt., Ltd.

**Reference Books:**

1. CAD/CAM Principles and Applications, Dr.P.N.Rao, Tata Mc Graw Hill Publishing Company Ltd.
2. CAD/CAM, Ibrahim Zeid, Mastering Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Automation, Production Systems, and Computer-Integrated Manufacturing, Mikell P. Groover, Pearson Education Asia.
4. Computer control of manufacturing systems, Yoram Koren, McGraw Hill Book.

**MODEL QUESTION PAPER**  
**MEM 62- COMPUTER AIDED DESIGN AND MANUFACTURING**

Time: 3 Hrs.

Maximum Marks: 75

- Note: 1. Answer ALL the questions in PART-A (1 mark each)  
2. Answer any ONE question from each unit in PART-B (3 marks each)  
3. Answer any ONE question from each unit in PART-C (10 marks each)  
4. The question paper contains TWO Pages

**PART-A**

(1x10=10)

1. Define: CAD.
2. Write the difference between solid modeling and wire-frame modeling.
3. Write down the various approaches used in CAPP.
4. Write any two objective of JIT.
5. What is meant by CNC system?
6. State the functions of adoptive control system.
7. What is the use of canned cycle?
8. State the methods of NC dimensioning.
9. Write down the benefits of FMS.
10. What are the drives used in ROBOT?

**PART-B**

(3x5=15)

**UNIT-I**

11. List out the benefits of CAD.
12. What are the transformations used in CAD?

**UNIT-II**

13. What are the benefits of group technology?
14. What is sequential engineering?

**UNIT-III**

15. State the requirements of feed drive.
16. What is closed loop control system?

**UNIT-IV**

17. What are the G-Codes used for interpolation?
18. What is Macro?

**UNIT-V**

19. State the applications of augmented reality.
20. What is intelligent manufacturing system?

**PART-C**

(10X5=50)

**UNIT-I**

21. Draw the CIM wheel and explain.
22. Explain the 3D modeling techniques used in CAD.

**UNIT-II**

23. Explain OPITZ coding system.
24. Explain capacity planning made in CIM.

**UNIT-III**

25. Explain CNC vertical milling machine with a neat sketch.
26. Explain re-circulating ball screw used in CNC. State its merits and de-merits.

**UNIT-IV**

27. Explain thread cutting canned cycle with simple example.
28. Explain the various types of motion control.

**UNIT-V**

29. Explain the various types of AGV with suitable diagram.
30. Explain the basic elements of industrial ROBOT with a neat sketch.

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Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Subject Code: ERM63

Semester VI

Subject Title: PROCESS CONTROL

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
PROCESS CONTROL	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

UNIT	TOPICS	TIME (Hrs.)
I.	Simple Process Control Systems and Terminology	11
II.	Controller Principles	11
III.	Tuning of Controllers	11
IV.	Final Control Elements	11
V.	Complex Control Systems	11
	Revision and Test	5
	<b>Total</b>	<b>60</b>

**RATIONALE:**

In process industries, controllers are used in controlling temperature, pressure, flow, liquid level, and other process variables. This is provided to get necessary knowledge that may help the students getting employed in process industries.



**COURSE OUTCOME:**

- Familiarize on functional block diagram of automatic process
- Learn the various control system such as temperature ,low, liquid level
- Explain the block diagram of controller
- Categorize the different types of controller such as P,I,D,PI,PD,PID
- Paraphrase the concept of tuning
- Explain the methods of tuning of controller
- Learn about the signal converter and actuators
- Substantiate the operation of control valve
- Study the different types of control systems
- Study the block diagram of Fuzzy logic controller

**DETAILED SYLLABUS**  
**CONTENTS**

UNIT	NAME OF THE TOPICS	HOURS
<b>I</b>	<p><b>SIMPLE PROCESS CONTROL SYSTEMS AND TERMINOLOGY</b></p> <p>Definition – Process – Functional block diagram of an Automatic process control system – Set point – Measured variable – Comparator – Error – Controller – Final control element. Controlled variable – Manipulated variable – disturbances –Advantages of Automatic control system – Simple Liquid level control system – Flow control system – Temperature control system with transportation Lag – Self Regulation – Capacitance and Capacity. Piping and Instrumentation flow Diagram (BIS standard) for the above system.</p>	<b>11</b>
<b>II</b>	<p><b>CONTROLLER PRINCIPLES</b></p> <p>Controller – Block diagram, Types, General properties – Reverse and Direct action, Controller modes – Discontinuous – On – Off Control with differential gap, without differential gap – Neutral zone– Continuous – Proportional controller – Proportional band (PB) – Effect of PB on a controller output – Offset –Integral control – PI – PD – PID – Definition, salient features, applications and limitations of the above controllers – Selection of control action – Electronic controllers – Error detector – Two position controller – P,I,D,PI,PD, PID controllers – reverse action – pneumatic controllers – Flapper – Nozzle mechanism, Pneumatic relay.</p>	<b>11</b>

<b>III</b>	<p><b>TUNING OF CONTROLLERS</b></p> <p>Concept of tuning – Criteria for controller tuning – Quarter decay ratio, IAE, ISE, ITAE – Methods of tuning – Open loop response method – Process reaction curve – Closed loop response method – Ultimate cycle method, Damped oscillation method.</p>	<b>11</b>
<b>IV</b>	<p><b>FINAL CONTROL ELEMENTS:</b></p> <p>Signal converters – P to I Converter, I to P Converter – Actuators – Electrical, Pneumatic, Hydraulic and Electro pneumatic – Valve Positioners – Control valve – Characteristics Quick opening, Linear, Equal percentage – Control valve sizing – Cv rating – Selection of a control valve – Effects of Cavitation and Flashing on control valve performance.</p>	<b>11</b>
<b>V</b>	<p><b>COMPLEX CONTROL SYSTEMS</b></p> <p>Cascade control system, Ratio control systems, feed forward control system, Comparison of feedback control system and feed forward control system. (One specific application for each of the above systems) – Introduction DCS and SCADA Block Diagram of Fuzzy logic controller – block diagram – typical application-washing machine</p>	<b>11</b>
<b>Revision and Test</b>		<b>05</b>

**Text books:**

1. Donald P Eckman, Process control, Wiley Eastern limited, 1991
2. Peter Hariot, Process control, Tata Mcgraw Hill.
3. B. Sankara Gomathi, Process control (Principles and applications), J J Publications, 1981.

**Reference books:**

1. George Stephanopoulos, Chemical process control.
2. Michael P Lukas, Distributed control system (Their evaluation and design), Van Nostrand Reinhold Company Inc, 1986.
3. James A Freeman / David M Skapura, Neural networks, Pearson Education, Eighth reprint, 2003.
4. C.D. Johnson, Process control instrumentation Technology, Prentice Hall of India Pvt, Ltd,
5. C.L. Smith, Digital computer process control. Douglas M. Considine, Process / Industrial Instruments Handbook, fourth edition, McGraw Hill, Inc.

**MODEL QUESTION PAPER**  
**ERM 63 – PROCESS CONTROL**

Time : 3 Hrs.

Maximum marks: 75

- Note:
1. Answer ALL the questions in PART-A (1 mark each)
  2. Answer any ONE question from each Unit in PART-B (3 marks each)
  3. Answer any ONE question from each Unit in PART-C (10 marks each)
  4. The question paper contains TWO pages

**PART-A**

**(1 X 10= 10)**

1. Define process control.
2. Define capacity.
3. State the main function of pneumatic relay?
4. What is differential gap?
5. Define tuning.
6. Mention the three integral performance criteria for controller tuning
7. Define Cv rating.
8. List any one types of control valve.
9. What is the limitation of feed forward control system?
10. Mention the advantages of fuzzy logic control system.

**PART-B**

**(3 X 5 = 15)**

**UNIT-I**

11. Write short notes on Simple Liquid level control system.
12. Write short notes on self-regulation.

**UNIT-II**

13. Differentiate reverse and direct action of controllers.
14. Draw the circuit diagram of flapper-nozzle mechanism.

**UNIT-III**

15. Write short notes on quarter decay ratio for controller tuning.
16. What are the criteria of controller tuning?

**UNIT-IV**

17. What do you mean by flashing on control valve performance?
18. Write short notes on electro pneumatic actuator

**UNIT-V**

19. Compare feed forward and feedback control system.
20. Draw the block diagram of fuzzy logic controller.

## **PART-C**

**(10×5=50)**

### **UNIT-I**

21. Explain in detail about temperature control system with transportation lag.
22. Explain the Functional block diagram of an Automatic process control system.

### **UNIT-II**

23. Explain the working of proportional integrator with a neat sketch.
24. Explain the working of PID with a neat sketch.

### **UNIT-III**

25. Explain in detail about open loop response method.
26. How do you find out the controller tuning parameter by process reaction curve method?

### **UNIT-IV**

27. Explain the characteristics of control valve.
28. Explain the operation of (i) P to I convertor (ii) I to P signal convertor.

### **UNIT-V**

29. Draw and explain the block diagram of Distributed Control System.
30. With neat sketch, explain ratio control system.

Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Subject Code: ERM64

Semester : VI

Subject Title : MICROCONTROLLER & EMBEDDED SYSTEM

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hour s/ week	Hours/ semester	Marks			Duration
MICROCONTROLLER & EMBEDDED SYSTEM	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS**

SL.NO.	TOPICS	TIME (HRS)
I.	Architecture of 8051 and 8086	11
II.	Instruction Set and Programming	11
III.	I/O, Timer, Interrupt and Serial Programming	11
IV.	Interfacing External Device With 8051	11
V.	PIC & Embedded System	11
	Revision and Test	05
	Total	60

**RATIONALE:**

Familiarization of Architecture & Functionality of 8051 makes them to work as a complete Engineer. Usage of interfacing helps them to do programming & take-up project works.

**COURSE OUTCOME:**

- Explain Architecture of 8051 Microcontroller.
- Understand interrupt structure of 8051.
- Understand serial data communication concepts.
- Explain the programming techniques.
- List various addressing modes.in 8051
- Create simple programs using 8051.

