

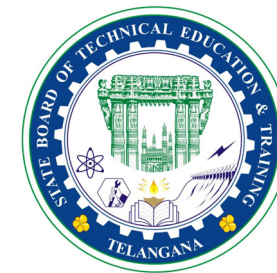
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**CURRICULUM – 2014**

**(C-14)**

**DIPLOMA IN  
ELECTRONICS & COMMUNICATION  
ENGINEERING**

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**State Board of Technical Education & Training  
Telangana State  
HYDERABAD**

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## CURRICULUM ( C-14 ) FOR DIPLOMA COURSES IN Telangana

**I. PREAMBLE**

The State Board of Technical Education and Training, **Telangana** under the aegis of the Department of Technical Education, Telangana generally reviews the Curricula once in every five years. However, recognizing the changing needs as stated by the user industries, the Board has decided to bring forward the revision of curriculum. Consequently, the Board with the assistance of NITTTR, Chennai under the guidance of Prof. C. Nagendra Rao, performed the evaluation of C-09 Curriculum in force. On finding the merits and demerits of C-09 Curriculum the faculty have made a thorough assessment of the curricular changes that have to be brought in. It was felt that there is an urgent need to improve hands-on experience among the students pursuing diploma courses. Further, the urgency of enhancing communication skills in English was also highlighted in the feedback and suggestions made by the user industries. Keeping these in view, a number of meetings and deliberations were held at district and state level, with experts from industry, academia and senior faculty of the department. The new Curricula for the different diploma courses have been designed with the active participation of the members of the faculty teaching in the Polytechnics of Telangana, besides reviewed by Expert Committee constituted with eminent academicians.

The primary objective of the curricular change is to produce best technicians in the country by correlating growing needs of the industries with the academic input.

The revised New Curriculum i.e., Curriculum – 2014 or C-14 is vetted by NITTTR, Chennai followed by BoG approval of SBTET for its implementation with effect from 2014-15.

**Salient Features:**

1. Duration of course is either 3 years / 3½ years duration of Regular Academic Instruction.
2. The Curriculum is prepared in Semester Pattern. However, First Year is maintained as Year-wise pattern.
3. The policy decisions taken at the State and Central level with regard to environmental science are implemented by including relevant topics in

Chemistry. This is also in accordance with the Supreme Court guidelines issued in Sri Mehta's case.

4. Keeping in view the increased need of communication skills which is playing a major role in the success of Diploma Level students in the Industries, emphasis is given for learning and acquiring listening, speaking, reading and writing skills in English. Further as emphasized in the meetings, Communication Skills lab and Life Skills lab are introduced in IV and V semesters respectively for all the branches except Chemical Engineering and Chemical Engineering (Sugar Technology) for which life skills is introduced at 3<sup>rd</sup> semester level..
5. In addition to Engineering Mathematics in I year (Mathematics -102) and III semester (Mathematics-301), Mathematics-401 has been introduced in the IV semester of present syllabus.
6. Modern topics relevant to the needs of the industry and global scenario suitable to be taught at Diploma level are also incorporated in the curriculum.
7. CAD specific to the branch has been given more emphasis in the curriculum. Preparing drawings using CAD software has been given more importance.
8. Every student is exposed to the computer lab at the 1<sup>st</sup> year itself in order to familiarize himself with skills required for keyboard/mouse operation, internet usage and e-mailing.
9. The number of teaching hours allotted to a particular topic/chapter has been rationalized keeping in view the past experience
10. Upon reviewing the existing C-09 curriculum, it is found that the theory content is found to have more weightage than the Practical content. In the revised C-14 curriculum, more emphasis is given to the practical content of Laboratories and Workshops, thus strengthening the practical skills.
11. With increased emphasis for the student to acquire Practical skills, the course content in all the subjects is thoroughly reviewed and structured as outcome based than the conventional procedure based. While the course content in certain subjects is reduced, in rest of the subjects the content has been enhanced as per the need.
12. A new subject "**Field Practices**" is introduced in 5<sup>th</sup> Semester. In Field Practices, the students will perform all the industry oriented activities for all types of Field tastings and make use of the machinery, equipment and tools actually used in the industry. By this, the student will get first-

hand experience of performing various practical procedures and field experiments to enhance their skills.

13. All Practical subjects are independent of each other and the practice of grouping two or more practical subjects is dispensed with.
14. Curricular of Laboratory and Workshops have been thoroughly revised based on the suggestions received from the industry and faculty, for better utilization of the equipment available at the Polytechnics. The experiments /exercises that are chosen for the practical sessions are identified to conform to the field requirements of industry.
15. The Members of the working group are grateful to Sri Ajay Jain, I.A.S., Commissioner of Technical Education & Chairman, S.B.T.E.T. and Smt.Sailaja Ramaiyer, I.A.S., for their guidance and valuable inputs in revising, modifying and updating the curriculum.
16. The Members acknowledge with thanks the cooperation and guidance provided by the Sri. D. Venkateswarlu, Secretary, SBTET, Telangana and Dr. CN Rao, Professor and Head, NITTTR, ECH and other officials of Directorate of Technical Education and the State Board of Technical Education, Telangana, experts from industry, academia from the universities and higher learning institutions and all teaching fraternity from the Polytechnics who are directly and indirectly involved in preparation of the curricula.

## II. RULES AND REGULATIONS

### 1. ADMISSION PROCEDURES :

#### 1.1 DURATION AND PATTERN OF THE COURSES

All the Diploma programs run at various institutions are of AICTE approved 3 years or 3½ years duration of Academic Instruction.

All the Diploma courses are run on year wise pattern in the First year, and the remaining two or two & half years are run in the semester pattern. In respect of few courses like Diploma in Electronics with specialization in CP/ CN/ IE/ TV/ BM/ Embedded systems, the training will be in the seventh semester.

#### 1.2 PROCEDURE FOR ADMISSION INTO THE DIPLOMA COURSES:

Selection of candidates is governed by the Rules and regulations laid down in this regard from time to time.

- i) Candidates who wish to seek admission in any of the Diploma courses will have to appear for Common Entrance Test for admissions into Polytechnics (POLYCET) conducted by the State Board of Technical Education and Training, Telangana, Hyderabad.

Only the candidates satisfying the following requirements will be eligible to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET).

- a) The candidates seeking admission should have appeared for the X class examination, conducted by the Board of Secondary Examination, Telangana or equivalent examination thereto, at the time of making application to the Common Entrance Test for Polytechnics for admissions into Polytechnics (POLYCET). In case of candidates who apply pending results of their qualifying examinations, their selection shall be subject to production of proof of their passing the qualifying examination in one attempt or compartmentally at the time of interview for admission.
- b) Admissions are made based on the merit obtained in the Common Entrance Test (POLYCET) and the reservation rules stipulated by the Government of Telangana from time to time.
- c) For admission into the following Diploma Courses for which entry qualification is 10+2, candidates need not appear for POLYCET. A separate notification will be issued for admission into these courses.

1). D.H.M.C.T. 2). D.Pharmacy

### 1.3 MEDIUM OF INSTRUCTION

The medium of instruction and examination shall be English.

### 1.4 PERMANENT IDENTIFICATION NUMBER (PIN)

A cumulative / academic record is to be maintained of the Marks secured in sessional work and end examination of each year for determining the eligibility for promotion etc., a Permanent Identification Number (PIN) will be allotted to each candidate so as to facilitate this work and avoid errors in tabulation of results.

### 1.5 NUMBER OF WORKING DAYS PER SEMESTER / YEAR:

- a). The Academic year for all the Courses usually shall be from Fifteenth June of the year of admission to the 31<sup>st</sup> March of the succeeding year.
- b). The Working days in a week shall be from Monday to Saturday
- c). There shall be 7 periods of 50 minutes duration on all working days.
- d). The minimum number of working days for each semester / year shall be 90 / 180 days excluding examination days. If this prescribed minimum is not achieved due to any reason, special arrangements shall be made to conduct classes to cover the syllabus.

### 1.6 ELIGIBILITY OF ATTENDANCE TO APPEAR FOR THE END EXAMINATION

- a). A candidate shall be permitted to appear for the end examination in all subjects, if he or she has attended a minimum of 75% of working days during the year/Semester.
- b). Condonation of shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester or 1<sup>st</sup> year may be granted on medical grounds.
- c). Candidates having less than 65% attendance shall be detained.
- d). Students whose shortage of attendance is not condoned in any semester / 1<sup>st</sup> year are not eligible to take their end examination of that class and their admissions shall stand cancelled. They may seek re-admission for that semester / 1<sup>st</sup> year when offered next.
- e). A stipulated fee shall be payable towards condonation for shortage of attendance.