- Understand the block diagram and control word formats for peripheral devices.
- Understand how to interface with RS232C.
- Demonstrate how to interface with 8255.
- Understand various application of 8051 Microcontroller
- Explain embedded system concepts.

## DETAILED SYLLABUS

### CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	<b>Architecture of 8086 and 8051</b> Architecture of 8086 - Pin details of 8086 - Comparison with Microprocessor and Microcontroller - Block diagram of Microcontroller – Pin details of 8051 – ALU – Special function registers – ROM – RAM – RAM Memory Map (including registers and register banks) – Program Counter – PSW register – Stack - I/O Ports – Timer – Interrupt – Serial Port – External memory – Clock – Reset – Clock Cycle – Machine Cycle – Instruction cycle – Instruction fetching and execution – Overview of 8051 family	11
II	<b>Instruction Set and Programming</b> Assembling and running an 8051 program – Instruction set of 8051 – Data transfer instructions – Different addressing modes – Arithmetic Instructions – Signed number concepts and arithmetic operations – Logic and Compare instructions – Rotate instruction and data serialization – BCD, ASCII – Loop and jump instructions – Call instructions – Time delay routines – Program control – Assembler directives – Sample programs	11
III	<b>I/O, Timer, Interrupt and Serial Programming</b> Bit addresses for I/O and RAM – I/O programming – I/O bit manipulation programming – Programming 8051 Timers – Counter programming – Basics of Serial programming – 8051 connection to RS 232 – 8051 Serial Port Programming – 8051 interrupt – Programming Timer Interrupt – Programming external hardware interrupts – Programming the serial communication interrupt – Interrupt priority in 8051	11

<b>IV</b>	<p><b>Interfacing External Device With 8051</b></p> <p>8051 interfacing to external memory – 8051 interfacing with the 8255 – (Programs are to be written in Assembly for the following interfacing applications) Relays and opto isolators – Sensors interfacing and signal conditioning – Parallel ADC and Serial ADC interfacing – DAC interfacing - Keyboard interfacing – Seven segment and LCD display interfacing – Stepper Motor interfacing – DC motor interfacing and PWM - RTC Interfacing-Interfacing with I2C Bus and SPI Bus</p>	<b>11</b>
<b>V</b>	<p><b>PIC &amp; Embedded System</b></p> <p><b>PIC:</b> Introduction to Microchip PIC series of Microcontroller – 16F87X – Features – Working register W – Block diagram – status register, power control registers (PCON), option register, Memory organization: Program memory – PCL and PCLATH – program memory paging, Data Memory, PIC file register: File register (Data RAM) space allocation in PIC, special function registers (SFR), General Purpose Registers for RAM (GPR) – GPRAM vs EEPROM in PIC – Data EEPROM and Flash program EEPROM – I/O ports – Interrupts in PIC : External Interrupts, timers, watch dog timer – PIC Analog to Digital converter – PIC reset actions: Power on Reset (POR), Brown out Reset (BOR), Oscillator Connections.</p> <p><b>Embedded System:</b> Elements of Embedded System-case studies (examples)-Washing Machine, Microwave Oven, Automated Embedded System</p>	<b>11</b>
<b>Revision and Test</b>		<b>05</b>

**TEXT BOOKS:** Mazidi, Mazidi and D.MacKinlay –“8051 Microcontroller and Embedded Systems using Assembly and C “- 2006 Pearson Education Low Price Edition.

1. R.Theagarajan –“Microprocessor and Microcontroller “- Sci Tech Publication, Chennai
2. Kenneth J.Ayala –“8051 Microcontroller”
3. Muhammad Ali Mazidi ,Rolind D.Mckinlay,Danny Causey-PIC Microcontroller and Embedded systems using Assembly and C for PIC 18.

**REFERENCE BOOKS:**

1. .Myke Predko, -“Programming customizing the 8051 Microcontroller “Tata McGraw Hill

**MODEL QUESTION PAPER**  
**ERM64 –MICROCONTROLLER AND EMBEDDED SYSTEM**

Time: 3 Hrs.

Maximum marks: 75

- NOTE:** 1. Answer ALL the questions in PART – A (1 mark each).  
2. Answer any ONE question from each unit in PART – B (3 marks each).  
3. Answer any ONE question from each unit in PART – C (10 marks each).  
4. The question paper contains two pages.

**PART –A**

(10 X 1 = 10)

1. Define clock cycle
2. What is the function of program counter in 8051?
3. Define machine cycle.
4. What is nested loop?
5. State function of SWAP function
6. Define baud rate.
7. State the modes of operation in 8255.
8. What is the stepper motor?
9. Expand PIC
10. What is the purpose of OV and N flag bits in PIC 18

**PART – B**

(3X5 =15)

**UNIT – I**

11. Distinguish between microprocessor and microcontroller.
12. Explain the function of oscillator and clock circuits in 8051.

**UNIT –II**

13. Explain signed binary addition with an example
14. Write a program to add 8-bit data using 8051 instructions

**UNIT –III**

15. Write short notes on external interrupts of 8051.
16. Write short notes on RS232C.

**UNIT – IV**

17. Draw the interfacing diagram of 8255 with 8051.
18. What is PWM and how is it used in DC motor control?

**UNIT – V**

19. List any three features of PIC18 microcontroller
20. Write short notes on program counter in PIC 18 microcontroller



**PART – C**

(5X10=50)

**UNIT – I**

21. Draw the architecture of 8051 microcontroller and explain.
22. Explain the memory organization of 8051.

**UNIT –II**

23. Discuss the addressing modes of 8051 with examples.
24. Write the 8051 program to find the largest number in the given array.

**UNIT –III**

25. Discuss the different modes of serial data transmission.
26. Develop a simple program that generates a delay of 100 microseconds using the timer 0 and timer 1.

**UNIT – IV**

27. Explain with neat diagram the DAC interfacing with 8051.
28. (a) Draw the internal block diagram of 8255 and explain.  
(b) Write the control word format for 8255

**UNIT – V**

29. Draw the block diagram of PIC 16F87X and explain in detail
30. Explain in detail the various PIC16F87X instructions with examples

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Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG.

Subject Code: ERM 66.1

Semester : VI

Subject Title : AUTO ELECTRONICS

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / week	Hours / semester	Marks			
AUTO ELECTRONICS	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

Sl.No.	TOPICS	TIME (Hrs.)
I.	Basics of automotive techniques	11
II.	Electronic engine control systems	11
III.	Sensors and actuators	11
IV.	Vehicle motion control	11
V.	Recent trends in automobile techniques, Vehicle intelligence	11
	Revision and Test	5
	Total	60

**RATIONALE:**

Auto Electronics is introduced with the aim of providing necessary knowledge on automobiles that may help the students getting employed in automobile Industries.

**COURSE OUTCOME:**

- Explain the basic concepts and components
- Discuss different ignition systems
- Explain the lead acid battery, testing and lighting system

- Analyze the sensor based electronic engine management and control devices
- Discuss advance Future Trends in Automobile Techniques

## DETAILED SYLLABUS

### CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
I	<p><b>Basics of automotive techniques</b></p> <p>Engine operations-IC engine &amp; steam engine-petrol engine-four stock, Otto cycle, spark ignition systems-valve timing diagram of four stock Otto cycle- cylindrical block- cylindrical head- cylindrical gaskets- oil pan or sump- piston- connecting rod- crank shaft- fly wheel.</p> <p>Cooling systems -purpose - types -air and water cooling systems - merits and demerits - thermo siphon system - pump assisted water cooling systems -components - water pump, fan - thermostat - types - radiator - types - pressure cap -vapor recovery cooling system -merits - vented and pressurized expansion tank - temperature sensors - troubles in cooling system- loss of coolant , overheating and over cooling -causes.</p> <p>Chassis and frames-layout of the chassis- front axle- types of front axle-suspension system-independent front suspension-independent rear suspension-purpose of spring coil spring-rubber suspension-air suspension-shock absorber-steering and steering geometry-steering gear layout-types of steering-power steering-steering gear linkage.</p> <p>Lubrication systems - purpose -types of lubricants - additives - Service types of lubricating systems - Full pressure system - techniques of cylinder lubrication - oil pumps - oil filters -full flow and bypass filter systems - lubrication system -oil leakage , low oil pressure, high oil pressure and consumption - causes.</p>	11
II	<p><b>Electronic engine control systems</b></p> <p>Motivation for electronic engine control-exhaust emission-fuel economy- federal government test procedures. Concept of an electronic engine control system-definition of general terms-parameters and variables-definition of engine performance terms-power, BSFC, torque, volumetric efficiency, thermal efficiency. Engine mapping -effect of air fuel ratio on performance, effect spark timing on performance, effect of exhaust gas recirculation on performance, control strategy - electronic fuel control system- closed loop control- open loop operation-open loop mode-measuring air mass-electronic ignition- Digital engine control system, digital engine control features-engine warm up-open loop control-close loop control-acceleration t-declaration enrichment- and idle speed control. EGR control-electronic ignition engine control system-close loop ignition timing –spark advance correction scheme-integrated engine control system-secondary air management-evaporative emission canister purge-torque convertor lock-up control, automatic system adjustment system</p>	11