**1.7 READMISSION**

Readmission shall be granted to eligible candidates by the respective RJD / Principal.

- 1) Within 15 days after commencement of class work in any semester (Except industrial Training).
- 2) Within 30 days after commencement of class work in any year (including D. Pharmacy course or first year course in Engineering and Non Engineering Diploma streams).

Otherwise such cases shall not be considered for readmission for that semester / year and are advised to seek readmission in the next subsequent eligible academic year.

The percentage of attendance of the readmitted candidates shall be calculated from the first day of beginning of the regular class work for that year / Semester, as officially announced by CTE/SBTET but not from the day on which he/she has actually reported to the class work, after readmission is granted.

**2. SCHEME OF EXAMINATION****2.1 a) First Year**

**THEORY EXAMINATION:** Each Subject carries 80% marks with examination of 3 hours duration, along with 20% marks for internal evaluation. (Sessional marks). However, there are no minimum marks prescribed for sessionals.

**PRACTICAL EXAMINATION:** There shall be 40% Marks for regular practical work done, i.e. sessional marks for each practical subject with an end examination of 3 hours duration carrying 60% marks. However, there are no minimum marks prescribed for sessionals.

**b) III, IV, V and VI Semesters:**

**THEORY EXAMINATION:** Each subject carries usually 80 marks and 40 marks in respect of specified subjects of 3hours duration, along with 20/ 10 marks for internal evaluation (sessional marks) respectively.

**PRACTICAL EXAMINATION:** Each subject carry 30/60 marks of 3hours duration 20/40 sessional marks.

**2.2 INTERNAL ASSESSMENT SCHEME**

- a) Theory Subjects: Theory Subjects carry 20 % sessional marks, Internal examinations will be conducted for awarding sessional marks on the dates specified. **Three unit tests will be conducted for I year students**

**and two Unit Tests for semesters.** Average of marks obtained in all the prescribed tests will be considered for awarding the sessional marks.

- b) Practicals: Student's performance in Laboratories / Workshop shall be assessed during the year of study for 40% marks in each practical subject. Allotment of marks should be discrete taking into consideration of the students skills, accuracy, recording and performance of the task assigned to him / her. Each student has to write a record / log book for assessment purpose. In the subject of Drawing, which is also considered as a practical paper, the same rules hold good. Drawing exercises are to be filed in seriatum.
- c) Internal assessment in Labs / workshops / Survey field etc., during the course of study shall be done and sessional marks shall be awarded by the concerned Lecturer / Senior Lecturer / Workshop superintendent as the case may be.
- d) For practical examinations, except in drawing, there shall be two examiners. External examiner shall be appointed by the Principal in consultation with respective head of the department preferably choosing a person from an Industry. Internal examiner shall be the person concerned with internal assessment as in (c) above. The end examination shall be held along with all theory papers in respect of drawing.
- e) Question Paper for Practicals: Question paper should cover all the experiments / exercise prescribed.
- f) Records pertaining to internal assessment marks of both theory and practical subjects are to be maintained for official inspection.
- g) **In case of Diploma courses having Industrial Training**, the training assessment shall be done and marks be awarded in the following manner.

Industrial assessment	:	200 marks (in two spells of 100 marks each)
Maintenance of log book	:	30 marks
Record Work	:	30 marks
Seminar / viva-voce	:	40 marks
		_____
TOTAL	:	300 marks
		_____

The assessment at the institute level will be done by a minimum of three members Internal Faculty, Industrial Experts and H.O.D. and be averaged.

- h) In case of Diploma courses **not having Industrial Training** in the curriculum, the students shall make **Industrial visits** as per the schedule given below:

S.No	Semester	Nature of Training/Exposure	Duration
1	III Semester	Industrial Visits	5 no. (One week)
2	IV Semester	Industrial Visits	5 no. (One week)
3	End of Semester Vacation of IV Semester	Industrial Training	4 Weeks
4	V Semester	Industrial Visits	5 no. (one Week)
		Simulated Industrial Training (Field Practices)	3 Weeks
5	VI Semester	Industrial Visits	5 no. (one Week)
<b>Total</b>			<b>11 Weeks</b>

**NOTE:** No Marks shall be awarded for the above industrial visits. However, it will be evaluated as satisfactory/unsatisfactory.