	<p>diagnosis- (Engine crank, engine warm up, open-loop control, closed loop control, hard acceleration, deceleration and idle) Improvements in electronic engine control-integrated engine control systems-oxygen sensor improvements, fuel injection timing-direct ignition, improvement in measurement of crankshaft angular position, CPU backup.</p>	
III	<p><b>Sensors and actuators</b> Automotive control system applications-variable to be measured, simplified electronics engine control system, instrumentation block diagram, analysis of intake manifold pressure-map sensor concept-strain gauge map sensor-capacitor capsular map sensor-engine crank shaft angular position-magnetic reluctance position sensor- hall effect position sensor-optical crankshaft position sensor-air flow rate sensor-mass air flow sensor-throttle angle sensor-temperature sensor-typical coolant sensor-exhaust gas emission-exhaust gas oxygen gas sensor, zirconia oxide EGO sensor-knock sensor Automotive engine control actuators-fuel metering actuators, fuel injection, fuel injector signal-ignition actuators-exhaust gas recirculator actuators, electronic control unit. Ignition system – Types – battery coil ignition system –High tension magneto –electronic ignition – Ignition system troubles and remedies. Lighting system – circuit – Head light – Aiming and adjustment – sealed beam head lights – directional signal circuits – fluorescent lamp - Horn circuit</p>	11
IV	<p><b>Vehicle motion control</b> General arrangement of power transmission system – Arrangement of front engine rear drive – rear engine rear drive – front engine front drive - four wheel drive – applications – clutch – function – Components – Types - Single plate ,multi plate and diaphragm spring clutch – fluid coupling – Clutch troubles and their causes. Gear box - purpose - various resistance to motion - types of gear boxes - sliding mesh, constant mesh and synchromesh -floor shift gear changer - gear box troubles and their causes. Drive line - propeller haft – Universal joint - Cross type only - slip joint – final drive - function - types of gear arrangement – straight &amp; spiral Bevel , Hypoid , Worm and Worm Wheel - merits , demerits and application -Hotch kiss drive-Torque tube drive – radius rod. Differential – purpose – Construction and operation – Self-locking and non-slip differential – Differential troubles and their Causes – forces in the rear axles – Semi floating , three quarter floating and full floating rear axles – Axle housing – types.</p>	11

<b>V</b>	<p><b>Recent trends in automobile techniques, Vehicle intelligence</b>  Electrical and Hybrid Vehicles, Introduction-Electric Vehicle development- system layout- basic system components- Electric battery solar cells- Rapid charging system-Motor drive system-fuel cell Electric vehicle- Hybrid vehicles- Parallel Hybrid Vehicle-CNG Electric hybrid vehicle.</p> <p><b>Vehicle Intelligence:</b> Introduction – Base structure- Vision based autonomous road vehicles- Architecture for vision system-Features-applications –image processing – Intelligent robot vehicles - obstacle detection, collision warning and avoidance system Comfort and Safety System Electronic seat adjustment Control Locking and electronic window Air bays and belt tensions Air conditioner Immobilizer Reverse sensor Rain based wiper Navigator and GPS</p>	<b>11</b>
<b>Revision and Test</b>		<b>05</b>

**Text Books:**

1. Automobile engineering vol- 1, vol – 2, Kirpalsingh, Standard publisher’s distributors New Delhi.
2. Automobile Engineering, G.B.S.Narang, Khanna Publishers, New Delhi.
3. Understanding Automotive Electronics, William B. Ribben, 6th edition Elsevier Science-2003

**Reference Books:**

1. Vehicle and Engine technology. Vol. I, Heinz Heisler, , ELBS
2. Automobile Engineering, R.B.Gupta, Satya Prakashan, New Delhi
3. Understanding Automotive Electronics, Fourth Edition, William B. Ribbens
4. Sensor and Transducers, Ronald K. Jurgen, SAE-2003
5. Electric and Hybrid-electric vehicles, Ronald K. Jurgen, SAE 2002

**MODEL QUESTION PAPER**  
**ERM 66.1 AUTO ELECTRONICS**

Time: 3 Hrs.

Maximum Marks: 75

- Note: 1. Answer ALL the questions in PART-A (1 mark each)  
2. Answer any ONE question from each unit in PART-B (3 marks each)  
3. Answer any ONE question from each unit in PART-C (10 marks each)  
4. The question paper contains TWO Pages

**PART- A**

(1x10=10)

1. What is S.I engine?
2. State the causes for excessive oil consumption in lubrication system?
3. Define emission fuel economy.
4. Give principle of EGO.
5. What is the purpose of speed sensors?
6. State any one trouble and remedy in ignition system.
7. What is the function of clutch?
8. What is the purpose of differential?
9. What is the use of Air bag?
10. What is speech synthesis?

**PART-B**

(3x5=15)

**UNIT-I**

11. Explain water cooling system.
12. Write short notes on steering gear linkage.

**UNIT-II**

13. Explain the open loop control system.
14. Explain direct ignition system.

**UNIT-III**

15. Explain the half effect position sensor.
16. Write short notes on lighting system circuit.

**UNIT-IV**

17. Explain about front engine front wheel drive transmission system.
18. Explain the various types of gear arrangement.

**UNIT-V**

19. Write short notes on vehicle development.
20. Explain about electronic seat adjustment.

## **PART-C**

(10X5=50)

### **UNIT-I**

21. Explain with neat sketch the construction and working of thermostat cooling system.
22. Explain the construction and working of power steering with neat sketch.

### **UNIT-II**

23. Explain the federal government test procedures.
24. Explain i) fuel injection timing. ii) Torque converter locks up control.

### **UNIT-III**

25. Explain the analysis of intake manifold pressure map sensor.
26. Explain with neat sketch sealed beam head lights.

### **UNIT-IV**

27. Explain the construction and working of synchromesh gear box.
28. With a neat sketch explain the construction and working of full floating rear axles.

### **UNIT-V**

29. Explain the construction and working of CNG Electric hybrid vehicle
30. With a neat sketch explain the construction and working of Rain based wiper.

Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Subject Code: ERM 66.2

Semester : VI

Subject Title : NON DESTRUCTIVE TESTING

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours/ week	Hours / semester	Marks			Duration
NON DESTRUCTIVE TESTING	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

Sl.No.	TOPICS	TIME (Hrs.)
I.	VISUAL INSPECTION AND EDDY CURRENT TESTING	11
II.	LIQUID PENETRANT TESTING	11
III.	MAGNETIC PARTICLE TESTING	11
IV.	RADIOGRAPHIC TESTING	11
V.	ULTRASONIC TESTING	11
	Revision and Test	5
	Total	60

**RATIONALE:**

Basic knowledge about various testing equipments, usage of testing equipments are most important for an Electronics(Robotics) Engineer. Knowledge about the various testing methods is essential to work in the field of Automation & process industries.



**COURSE OUTCOME:**

- Explain the basic principles of various NDT techniques.
- Analyze the equipment required for the NDT
- Discuss the procedure followed in NDT techniques
- Utilize the Applications of NDT and recent trends in NDT

**DETAILED SYLLABUS****CONTENTS**

<b>UNIT</b>	<b>NAME OF THE TOPICS</b>	<b>Hours</b>
<b>I</b>	<b>VISUAL INSPECTION AND EDDY CURRENT TESTING:-</b> Scope and advantages of NDT, comparison of NDT with DT, classification of NDT Visual Inspection Equipment used for Visual Inspection –magnifying Glass Magnifying mirror, Microscope Borescope, endoscopes or endoprobes flexible fiber optics borescope, video images cope , Eddy Current Testing – Principle Advantages , Disadvantages Factors Affecting Eddy Current Response-Material Conductivity Permeability-Frequency-geometry-proximity –types of probes.	<b>11</b>
<b>II</b>	<b>LIQUID PENETRANT TESTING</b> Liquid penetration testing –introduction, principle, Equipment, procedure, characteristics of penetrants – developers – Evaluation –hazards precaution, advantages, limitation and application.	<b>11</b>
<b>III</b>	<b>MAGNETIC PARTICLE TESTING</b> Principle of Magnetic particle testing-different methods to generate magnetic fields-magnetic particle testing equipment - magnetic particle testing procedures method of De-Magnetization-Magnetic particle Medium-Evaluation of Indications and Acceptance Standards-magnetic particle test-applications, advantages and limitations.	<b>11</b>

<b>IV</b>	<p><b>RADIOGRAPHIC TESTING</b></p> <p>X-ray radiography principle, equipment &amp; methodology-type of industrial radiation sources and application-Radiographic exposure factors and technique-GAMA Ray and X-Ray Equipment-Radiographic procedure- Radiographic Interpretation, Radiography Image Quality indicators-Radiographic Techniques-Film processing-methods of viewing radiographs-radiographic testing procedures for weld. Precautions against radiation hazards.</p>	<b>11</b>
<b>V</b>	<p><b>ULTRASONIC TESTING</b></p> <p>Introduction, Principle of operation types of Ultrasonic Propagation- Ultrasonic probes. Types of Transducers-Ultrasonic testing techniques. Method for Evaluating Discontinuities-Ultrasonic Testing procedures for different component –application , advantages and limitations, Documentation, Applications in inspections in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements.</p>	<b>11</b>

### TEXT BOOKS

1. J Prasad ,C G K N air, Non-Destructive testing and Evaluation of Materials.Tata McGraw Hill Education Private Limited

### REFERENCES

1. American Metals Society Non-Destructive Examination and Quality Control, Metals HandBook, Vol.17, 9<sup>th</sup>Ed,Metals Park, OH, 1989.
2. Bray ,Don.E and Stanley, Roderic .K,Nondestructive Evaluation: A Tool in Design.Manufacturing and service. Revised. CRC Press New York, Edition 1997.

**MODEL QUESTION PAPER**  
**ERM 66.2 NON DESTRUCTIVE TESTING**

Time: 3 Hrs.

Maximum Marks: 75

- Note: 1. Answer ALL the questions in PART-A (1 mark each)  
2. Answer any ONE question from each unit in PART-B (3 marks each)  
3. Answer any ONE question from each unit in PART-C (10 marks each)  
4. The question paper contains TWO Pages

**PART- A**

(1x10=10)

1. Define NDT.
2. Mention the types of NDT visual inspection.
3. What is Liquid penetration testing?
4. State the Characteristics of Liquid penetration testing.
5. What is the principle of Magnetic particle testing?
6. State any one of testing equipment.
7. What is the function of X-ray radiography?
8. What is the purpose of GAMA Ray?
9. Define Transducers.
10. State the types of inspection of castings.

**PART-B**

(3x5=15)

**UNIT-I**

11. What are the advantages of NDT visual inspection?
12. Explain about endoprobes.

**UNIT-II**

13. Explain the characteristics of penetrants.
14. State the applications Liquid penetration testing.

**UNIT-III**

15. Write short notes on generate magnetic fields.
16. Explain about Acceptance Standards.

**UNIT-IV**

17. Explain the methods of viewing radiographs.
18. State the Precautions against radiation hazards.

**UNIT-V**

19. State the applications of Ultrasonic testing.
20. Explain Ultrasonic Testing procedures.

**UNIT-I**

21. Explain with a neat sketch the construction and working of flexible fiber optics.
22. Explain the construction and working of Eddy Current Testing and state its advantages.

**UNIT-II**

23. Explain the procedures of Liquid penetration testing.
24. Explain i) developers ii) evaluation and its limitation and application.

**UNIT-III**

25. Explain the procedures of magnetic particle testing.
26. Explain the various methods of De magnetization.

**UNIT-IV**

27. Explain the various factors of Radiographic exposure.
28. With a neat sketch explain film processing.

**UNIT-V**

29. Explain the construction and working of ultrasonic propagation.
30. Explain with a neat sketch the construction and working of transducers.

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Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG.

Subject Code: ERM 66.3

Semester : VI

Subject Title : MECHANICAL INSTRUMENTATION

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours/ week	Hours / semester	Marks			
MECHANICAL INSTRUMENTATION	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

Sl.No.	TOPICS	TIME (Hrs.)
I.	LIMITS, FITS AND GAUGES	11
II.	STRAIGHTNESS, FLATNESS, SQUARENESS, PARALLELISM, CIRCULARITY AND ROTATION	11
III.	MEASUREMENT OF FORCE, TORQUE, AND STRAIN	11
IV.	DISPLACEMENT, VELOCITY/SPEED, AND ACCELERATION, MEASUREMENT	11
V.	LINEAR AND ANGULAR MEASUREMENTS	11
	Revision & Test	5
	Total	60

**RATIONALE:**

Basic knowledge about instruments, usage of instruments, debugging faults, maintenance of instruments are most important for an Electronics(Robotics) Engineers. Types of gauges, meters and their measurement methods & procedures are essential to work in the field of Automation & process industries.

**COURSE OUTCOME:**

- Classify the Various types of gauges
- Discuss straightness, flatness, squareness, parallelism, circularity and rotation
- Explain the various types of force and strain measurement.
- Discuss the displacement, velocity/speed, and acceleration, measurement
- Explain the linear and angular measurements.

**DETAILED SYLLABUS****CONTENTS**

<b>UNIT</b>	<b>NAME OF THE TOPICS</b>	<b>Hours</b>
<b>I</b>	<p><b>LIMITS, FITS AND GAUGES:-</b></p> <p>Introduction –Tolerance –Importance of Tolerance–different ways of expressing tolerance –interchangeability–selective assembly–Indian standards–definitions –fits–Sizes–deviation tolerance–clearance –interference–guide for selection of fits– Clearance fits –transmission fits –interference fits –ISO system of limits and fits –Gauges–types of gauges–limit gauges –plug gauges –ring gauges –snap gauges –gauges for taper –adjustable type gap gauges –miscellaneous gauges – Geometric characteristics and symbols.</p>	<b>11</b>
<b>II</b>	<p><b>STRAIGHTNESS, FLATNESS, SQUARENESS, PARALLELISM, CIRCULARITY AND ROTATION</b></p> <p>Straightness-definitions -straight edge-tests for straightness by using spirit level -auto collimator -flatness testing-procedure. Parallelism-two axis -two planes-parallel motions between trajectory and plane –trajectory to an axis two trajectories -equidistance-coincidence or alignment. Square ness -axis of rotation with a given plane -perpendicularity of motion-square ness testing-indicator method-correction for square ness error -engineer’s square tester-optical tester for square ness–Optical test for square ness – Circularity –sources of out of roundness –different types of irregularities of a circular part –causes of out of roundness – roundness and circularity–Measurement of roundness by using V block –Test for checking rotation.</p>	<b>11</b>

III	<p><b>MEASUREMENT OF FORCE, TORQUE, AND STRAIN:</b></p> <p>Force measurement, load cell, cantilever beams, proving rings, and differential transformers, measurement of torque, torsion bar dynamometer, and absorption dynamometer. Power measurement. Measurement of strain guage, electrical strain guage, mechanical strain guage and method of measurement, bridge arrangement, temperature compensation.</p>	11
IV	<p><b>DISPLACEMENT, VELOCITY/SPEED, AND ACCELERATION, MEASUREMENT:</b></p> <p>Working principal of resistive potentiometer, linear variable differential .electromagnetic transducers, Mechanical, Electrical and photoelectric tachometers, piezoelectric accelerometer, seismic accelerometer. Temperature measurement device thermocouples, resistance temperature detector, thermistor, liquid in glass thermometer, pressure thermometers, pressure thermometers, pyrometer, bimetallic strip, calibration of temperature measuring devices. Numerical examples on flow measurement.</p>	11
V	<p><b>LINEAR AND ANGULAR MEASUREMENTS:</b></p> <p>Linear measurement instruments-evolution-types-classification-limits-classification-limit gauges design-procedure-concepts of interchange ability and selective assemblangular measurement instruments-types-bevel protractor clinometers angle gauge, sprit levels sine bar-angle alignment telescope-autocollimator-application.</p>	11

### TEXT BOOKS

1. D.Patranabis, "Principles of industrial instrumentation", tata mcgraw hill, ii edition

### REFERENCES

1. Modern Electronic Instrumentation & Measurements Techniques – Albert D. Helfrick and William David Cooper – PHI
2. R.K.Jain, "Mechanical and Industrial Measurements", Khanna Publishers, 11<sup>th</sup> Edition

**MODEL QUESTION PAPER**  
**ERM 66.3- MECHANICAL INSTRUMENTATION**

Time: 3 Hrs.

Maximum Marks: 75

- Note: 1. Answer ALL the questions in PART-A (1 mark each)  
2. Answer any ONE question from each unit in PART-B (3 marks each)  
3. Answer any ONE question from each unit in PART-C (10 marks each)  
4. The question paper contains TWO Pages

**PART- A**

(1x10=10)

1. Define tolerance.
2. State any two causes of ISO system.
3. Define Straightness.
4. What is circularity?
5. What is load cell?
6. State any one type of measurements.
7. What is the use of transducers?
8. What is the principle of tachometer?
9. Classify linear measurements instruments.
10. What is the use of spirit level sine bar?

**PART-B**

(3x5=15)

**UNIT-I**

11. Explain the different ways of expressing tolerance.
12. Classify gauges.

**UNIT-II**

13. Write short notes on flatness testing.
14. Explain the correction for square ness error.

**UNIT-III**

15. Explain the absorption dynamometer.
16. Explain the Measurement of strain gauge.

**UNIT-IV**

17. Explain piezoelectric accelerometer.
18. Write short notes on bimetallic strip.

**UNIT-V**

19. Mention the various types of evolution.
20. With a neat sketch explain bevel protractor.



**UNIT-I**

21. Explain the various guidance for selection of fits.
22. Explain the construction and working of adjustable type gap gauges with a neat sketch.

**UNIT-II**

23. Explain the construction and working of auto collimator with a neat sketch.
24. Explain i) engineer's square tester ii) sources of out of roundness.

**UNIT-III**

25. With a neat sketch explain cantilever beams.
26. Explain the various methods of bridge arrangement.

**UNIT-IV**

27. Explain the construction and working of temperature measurement device.
28. With a neat sketch explain pressure thermometers.

**UNIT-V**

29. Explain the procedures of limit gauges.
30. Explain with a neat sketch the construction and working of angle alignment telescope.

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Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG.(SW)

Subject Code: MEM 65

Semester : VI

Subject Title : COMPUTER AIDED DESIGN AND MANUFACTURING PRACTICAL

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / week	Hours / semester	Marks			
COMPUTER AIDED DESIGN AND MANUFACTURING PRACTICAL	6	90	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**RATIONALE:**

As per the latest requirements in the industries, this enables to learn the assistance of computer in the field of design and manufacturing areas. The application of material handling equipment is learnt based on the automation in the industries.

**COURSE OUTCOME:**

- Demonstrate basic concepts of solid modeling tools used in software
- Create 3D modeling for the given 2D drawings
- Prepare part programming using G codes and M codes
- Write CNC part program for turning and milling operations
- Simulate the part program for turning and milling
- Operate CNC Turning centre and CNC Vertical Machining Centre safely
- Produce the components in CNC Turning centre and CNC Vertical Machining Centre

**PART A: SOLID MODELLING**

**Introduction:**

Part modelling - Datum Plane – constraint – sketch – dimensioning – extrude – revolve – sweep – blend – protrusion – extrusion – rib – shell – hole – round – chamfer – copy – mirror – assembly – align – orient.

**Exercises:**

**3D Drawings**

1. Geneva Wheel
2. Bearing Block
3. Bushed bearing
4. Gib and Cotter joint

5. Screw Jack
6. Connecting Rod

## **PART B: CNC Programming and Machining**

### **Introduction:**

1. Study of CNC lathe, milling.
2. Study of international standard codes: G-Codes and M-Codes
3. Format – Dimensioning methods.
4. Program writing – Turning simulator – Milling simulator, IS practice – commands menus.
5. Editing the program in the CNC machines.
6. Execute the program in the CNC machines.

### **Exercises:**

#### **CNC Turning Machine Material:** Aluminum / Acrylic fibre rod / Plastic

1. Using Linear and Circular interpolation - Create a part program and produce component in the Machine.
2. Using Stock removal cycle – Create a part program for multiple turning operations and produce component in the Machine.
3. Using canned cycle - Create a part program for thread cutting, grooving and produce component in the Machine.