### 2.3 MINIMUM PASS MARKS

#### THEORY EXAMINATION:

For passing a theory subject, a candidate has to secure a minimum of 35% in end examination and a combined minimum of 35% of both Sessional and end examination marks put together.

#### PRACTICAL EXAMINATION:

For passing a practical subject, a candidate has to secure, a minimum of 50% in end examination and a combined minimum of 50% of both sessional and practical examination marks put together. In case of D.C.C.P., the pass mark for typewriting and short hand is 45% in the end examination. There are no sessional marks for typewriting and Shorthand subjects of D.C.C.P course.

### 2.4 PROVISION FOR IMPROVEMENT

- Improvement is allowed only after he / she has completed all the subjects from First Year to Final semester of the Diploma.
- Improvement is allowed in any 4 (Four) subjects of the Diploma.
- The student can avail of this improvement chance only once, that too within the succeeding two examinations after the completion of Diploma, with the condition that the duration including Improvement examination shall not exceed FIVE years from the first admission.

- No improvement is allowed in Practical / Lab subjects or Project work or Industrial Training assessment. However, improvement is allowed in drawing subject.
- If improvement is not achieved, the marks obtained in previous Examinations hold good.
- Improvement is not allowed in respect of the candidates who are punished under Mal-practice in any Examination.
- Examination fee for improvement shall be paid as per the notification issued by State Board of Technical Education and Training from time to time.
- All the candidates who wish to appear for improvement of performance shall deposit the original Marks Memos of all the years / Semesters and also original Diploma Certificate to the Board. If there is improvement in performance of the current examination, the revised Memorandum of marks and Original Diploma Certificate will be issued else the submitted originals will be returned.

### 3 RULES OF PROMOTION TO NEXT LEVEL :

#### 3.1 For Diploma Courses (Except HMCT, Architecture, Chemical-Sugar & Auto mobile Engineering) From 1<sup>ST</sup> YEAR TO 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> Semesters:

- A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance and pays the examination fee. However, he/she can be condoned on Medical grounds upto 10% ( i.e. attendance after condonation on Medical grounds should not be less than 65%) and he/she has to pay the condonation fee along with examination fee.
- A candidate shall be promoted to 3<sup>rd</sup> semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3<sup>rd</sup> semester.
- A candidate shall be promoted to 4<sup>th</sup> semester provided he/she puts the required percentage of attendance in the 3<sup>rd</sup> semester and pays the examination fee. A candidate who could not pay the 3<sup>rd</sup> semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4<sup>th</sup> semester.

A candidate is eligible to appear for the 4<sup>th</sup> semester exam if he/she

- i) Puts the required percentage of attendance in the 4<sup>th</sup> semester
- ii) Should not have failed in more than Four backlog subjects of 1<sup>st</sup> year
4. A candidate shall be promoted to 5<sup>th</sup> semester provided he / she puts the required percentage of attendance in the 4<sup>th</sup> semester and pays the examination fee on fulfilment of 3(i)(ii) clauses stated above. A candidate, who could not pay the 4<sup>th</sup> semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5<sup>th</sup> semester.

A candidate is eligible to appear for the 5<sup>th</sup> semester exam if he/she

- i) Puts the required percentage of attendance in the 5<sup>th</sup> semester
- ii) Should have obtained eligibility to appear for 4<sup>th</sup> Semester examination.

**For IVC students.**

- i) Puts the required percentage of attendance in the 5<sup>th</sup> semester
- ii) Should have appeared for 4<sup>th</sup> Semester examination.
- iii) Should not have failed in more than Four backlog subjects of III Semester
5. A candidate shall be promoted to 6<sup>th</sup> semester provided he/she has puts the required percentage of attendance in the 5<sup>th</sup> semester and pay the examination fee, a candidate who could not pay the 5<sup>th</sup> semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 6<sup>th</sup> semester.

A candidate is eligible to appear for 6<sup>th</sup> semester examination if he/she

- i) Puts the required percentage of attendance in 6<sup>th</sup> semester and
- ii) Should not have failed in more than six backlogs subjects of 1<sup>st</sup> year, 3<sup>rd</sup> & 4<sup>th</sup> semesters put together.