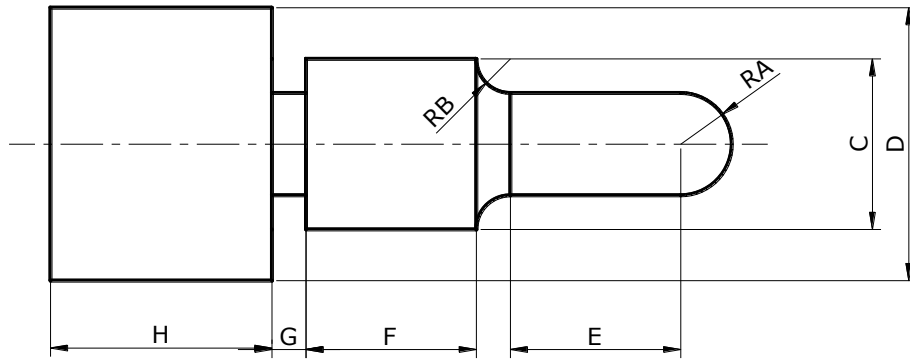
#### **CNC Milling Machine Material:** Aluminum flat or acrylic fibre or plastic

4. Using Linear interpolation and Circular interpolation – Create a part program for grooving and produce component in the Machine.
5. Using canned cycle - Create a part program for drilling, tapping, counter sinking and produce component in the Machine.
6. Using subprogram - Create a part program for mirroring and produce component in the Machine.

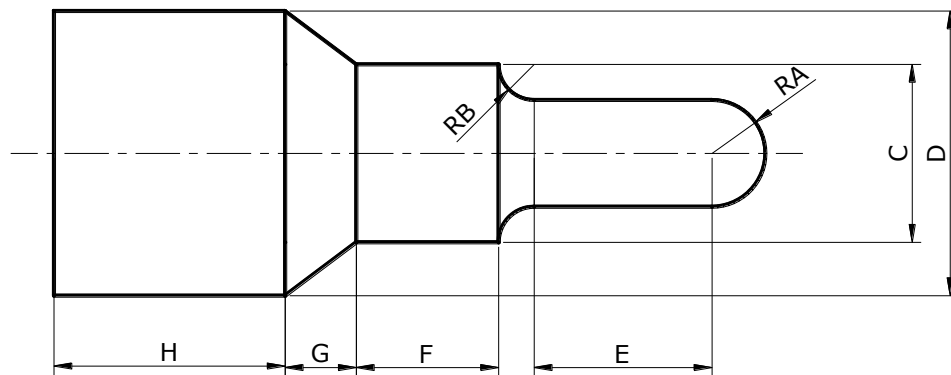
**EXERCISES:**

**CNC Turning Machine Material:** MS/Aluminium/ Acrylic fibre/ Plastic

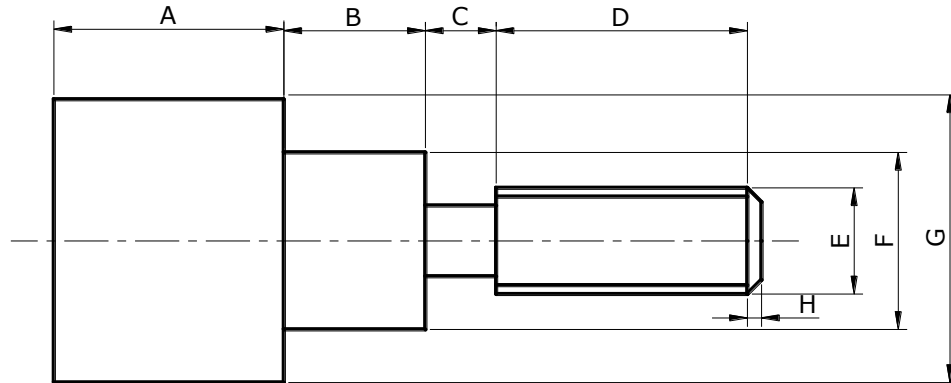
1. Using Linear and Circular interpolation - Create a part program and produce component in the Machine.



2. Using Stock removal cycle – Create a part program for multiple turning operations and produce component in the Machine

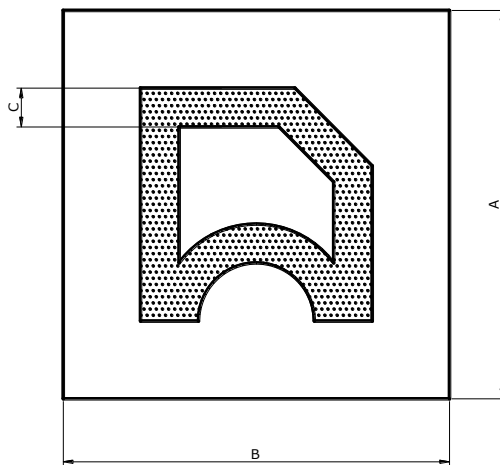


- Using canned cycle - Create a part program for thread cutting, grooving and produce component in the Machine.

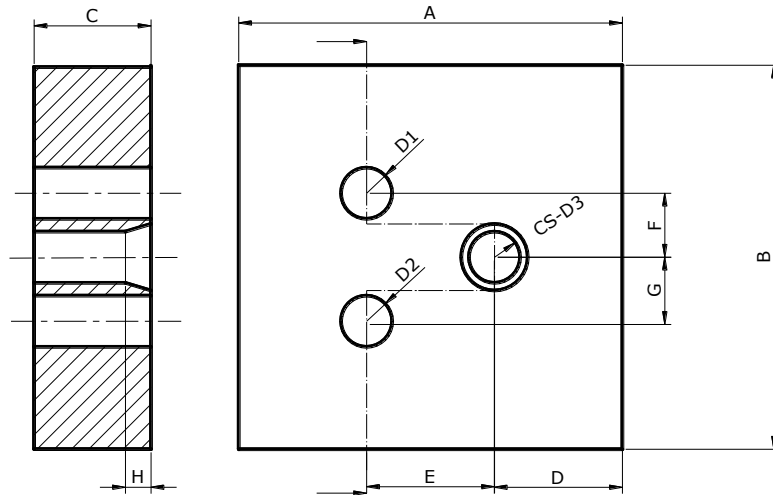


**CNC Milling Machine Material:** MS/Aluminium/ Acrylic fibre/ Plastic

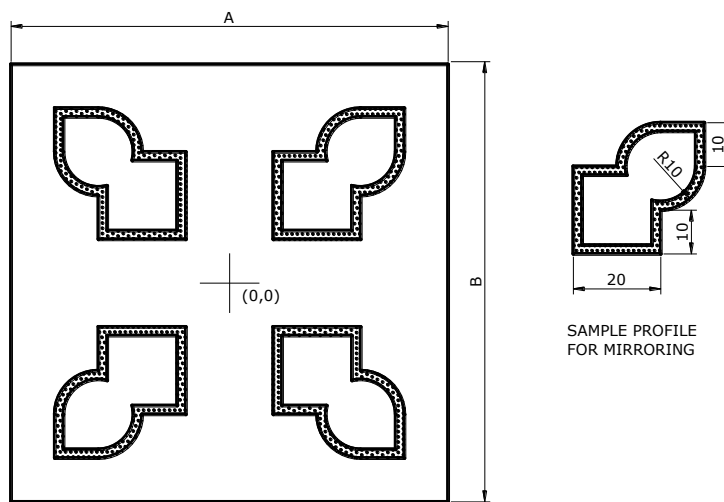
- Using Linear interpolation and Circular interpolation – Create a part program for grooving and produce component in the Machine.



- Using canned cycle - Create a part program for drilling, tapping, counter sinking and produce component in the Machine.



- Using subprogram - Create a part program and produce component in the Machine.



**Note:** Print the part program from the simulation software and make the component in the CNC machine.

Software used for CAD Modeling: CREO/CATIA

## EQUIPMENT REQUIREMENTS

EQUIPMENT NAME	QUANTITY
Desktop / Laptop Computers	15 Nos.
CNC Turn & CNC Mill Simulation Software	15 Nos.
AutoCad Software	15 Nos.
CNC Turning Machine	1 NO.
CNC Milling Machine	1 NO.

	SCHEME OF EVALUATION		
	Sl.No.	Allocation	Marks
<b>Part-A</b>	1	Part modelling	15
	2	Assembly	10
	3	Printout	10
<b>Part-B</b>	4	Program editing and creation	15
	5	Component manufacturing	10
	6	Finish	10
	7	Viva-Voce	05
	Total		75

**Course Name: DIPLOMA ELECTRONICS (ROBOTICS) ENGG.(SW)**

**Subject Code: ERM67**

**Semester : VI**

**Subject Title: PROCESS CONTROL & INSTRUMENTATION PRACTICAL**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours / week	Hours / semester	Marks			
PROCESS CONTROL & INSTRUMENTATION PRACTICAL	3	45	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**COURSE OUTCOME:**

- Study the basic concepts of instrumentation
- Categories the different types of sensors and transducer.
- Explain the signal conditioning.
- Measure the measurement technique of strain, force, Torque and power.
- Examine the measurement technique of pressure, temperature and flow.

**LIST OF EXPERIMENTS**

1. Perform Transient response of thermocouple
2. Compute Effect of Capacity
3. Demonstrate On- off control of temperature process
4. Demonstrate On – off control of pressure process
5. Demonstrate On off control of level process
6. Measure Differential output of a thermocouple
7. Measure temperature using RTD
8. Measure temperature using thermistor
9. Perform Characteristics of control valve
10. Measure Pressure using U-tube manometer
11. Plot the Response of PID controller



12. Measure displacement using LVDT
13. Measure displacement using strain gauge
14. Measure flow using Rotameter and lobed impeller
15. Measure angular displacement using encoder
16. Measure linear displacement using encoder

### **EQUIPMENT REQUIREMENTS**

<b>EQUIPMENT NAME</b>	<b>QUANTITY</b>
On-off level process	1 No.
On-off pressure process	1 No.
Temperature process	1 No.
LVDT trainer module	1 No.
RTD trainer module	1 No.
PID controller	1 No.
Thermister trainer module	1 No.
Control valve trainer kit	1 No.
Thermocouple	1 No.
Strain Gauge Experimental Setup	1 No.
Flow measurement Trainer Module	1 No.
Encoder Trainer Module	1 No.

### **QUESTION PAPER PATTERN**

<b>ALLOCATION</b>	<b>MARKS</b>
Block/Circuit diagram	20
Connections	20
Reading and Graph	20
Result	10
Viva Voce	5
<b>Total</b>	<b>75</b>

**Course Name : DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**

**Subject Code : ERM68**

**Semester : VI**

**Subject Title : MICROCONTROLLER AND ITS INTERFACING PRACTICAL**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 15 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours/ week	Hours / semester	Marks			Duration
MICROCONTROLLER AND ITS INTERFACING PRACTICAL	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**COURSE OUTCOME:**

- Familiarize on the arithmetic operations using instruction set on simulation software.
- Apprehension of decimal conversions using microcontroller commands.
- Realization of Greatest common divisor and Least
- Composing programs using I/O's Timers and interrupts.
- Application of microcontroller by using various interfacing kits.
- Generation of LCD display, 7-segment display, LED display and Traffic control using simulation software
- Stepper motor and DC motor controls using interfacing with 8051 microcontroller kit.
- Grasping the knowledge on matrix keyboard and printer interfacing with 8051 microcontroller kits

**Part – A**

1. Write an Assembly Language Programme for Multi-byte Addition and execute the same in the 8051 Kit.
2. Write an Assembly Language Programme for Multiplication and Division of two numbers and execute the same in the 8051 Kit.
3. Write an Assembly Language Programme for arranging the given data in Ascending order and execute the same in the 8051 Kit.
4. Write an Assembly Language Programme for BCD to Hex conversion and execute the same in the 8051 Kit.
5. Write an Assembly Language Programme for Hex to BCD conversion and execute the same in the 8051 Kit.

6. Write an Assembly Language Programme for ASCII to Binary and execute the same in the 8051 Kit.
7. Write an Assembly Language Programme for Parity bit generation and execute the same in the 8051 Kit.
8. Write an Assembly Language Programme for using timer / Counter and execute the same in the 8051 kit

### Part – B

#### INTERFACING WITH APPLICATION BOARDS

9. Write an Assembly Language Programme for interfacing Digital I/O board and test it.
10. Write an Assembly Language Programme for interfacing Matrix keyboard and test it.
11. Write an Assembly Language Programme for interfacing seven segment LED displays and test it.
12. Write an Assembly Language Programme for interfacing Traffic light control and test it.
13. Write an Assembly Language Programme for interfacing 8 bit ADC and test it.
14. Write an Assembly Language Programme for interfacing 8 bit DAC and test it.
15. Write an Assembly Language Programme for interfacing STEPPER MOTOR and test it.
16. Write an Assembly Language Programme for interfacing DC motor and test it.
17. Write an Assembly Language Programme for Sending data through serial port between controller kits and test it.

#### EQUIPMENT REQUIREMENTS

SI.No	Name of the Equipments	Quantity
1	8051 Microcontroller kit	6 Nos.
2	Digital I/O interface board	2 Nos.
3	Matrix keyboard interface board	2 Nos.
4	Seven segment led display interface board	2 Nos.
5	Traffic light interface board	2 Nos.
6	8bit ADC interface board	2 Nos.
7	8 bit DAC interface board	2 Nos.
8	Stepper motor control interface board	2 Nos.
9	DC motor control interface board.	2 Nos.

## SOFTWARE REQUIREMENT

UMPS 7.5 Software

### QUESTION PAPER PATTERN:

ALLOCATION	MARKS
Writing program	25
Flow chart	15
Execution	20
Output & Result	10
Viva – Voce	5
Total	75

Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG.(SW)

Subject Code: ERM71

Semester : VII

Subject Title: ROBOTICS

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			Duration
	Hours/ week	Hours / semester	Marks			
ROBOTICS	4	60	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**TOPICS AND ALLOCATION OF HOURS:**

UNIT	TOPICS	TIME (Hrs.)
I.	Basic Configuration of Robotics and its Working	11
II.	Robot Controller, Servo Systems	11
III.	Robot Motion Analysis and Vision System	11
IV.	Robot Programming	11
V.	Robot Application in Manufacturing and Robot Technologies in the Future	11
	Revision and Test	05
	Total	60

**RATIONALE:**

In Recent days robots are used in automation industries. Knowledge & Familiarization of robots will be considered as an added advantage in the field of Automation.

**COURSE OUTCOME:**

- Explain different components of robot
- compare various types of Robot
- Discuss the working of various robot controllers.
- Distinguish various robot controller.
- Explain the kinematics of robot.

- Explain the working of vision system
- Utilize the application of robots in various industries.
- Compare the uses of various sensors & warning system
- Discuss Robot programming Methods and Robot Languages
- Explain the Robot Technologies of the future

## DETAILED SYLLABUS

### CONTENTS

UNIT	NAME OF THE TOPICS	HOURS
<b>I</b>	<p><b>Basic Configuration of Robotics and its Working</b>            Introduction – history of robots, -definition – basic configuration of robotics and its working –robot components – manipulator, end effectors, drive system, controller, sensors –mechanical arm – degrees of freedom – links and joints – construction of links, types of joint – classification of robots – Cartesian, cylindrical, spherical, horizontal articulated (SCARA), vertical articulated – structural characteristics of robots –work envelope and work volume - robot work volumes and comparison – wrist rotations – mechanical transmission, pulleys, belts, gears, harmonic drive - conversion between linear and rotary motion and its devices.-introduced to PUMA</p>	<b>11</b>
<b>II</b>	<p><b>Robot Controller, Servo Systems</b>            Robot controller – level of controller- four types of controller– open loop and closed loop controller –servo systems — robot path control – point to point – continuous path control – sensor based path control – controller programming – actuators – dc servo motors – stepper motors – hydraulic and pneumatic drives - feedback devices – potentiometers – optical encoders – dc tachometers.</p>	<b>11</b>
<b>III</b>	<p><b>Robot Motion Analysis and Vision System</b>            Robot motion analysis – robot kinematics – robot dynamics - end effectors – grippers and tools - gripper design – mechanical gripper – vacuum gripper – magnetic grippers – sensors – transducers – tactile sensors – proximity sensors and range sensors – force and moment sensors and its applications and problems photoelectric sensors – vision system – image processing and analysis – robotic applications – robot operation aids – teach pendent – MDI and computer control</p>	<b>11</b>

<p><b>IV</b></p>	<p><b>Robot Programming</b></p> <p>Robot programming – lead through methods and textual robot languages – motion specification - motion interpolation –</p> <p><b>Basic robot programming:</b>Methods of Programming a Robot, Lead through Programming Methods, Robot Programme as a Path in Space, Motion Interpolation, WAIT, SIGNAL and DELAY Commands, Capabilities and Limitations of Lead through Methods.</p> <p><b>Basic robot language:</b>The Textual Robot Languages, Generations of Robot Programming Languages, Robot Language Structure, Constants, Variables and other Data Objects, Motion Commands, End Effector and Sensor Commands, Computations and Operations, Program Control and Sub-routines, Communications and Data Processing, Monitor Mode Commands.</p>	<p><b>11</b></p>
<p><b>V</b></p>	<p><b>Robot Application in Manufacturing and Robot Technologies of the Future</b></p> <p>Robot application in manufacturing – material handling –assembly finishing –adopting robots to work station - requisite and non – requisite robot characteristics –stages in selecting robot for individual application – precaution for robot –future of robotics - Economics analysis for robotics – cost data required for the analysis – methods of economic analysis – pay back method – equivalent uniform annual cost method – return on investment method.</p> <p><b>Robot Technologies of the Future:</b> Introduction Robot intelligence, Advanced sensor capabilities, Three – Dimension visions Telepresence, and related technologies Mechanical design features. Direct drive Robot, Multiple arm coordinate, Robot-Mobility, locomotion and navigation, Wheeled vehicles, Walking machines, Universal hand System, integration and network, Future applications of Robots in Military operations, Firefighting operations, under sea operations, Space operations.</p>	<p><b>11</b></p>
<p style="text-align: center;"><b>Revision and Test</b></p>		<p><b>05</b></p>

**Text Books:**

1. Mikkel P.Groover, Mite chell weiss, Rogern Negal and Nicholes G.Odress,
2. Industrial Robotics Technology- Programming and Applications
3. R.K.Mittal, I.J.Nagrath, Robotics and controls, Tata McGraw Hill Education Pvt.

**Reference Books:**

1. Doughlaes –R. HALcoojr, An Introduction to robotics.
2. Robotics – An Introduction – Doughales – R. Halconnjr.An Introduction to Robotics

**MODEL QUESTION PAPER**  
**ERM71- ROBOTICS**

Time: 3 Hrs.

Maximum Marks: 75

- Note: 1. Answer ALL the questions in PART-A (1 mark each)  
2. Answer any ONE question from each unit in PART-B (3 marks each)  
3. Answer any ONE question from each unit in PART-C (10 marks each)  
4. The question paper contains TWO Pages

**PART-A**

(1x10=10)

1. What is degree of freedom?
2. List the different types of control in robot.
3. What is closed loop system?
4. Define actuator.
5. Define transducer.
6. What is two finger end effector?
7. What is online programming?
8. List any two precautions for robot operation.
9. Give any two basic commands used in robot.
10. Give any two applications of sensors in automobiles.

**PART-B**

(3x5=15)

**UNIT-I**

11. Write short notes on drive system.
12. Explain the structural of robot behavior.

**UNIT-II**

13. Explain the different types of languages used in robot.
14. Distinguish between point to point and continuous path controller.

**UNIT-III**

15. Write short notes on gripper linkage.
16. Explain the working principle of photo electric sensors.

**UNIT-IV**

17. Explain any one type of interpolation.
18. Write short notes on robot structure.

**UNIT-V**

19. Write short notes on touch sensors.
20. Describe Artificial intelligence.



**PART-C**

(10X5=50)

**UNIT-I**

21. Classify robots and explain the configuration of SCARA robot with neat sketch.
22. Explain the conversion of linear motion into rotary motion with suitable device.

**UNIT-II**

23. Explain the operation of stepper motor with neat sketch.
24. Explain the working principle of potentiometer with neat sketch.

**UNIT-III**

25. Explain the working principle of magnetic gripper. List the advantages and disadvantages.
26. What are the factors to be considered in the selection and design of gripper?

**UNIT-IV**

27. Explain various motion interpolation of robot.
28. Mention the various types of programming and Explain off line programming in detail.