**For IVC students.**

- i) Puts the required percentage of attendance in the 6<sup>th</sup> semester
- ii) Should have obtained eligibility to appear for V semester examination.
- iii) Should not have failed in more than Six backlog subjects of III & IV Semester put together.

**3.2 For HMCT, Architecture and Chemical - Sugar courses**

- 1) The same rules are applicable on par with other diploma courses with the exception that the Industrial Training is in the 5<sup>th</sup> semester.
- 2) A candidate shall be promoted to 5<sup>th</sup> semester (Industrial Training) provided he/she puts the required percentage of attendance in the 4<sup>th</sup> semester and pay the examination fee. A candidate, who could not pay the 4<sup>th</sup> semester examination fee, has to pay the promotion fee as prescribed by the SBTET from time to time before commencement of 5<sup>th</sup> semester (Industrial Training).
- 3) A candidate shall be promoted to 6<sup>th</sup> semester of the course provided he/she has successfully completed the Industrial Training (Passed).  
A candidate is eligible to appear for the 6<sup>th</sup> semester examination if he/she
- (i) Puts the required percentage of attendance in 6<sup>th</sup> semester.
- (ii) Should not have failed in more than six backlog subjects of 1<sup>st</sup> Year, 3<sup>rd</sup> & 4<sup>th</sup> semesters put together.

**For IVC students**

- i) Puts the required percentage of attendance in the 6<sup>th</sup> semester
- ii) Should have completed the Industrial Training.
- iii) Should not have failed in more than Six backlog subjects of III & IV Semester put together.

**3.3 For Automobile Engineering Course**

The same rules are applicable on par with other diploma courses with the exception that the Industrial Training is in the 6<sup>th</sup> semester. A Candidate shall be promoted to 6<sup>th</sup> semester provided he/she puts the required percentage of attendance in 5<sup>th</sup> semester and pay the examination fee. A candidate, who could not pay the 5<sup>th</sup> semester examination fee, has to pay the promotion fee prescribed by SBTET from time to time before commencement of 6<sup>th</sup> semester (Industrial Training).

Or

The Automobile Engineering Industrial Training may be shifted to 5<sup>th</sup> semester on par with **HMCT/ARCH/CH (ST)**



### 3.4 For Diploma Courses of 3 ½ Years duration:

#### 3.4.1 MET/ CH/ CHPP/ CHPC/ CHOT/ TT

1. A candidate shall be permitted to appear for 1<sup>st</sup> year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.
2. A candidate shall be promoted to 3<sup>rd</sup> semester if he/she puts the required percentage of attendance in the 1<sup>st</sup> year and pays the examination fee. A candidate who could not pay the 1<sup>st</sup> year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3<sup>rd</sup> semester.
3. A candidate shall be promoted to 4<sup>th</sup> semester provided he/she puts the required percentage of attendance in the 3<sup>rd</sup> semester and pay the examination fee. A candidate, who could not pay the 3<sup>rd</sup> semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4<sup>th</sup> semester.  
A candidate is eligible to appear for the 4<sup>th</sup> semester exam if he/she
  - i) Puts the required percentage of attendance in the 4<sup>th</sup> semester
  - ii) Should not have failed in more than Four backlog subjects of 1<sup>st</sup> year.
4. A candidate shall be promoted to 5<sup>th</sup> semester provided he / she puts the required percentage of attendance in the 4<sup>th</sup> semester and pays the examination fee. A candidate, who could not pay the 4<sup>th</sup> semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5<sup>th</sup> semester.
5. Promotion from 5<sup>th</sup> to 6<sup>th</sup> semester is automatic (i.e., from 1<sup>st</sup> spell of Industrial Training to 2<sup>nd</sup> spell) provided he/she puts the required percentage of attendance, which in this case would be 90 % attendance and attends for the VIVA-VOCE examination at the end of training.
6. A candidate shall be promoted to 7<sup>th</sup> semester of the course provided he/she has successfully completed both the spells of Industrial Training (Passed).  
A candidate is eligible to appear for 7<sup>th</sup> semester examination if he/she
  - i) Puts the required percentage of attendance in the 7<sup>th</sup> semester and
  - ii) Should not have failed in more than 6 backlog subjects of 1<sup>st</sup> year, 3<sup>rd</sup> and 4<sup>th</sup> semesters put together.

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- iii) Should not have failed in more than six backlog subjects of 3<sup>rd</sup> and 4<sup>th</sup> semester put together for IVC students.

#### 3.4.2 For Diploma Courses of 3 ½ Years duration:

##### FW

- i) In respect of Diploma in Footwear Technology, the Industrial training is offered in two spells, the 1<sup>st</sup> spell of Industrial training after the First Year (i.e. III semester of the course) and the second spell of industrial training after the V semester (i.e VI Semester of the course). The promotion rules for this course are on par with the other sandwich Diploma courses except that there is no restriction on number of backlog subjects to get eligibility to appear for the 4<sup>th</sup> semester examination and ,  
A candidate is eligible to appear for 5<sup>th</sup> semester examination if he/she
  1. Puts the required percentage of attendance in the 5<sup>th</sup> semester and
  2. Should not have failed in more than four subjects of 1<sup>st</sup> year.
- ii) A candidate shall be promoted to 7<sup>th</sup> semester of the course provided he/she has successfully completed second spell of Industrial Training (Passed).  
A candidate is eligible to appear for 7<sup>th</sup> semester examination if he/she
  1. Puts the required percentage of attendance in the 7<sup>th</sup> semester and
  2. Should not have failed in more than 6 backlog subjects of 1<sup>st</sup> year and 4<sup>th</sup> semesters put together.
  3. Should not have failed in more than six backlog subjects of 4<sup>th</sup> and 5<sup>th</sup> semester  
put together for IVC students.

#### 3.4.3 For Diploma Courses of 3 ½ Years duration:

##### BM

- The same rules as are applicable for conventional courses also apply for these courses. Since the industrial training in respect of these courses is restricted to one semester (6 months) after the 6<sup>th</sup> semester (3 years) of the course.
- A candidate shall be promoted to 7<sup>th</sup> semester provided he/she puts the required percentage of attendance in 6<sup>th</sup> semester and pay the examination fee. A candidate, who could not pay the 6<sup>th</sup> semester examination fee, has to pay the promotion fee prescribed by SBTET

from time to time before commencement of the 7<sup>th</sup> semester (Industrial Training).

**OR**

Run through system for 1<sup>st</sup> Year and 3<sup>rd</sup> semester to 6/7<sup>th</sup> semester provided that the student puts in 75% of attendance (which can be condoned on medical grounds upto 10%) i.e. attendance after condonation on medical grounds should not be less than 65%.

### 3.5 OTHER DETAILS

- In case a candidate does not successfully complete the Industrial training, he / she will have to repeat the training at his / her own cost.
- The I spell of Industrial training shall commence 10 days after the completion of the last theory examination of 4<sup>th</sup> Semester.
- The Second spell of Industrial training shall commence within 10 days after the completion of I spell of Industrial training.
- Each Semester of Institutional study shall be a minimum of 90 working days. (With 6 working days in a week i.e. from Monday to Saturday, with 7 periods of 50 minutes, duration per day.

## 4 STUDENTS PERFORMANCE EVALUATION

### 4.1 AWARD OF DIPLOMA

Successful candidates shall be awarded the Diploma under the following divisions of pass.

- First Class with Distinction shall be awarded to the candidates who secure an overall aggregate of 75% marks and above.
- First Class shall be awarded to candidates who secure overall aggregate of 60% marks and above and below 75% marks.
- Second Class shall be awarded to candidates who secure a pass with an overall aggregate of below 60%.

The Weightage of marks for various year/Semesters which are taken for computing overall aggregate shall be 25% of I year marks + 100% of 3<sup>rd</sup> and subsequent Semesters.

With respect to the intermediate vocational candidates who are admitted directly into diploma course at the 3<sup>rd</sup> semester (i.e., second year) level the aggregate of (100%) marks secured at the 3<sup>rd</sup> and subsequent semesters of study shall alone be taken into consideration for

determining the overall percentage of marks secured by the candidates for award of class/division.

- Second Class shall be awarded to all students, who fail to complete the Diploma in the regular three years and four subsequent examinations, from the first admission.