**UNIT-V**

29. With neat sketch explain the working of fuel level sensor used in automobiles.
30. Explain the economic analysis of robotics.

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Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)

Subject Code: ERM72

Semester : VII

Subject Title: ROBOTICS PRACTICAL

**TEACHING AND SCHEME OF EXAMINATION:**

No of Weeks per Semester: 15 weeks

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
ROBOTICS PRACTICAL	3	45	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**RATIONALE:**

In Recent days robots are used in automation industries. Knowledge & Familiarization of robots will be considered as an added advantage in the field of Automation.

**COURSE OUTCOME:**

- Identify different part of robot
- Record positions using Cartesian coordinate and joint co ordinates
- Write programmers for pick and place
- Operate and control robot through teach pendant
- Operate and control robot through programming
- Examine and use vision system in robot application

**LIST OF EXERCISES**

**OFF-LINE – ARISTOSIM**

Robot system connection and component recognition

1. Robot operation, moving the various axis continuous and intermittent motions.

(e.g.) Writing programs off-line

(a). Homing operation

(b).Recording positions

2.Writing programs for pick and place at least three programs

3. Write a Program for stacking the object using offline
4. Write a Looping program using offline

### **ON-LINE with Nachi VS05G-01 6 AXIS ROBOT**

Study of the robot configuration and manipulating the robot

1. Study of Vision system in Robot
2. Writing programs on-line
  - a) Homing operation
  - b) Recording positions
3. Teaching positions via XYZ co-ordinates
4. Write a Program using XYZ Coordinates
5. Write a program Robot working limits
6. Write a program operating the gripper
7. Write a program using wait, speed commands
8. Measurement of Robot work envelope
9. Measurement of Robot of motion
10. Measurement of Repeatability
11. Practical connected with Photo sensor

### **Factory I/O Automation**

1. Transport a box until it reaches a sensor.
2. Fill and empty a tank using timer.
3. Assembly parts made of lids and bases using pick and place with analog valves.
4. Converge two parts into a single one.
5. Transport items through three different levels to elevators.
6. Sorting station:-
  - a) Separate green and blue items using a vision system.
  - b) Sort boxes by weight using a conveyor scale.
  - c) Sort cardboard boxes by height using chain transfer.

## EQUIPMENT REQUIREMENTS

<b>EQUIPMENT NAME</b>	<b>QUANTITY</b>
Robot off line simulation software (ARISTO SIM SOFTWARE)	10 users
Factory Input Output Automation MHJ Software	10 users
Industrial robot	1 No.
Desktop/ Laptop Computers	15 nos.
Transducers/photo sensor	2

## QUESTION PAPER PATTERN

<b>ALLOCATION</b>	<b>MARKS</b>
Writing program	30
Execution/Simulation	30
Result	10
Viva Voce	5
Total	75

**Course Name: DIPLOMA IN ELECTRONICS (ROBOTICS) ENGG. (SW)**

**Subject Code: ERM73**

**Semester : VII**

**Subject Title: PROJECT WORK**

**TEACHING AND SCHEME OF EXAMINATION:**

**No of Weeks per Semester: 16 weeks**

SUBJECT	INSTRUCTIONS		EXAMINATION			
	Hours / week	Hours / semester	Marks			Duration
PROJECT WORK	3	45	Internal Assessment	Board Examination	Total	3 Hrs.
			25	75	100	

**COURSE OUTCOME:**

- Implement the theoretical and practical knowledge gained through the curriculum into an application suitable for a real practical working environment preferably in an industrial environment
- Get exposure on industrial environment and its work ethics.
- Understand what entrepreneurship is and how to become an entrepreneur.
- Learn and understand the gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key dates, asynchronous document sharing and discussions, as well as to prepare collaborative edition of the final project report.
- Understand the facts and importance of environmental management.
- Understand and gain knowledge about disaster management

**CONTINUOUS ASSESSMENT:**

The continuous assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

Detail of assessment	Period of assessment	Max. Marks
First Review	6 <sup>th</sup> week	10
Second Review	12 <sup>th</sup> week	10
Attendance	Entire semester	5
<b>Total</b>		<b>25</b>

## EVALUATION FOR END EXAMINATION:

Details of Mark allocation	Max Marks
Marks for Report Preparation, Demo, Viva-voce	65
Marks for answer of 4 questions which is to be set by the external examiner from the given question bank consisting of questions in the following two topics, Disaster management and Environmental Management. Out of four questions two questions to appear from each of the above topics. i.e. 2 questions x 2 topics = 4 questions.  4 questions x 2 ½ marks = 10 Marks	10
<b>Total</b>	<b>75</b>

### **DETAILED SYLLABUS** **ENVIRONMENTAL & DISASTER MANAGEMENT**

#### **ENVIRONMENTAL MANAGEMENT:**

1.1	Introduction – Environmental Ethics – Assessment of Socio Economic Impact – Environmental Audit – Mitigation of adverse impact on Environment – Importance of Pollution Control – Types of Industries and Industrial Pollution.
1.2	Solid waste management – Characteristics of Industrial wastes – Methods of Collection, transfer and disposal of solid wastes – Converting waste to energy – Hazardous waste management Treatment technologies.
1.3	Waste water management – Characteristics of Industrial effluents – Treatment and disposal methods – Pollution of water sources and effects on human health.
1.4	Air pollution management – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management.
1.5	Noise pollution management – Effects of noise on people – Noise control methods.

#### **DISASTER MANAGEMENT:**

2.1	Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc. – Man made Disasters – Crisis due to fires, accidents, strikes etc. – Loss of property and life..
2.2	Disaster Mitigation measures – Causes for major disasters – Risk Identification – Hazard Zones – Selection of sites for Industries and residential buildings – Minimum distances from Sea – Orientation of

	Buildings – Stability of Structures – Fire escapes in buildings - Cyclone shelters – Warning systems.
2.3	Disaster Management – Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services - Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Firefighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbors / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

### **LIST OF QUESTIONS**

#### **ENVIRONMENTAL MANAGEMENT:**

1. What is the responsibility of an Engineer-in-charge of an Industry with respect to Public Health?
2. Define Environmental Ethic.
3. How Industries play their role in polluting the environment?
4. What is the necessity of pollution control? What are all the different organizations you know, which deal with pollution control?
5. List out the different types of pollutions caused by a Chemical / Textile / Leather / Automobile / Cement factory.
6. What is meant by Hazardous waste?
7. Define Industrial waste management.
8. Differentiate between garbage, rubbish, refuse and trash based on their composition and source.
9. Explain briefly how the quantity of solid waste generated in an industry could be reduced.
10. What are the objectives of treatments of solid wastes before disposal?
11. What are the different methods of disposal of solid wastes?
12. Explain how the principle of recycling could be applied in the process of waste minimization.
13. Define the term 'Environmental Waste Audit'.
14. List and discuss the factors pertinent to the selection of landfill site.
15. Explain the purpose of daily cover in a sanitary landfill and state the minimum desirable depth of daily cover.
16. Describe any two methods of converting waste into energy.

17. What actions, a local body such as a municipality could take when the agency appointed for collecting and disposing the solid wastes fails to do the work continuously for number of days?
18. Write a note on Characteristics of hazardous waste.
19. What is the difference between municipal and industrial effluent?
20. List few of the undesirable parameters / pollutants anticipated in the effluents from oil refinery industry / thermal power plants / textile industries / woolen mills / dye industries / electroplating industries / cement plants / leather industries (any two may be asked)
21. Explain briefly the process of Equalization and Neutralization of waste water of varying characteristics discharged from an Industry.
22. Explain briefly the Physical treatments “Sedimentation” and “Floatation” processes in the waste water treatment.
23. Explain briefly when and how chemical / biological treatments are given to the waste water.
24. List the four common advanced waste water treatment processes and the pollutants they remove.
25. Describe refractory organics and the method used to remove them from the effluent.
26. Explain biological nitrification and de-nitrification.
27. Describe the basic approaches to land treatment of Industrial Effluent.
28. Describe the locations for the ultimate disposal of sludge and the treatment steps needed prior to ultimate disposal.
29. List any five Industries, which act as the major sources for Hazardous Air Pollutants.
30. List out the names of any three hazardous air pollutants and their effects on human health.
31. Explain the influence of moisture, temperature and sunlight on the severity of air pollution effects on materials.
32. Differentiate between acute and chronic health effects from Air pollution.
33. Define the term Acid rain and explain how it occurs.
34. Discuss briefly the causes for global warming and its consequences
35. Suggest suitable Air pollution control devices for a few pollutants and sources.
36. Explain how evaporative emissions and exhaust emissions are commonly controlled.
37. What are the harmful elements present in the automobile smokes? How their presence could be controlled?
38. What is the Advantage of Ozone layer in the atmosphere? State few reasons for its destruction.
39. Explain the mechanism by which hearing damage occurs.



40. List any five effects of noise other than hearing damage.
41. Explain why impulsive noise is more dangerous than steady state noise.
42. Briefly the Source – Path – Receiver concept of Noise control.
43. Where silencers or mufflers are used ? Explain how they reduce the noise.
44. Describe two techniques to protect the receiver from hearing loss when design / redress for noise control fail.
45. What are the problems faced by the people residing along the side of a railway track and near to an Airport? What provisions could be made in their houses to reduce the problem?

### **DISASTER MANAGEMENT:**

1. What is meant by Disaster Management? What are the different stages of Disaster management?
2. Differentiate Natural Disasters and Man-made Disasters with examples.
3. Describe the necessity of Risk identification and Assessment Surveys while planning a project.
4. What is Disasters recovery and what does it mean to an Industry?
5. What are the factors to be considered while planning the rebuilding works after a major disaster due to flood / cyclone / earthquake? (Any one may be asked)
6. List out the public emergency services available in the state, which could be approached for help during a natural disaster.
7. Specify the role played by an Engineer in the process of Disaster management.
8. What is the cause for Earthquakes? How they are measured? Which parts of India are more vulnerable for frequent earthquakes?
9. What was the cause for the Tsunami 2004 which inflicted heavy loss to life and property along the coast of Tamilnadu ? Specify its epicenter and magnitude.
10. Specify the Earthquake Hazard Zones in which the following towns of Tamilnadu lie: (a) Chennai (b) Nagapattinam (c) Coimbatore (d) Madurai (e) Salem.
11. Which parts of India are experiencing frequent natural calamities such as (a) heavy rain fall (b) huge losses due to floods (c) severe cyclones
12. Define basic wind speed. What will be the peak wind speed in (a) Very high damage risk zone – A, (b) High damage risk zone, (c) Low damage risk zone.
13. Specify the minimum distance from the Sea shore and minimum height above the mean sea level, desirable for the location of buildings.

14. Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.
15. Explain how the shape and orientation of buildings could reduce the damages due to cyclones.
16. What is a cyclone shelter? When and where it is provided? What are its requirements?
17. What Precautionary measures have to be taken by the authorities before opening a dam for discharging the excess water into a canal/river?
18. What are the causes for fire accidents? Specify the remedial measures to be taken in buildings to avoid fire accidents.
19. What is a fire escape in multistoried buildings? What are its requirements?
20. How the inmates of a multistory building are to be evacuated in the event of a fire/Chemical spill/Toxic Air Situation/ Terrorist attack, (any one may be asked).
21. Describe different fire fighting arrangements to be provided in an Industry.
22. Explain the necessity of disaster warning systems in Industries.
23. Explain how rescue operations have to be carried out in the case of collapse of buildings due to earthquake / blast / Cyclone / flood.
24. What are the necessary steps to be taken to avoid dangerous epidemics after a flood disaster?
25. What relief works that have to be carried out to save the lives of workers when the factory area is suddenly affected by a dangerous gas leak / sudden flooding?
26. What are the difficulties faced by an Industry when there is a sudden power failure? How such a situation could be managed?
27. What are the difficulties faced by the Management when there is a group clash between the workers? How such a situation could be managed?
28. What will be the problems faced by the management of an Industry when a worker dies because of the failure of a mechanical device due to poor maintenance? How to manage such a situation?
29. What precautionary measures have to be taken to avoid accidents to laborers in the Industry in a workshop / during handling of dangerous Chemicals / during construction of buildings / during the building maintenance works.
30. Explain the necessity of medical care facilities in an Industry / Project site.
31. Explain the necessity of proper training to the employees of Industries dealing with hazardous products, to act during disasters.

32. What type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?
33. What is meant by Emergency Plan Rehearsal? What are the advantages of such Rehearsals?
34. What action you will take when your employees could not reach the factory site because of continuous strike by Public Transport workers?
35. What immediate actions you will initiate when the quarters of your factory workers are suddenly flooded due to the breach in a nearby lake / dam, during heavy rain?
36. What steps you will take to avoid a break down when the workers union of your Industry have given a strike notice?
37. List out few possible crisis in an organization caused by its workers? What could be the part of the middle level officials in managing such crisis?
38. What types of warning systems are available to alert the people in the case of predicted disasters, such as floods, cyclone etc.
39. Explain the necessity of Team work in the crisis management in an Industry / Local body.
40. What factors are to be considered while fixing compensation to the workers in the case of severe accidents causing disability / death to them?
41. Explain the legal / financial problems the management has to face if safety measures taken by them are found to be inadequate.
42. Describe the importance of insurance to men and machinery of an Industry dealing with dangerous jobs.
43. What precautions have to be taken while storing explosives in a match/ fire crackers factory?
44. What are the arrangements required for emergency rescue works in the case of Atomic Power Plants?
45. Why residential quarters are not constructed nearer to Atomic Power Plants?

## ERM74 INDUSTRIAL TRAINING – II

The students are expected to gain a working experience in various departments of an industry / organization and hence learning the industrial management in a practical way.

The students have to undergo a six months industrial training (PHASE II) during the VII semester in a related industry / organization. During the training period the students are maintaining an Industrial diary to record their observation and learning. On completion of training, a training report should be submitted to the Head of the Department. Industrial training of Sandwich students will be evaluated based on Continuous Assessment of two periodical reviews and an End semester Examination on Assessment of Training Report and viva-voce.

### SANDWICH DIPLOMA COURSE - INDUSTRIAL TRAINING

#### 1. Introduction

The main objective of the Sandwich Diploma Course is to mould a well rounded technician acclimated with industrial environment while being a student in the institution.

The Sandwich Diploma Course study is pursued by students, in 7 semesters of 3½ years duration, the subjects of 3 years - Full Time Diploma Course being regrouped for academic convenience.

While in the 4<sup>th</sup> semester students undergo Industrial Training-I for 6 months (December through May). They also do course work in the institution for one day in a week, while in the 7<sup>th</sup> semester they undergo another spell of 6 months (June through November) Industrial training-II.

The Apprenticeship (Amendment) Act 1973 is followed in regulating the Industrial training procedure for Sandwich Course.

I SEM	II SEM	III SEM	IV SEM	V SEM	VI SEM	VII SEM
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Institutional study



Industrial Training

First Spell - IV Semester (December - May)

Second Spell - VII Semester (June - November)

#### 2. Attendance Certification

Every month students have to get their attendance certified by industrial supervisor in the prescribed form. Students have also to put their signature on the form and submit it to the institutional staff in-charge. Attendance and submission of Review reports will be duly considered while awarding the Continuous Assessment mark.

#### 3. Training Reports

The students have to prepare two types of reports:

- Weekly report in the form of diary to be submitted to the concerned staff in-charge of the institution. This will be reviewed while awarding Continuous Assessment mark.

- Comprehensive report at the end of each phase of Industrial Training will be reviewed while awarding End semester Examination marks.

### 3.1 Industrial Training Diary

Students are required to maintain the record of day - to- day work done. Such record is called Industrial training Diary. Students have to write this report regularly. All days of the week should be accounted for clearly giving attendance particulars (Presence, Absence, Leave, and Holiday etc.). The concerned Industrial supervisor is to check periodically these progress reports.

### 3.2 Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organization where the training was undergone after attestation by the supervisors. The comprehensive report should be incorporating study of plant/ product /process/ construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc. should be incorporated with the consent of the Organization.

## 4. Scheme of Evaluation

Components	SCHEME OF EVALUATION		
	No.	Allocation	Marks
Continuous Assessment Mark	1	First review	20
	2	Second review	20
	3	Attendance	10
End Examination	4	Comprehensive Training Report	20
	5	Viva-Voce	30
<b>Total</b>			<b>100</b>



**MURUGAPPA POLYTECHNIC COLLEGE, S.M.NAGAR, CHENNAI-62**  
**DEPARTMENT OF ELECTRONICS (ROBOTICS)**  
**DIPLOMA COURSE IN ELECTRONICS (ROBOTICS) ENGINEERING**  
**LIST OF EQUIVALENT SUBJECTS**  
**EQUIVALENT PAPERS OF L-SCHEME SUBJECT IN M-SCHEME**

**III SEMESTER**

MPC 'L' SCHEME		MPC 'M' SCHEME	
Subject Code	Subject Name	Subject Code	Subject Name
MEL31	Strength of Materials	MEM31	Strength of Materials
ERL32	Electrical Circuits and Machines	ERM33	Electrical Circuits and Machines
ERL33	Machine Shop Technology	ERM34	Machine Shop Technology
ERL34	Electrical circuits and machines practical	ERM36	Electrical Circuits and Machines Practical
ERL35	Programming in "C" Practical	ERM58	Programming in "C" Practical
ERL36	Computer Aided Machine Drawing Practical	ERM56	Computer Aided Machine Drawing Practical
ERL37	Machine Shop Technology Practical	ERM37	Machine Shop Technology Practical

**IV SEMESTER**

MPC 'L' SCHEME		MPC 'M' SCHEME	
Subject Code	Subject Name	Subject Code	Subject Name
ERL41	Electronics Devices and Circuits	ERM32	Electronic Devices and Circuits
ERL42	Electronics Devices and Circuits Practical	ERM35	Electronic Devices and Circuits Practical
ERL48	Industrial Training- I	ERM43	Industrial Training- I

**V SEMESTER**

MPC 'L' SCHEME		MPC 'M' SCHEME	
Subject Code	Subject Name	Subject Code	Subject Name
ERL51	Analog and Digital Electronics	ERM51	Analog and Digital Electronics
ERL52	Measuring Instrument& Sensors	NO EQUIVALENT	
ERL53	Hydraulic and Pneumatic systems	ERM53	Hydraulic and Pneumatic systems
ERL54	PLC & SCADA	NO EQUIVALENT	
ERL55	Auto Electronics	ERM65	Auto Electronics
ERL56	Analog and Digital Electronics Practical	ERM54	Analog and Digital Electronics Practical
ERL57	Sensor and PLC Practical	NO EQUIVALENT	
ERL58	Hydraulic and Pneumatic Practical	ERM55	Hydraulic, Pneumatic and PLC Practical

## VI SEMESTER

MPC 'L' SCHEME		MPC 'M' SCHEME	
Subject Code	Subject Name	Subject Code	Subject Name
MEL61	Industrial Engineering and Management	MEM61	Industrial Engineering and Management
MEL62	Computer Integrated Manufacturing	MEM62	CAD / CAM
ERL63	Process control and Instrumentation	ERM63	Process Control
ERL64	Microcontroller & PIC	ERM64	Microcontroller & Embedded System
MEL65	Computer Integrated Manufacturing Practical	MEM66	CAD / CAM Practical
ERL66	Microcontroller and its Interfacing Practical	ERM68	Microcontroller and its Interfacing Practical
GEL57	Communication and life skills Practical	GEM57	Life and Employability Skills Practical
ERL68	Process Control and Instrumentation Practical	ERM67	Process Control and Instrumentation Practical

## VII SEMESTER

MPC 'L' SCHEME		MPC 'M' SCHEME	
Subject Code	Subject Name	Subject Code	Subject Name
ERL71	Robotics	ERM71	Robotics
ERL72	Robotics Practical	ERM72	Robotics Practical
ERL73	Project Work	ERM73	Project Work
ERL74	Industrial Training –II	ERM74	Industrial training-II