### 4.2 EXAMINATION FEE SCHEDULE:

The examination fee should be paid as per the notification issued by State Board of Technical Education and Training from time to time.

### 4.3 STRUCTURE OF END EXAMINATION QUESTION PAPER:

The question paper for theory examination is patterned in such a manner that the Weightage of periods/marks allotted for each of the topics for a particular subject be considered.

Examination paper is of 3/6/9 hour's duration.

- Each theory paper consists of Section 'A' and Section 'B'. Section 'A' contains 10 short answer questions. All questions are to be answered and each carries 3 marks Max. Marks: 10 x 3 = 30.

Section B contains 8 essay type questions including Numerical questions, out of which 5 questions each carrying 10 marks are to be answered.

Max.Marks: 5 x 10 = 50.

Total Maximum Marks: 80.

- For Engineering Drawing Subject (107) consist of section 'A' and section 'B'. Section 'A' contains four (4) questions. All questions in section 'A' are to be answered and each carries 5 marks. Max. Marks: 4 x 5=20. Section 'B' contains six (6) questions. Out of which four (4) questions to be answered and each question carries 10 Marks. Max. Marks 4 x 10 = 40.

Practical Examinations

For Workshop practice and Laboratory Examinations,

Each student has to pick up a question paper distributed by Lottery System.

Max. Marks for an experiment / exercise : 50%

Max. Marks for VIVA-VOCE : 10%

Total : 60%

In case of practical examinations with 50 marks, the marks will be worked out basing on the above ratio.

In case of any change in the pattern of question paper, the same shall be informed sufficiently in advance to the candidates.

#### 4.4 ISSUE OF MEMORANDUM OF MARKS

All candidates who appear for the end examination will be issued memorandum of marks without any payment of fee. However candidates who lose the original memorandum of marks have to pay the prescribed fee to the Secretary, State Board of Technical Education and Training, Telangana. for each duplicate memo.

#### 4.5 MAXIMUM PERIOD FOR COMPLETION OF DIPLOMA COURSES:

Maximum period for completion of the course is twice the duration of the course from the date of First admission (includes the period of detention and discontinuation of studies by student etc) failing which they will have to forfeit the claim for qualifying for the award of Diploma (They will not be permitted to appear for examinations after that date). This rule applies for all Diploma courses of 3 years and 3 ½ years of engineering and non-engineering courses.

#### 4.6 ELIGIBILITY FOR AWARD OF DIPLOMA

A candidate is eligible for award of Diploma Certificate if he / she fulfils the following academic regulations.

- i. He / She pursued a course of study for not less than 3 / 3 ½ academic years & not more than 6 / 7 academic years.
- ii. He / she has completed all the subjects.

Students who fail to fulfill all the academic requirements for the award of the Diploma within 6 / 7 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

#### 4.7 RECOUNTING, ISSUE OF PHOTO COPY OF VALUED ANSWER SCRIPT & REVERIFICATION:

- 4.7.1 a) A candidate desirous of applying for Recounting/ issue of Photo copy of valued answer scripts/ Reverification should submit the application to the Secretary, State Board of Technical Education and Training, Telangana., Hyderabad – 500 063 within 15 days from the date

of receipt of Tabulated Marks Statement by the Principal of concerned Polytechnic or the date specified.

Recounting shall be done for any **TWO** theory subjects per Year/Semester only, including drawing subjects. No request for recounting shall be entertained from any candidate who is reported to have resorted to Malpractice in that examination. The fee prescribed for Recounting should be paid by way of Demand Draft drawn on any Scheduled Bank payable at Hyderabad in favour of the Secretary, State Board of Technical Education and Training, Telangana., Hyderabad. The verification of the totaling will be done by an Officer of the Board and will be intimated to the candidate by post only.

The following documents should be invariably be enclosed with the application failing which the application will not be considered.

1. Marks secured as per Tabulated Marks Sheet certified by the Principal.
2. Demand draft towards the payment of fee
3. Self – addressed and stamped envelopes of 11" X 5" size.

The applications received after the prescribed date will not be accepted and any correspondence in this regard will not be entertained.

#### 4.7.2 FOR ISSUE OF PHOTO COPIES OF VALUED ANSWER SCRIPTS

1. A candidate desirous of applying for Photo copy of valued answer script/ scripts should submit the application to the Secretary, State Board of Technical Education and Training, Telangana., Hyderabad – 500 063 along with the required fee in the form of Demand Draft within 07 days from the date of receipt of Tabulated Marks Statement by the Principal of concerned Polytechnic or the date specified in the covering letter whichever is earlier.
2. Photo copies of valued answer scripts will be issued to all theory subjects including drawing subjects.
3. The following documents should invariably be enclosed with the application
  - (1) Marks secured as per Tabulated Marks Sheets certified by the Principal
  - (2) Self-addressed Stamped Envelope/Cloth-line cover of size 10" x 14".
  - (3) Fee in the form of Demand Draft

#### 4.7.3 FOR RE-VERIFICATION OF THE VALUED ANSWER SCRIPT

1. A candidate desirous of applying for Re-verification of valued answer script should submit the application to the Secretary, State Board of Technical Education and Training, Telangana., Hyderabad – 500 063 along with the required fee in the form of Demand Draft, within 15 days from declaration of result.
2. Re-verification of valued answer script shall be done for all theory subjects including drawing subjects.
3. The following documents should invariably be enclosed with the application failing which the application will not be considered.
  - (i) Marks secured as per Tabulated Marks Sheets certified by the Principal.
  - (ii) Fee in the form of Demand Draft.

#### 4.7.4 MALPRACTICE CASES:

If any candidate resorts to any Mal Practice during examinations, he / she shall be booked and the Punishment shall be awarded as per rules and regulations framed by SBTET from time to time.

#### 4.7.5 DISCREPANCIES/ PLEAS:

Any Discrepancy /Pleas regarding results etc., shall be represented to the Board within one month from the date of issue of results. Thereafter, no such cases shall be entertained in any manner.

## 5 ISSUE OF CERTIFICATES AND VETO

### 5.1. ISSUE OF DUPLICATE DIPLOMA

If a candidate loses his/her original Diploma Certificate and desires a duplicate to be issued he/she should produce written evidence to this effect. He / she may obtain a duplicate from the Secretary, State Board of Technical Education and Training, Telangana on payment of prescribed fee and on production of an affidavit signed before a First Class Magistrate (Judicial) and *non-traceable certificate* from the Department of Police. In case of damage of original Diploma Certificate, he / she may obtain a duplicate certificate by surrendering the original damaged certificate on payment of prescribed fee to the State Board of Technical Education and Training.

In case the candidate cannot collect the original Diploma within 1 year from the date of issue of the certificate, the candidate has to pay the penalty prescribed by the SBTET from time to time.

### 5.2 ISSUE OF MIGRATION CERTIFICATE AND TRANSCRIPTS:

The Board on payment of prescribed fee will issue these certificates for the candidates who intend to prosecute Higher Studies in India or Abroad.

### 5.3 GENERAL

- i. The Board may change or amend the academic rules and regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students, for whom it is intended, with effect from the dates notified by the competent authority.
- ii. All legal matters pertaining to the State Board of Technical Education and Training are within the jurisdiction of Hyderabad.
- iii. In case of any ambiguity in the interpretation of the above rules, the decision of the Secretary, SBTET is final.

# V SEMESTER

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## DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING SCHEME OF INSTRUCTIONS AND EXAMINATIONS

### V Semester

	Name of the Subject	Instruction period / week		Total Period / Sem	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam	Total Marks
<b>THEORY:</b>								
EC-501	Industrial Management	4	-	60	3	20	80	100
EC-502	Consumer Electronics	4	-	60	3	20	80	100
EC-503	Industrial Electronics	4	-	60	3	20	80	100
EC-504	Microcontroller Applications	4	-	60	3	20	80	100
EC-505	Electronic Product Design & Quality Assurance	4	-	60	3	20	80	100
EC-506	Mobile Communications	4	-	60	3	20	80	100
<b>PRACTICAL</b>								
EC-507	Industrial Electronics Lab Practice	-	5	75	3	40	60	100
EC-508	Life Skills	-	3	45	3	40	60	100
EC-509	Microcontroller Applications lab Practice	-	3	45	3	40	60	100
EC-510	Field Practices	-	7	105	3	40	60	100
<b>TOTAL</b>		<b>24</b>	<b>18</b>	<b>630</b>		<b>280</b>	<b>720</b>	<b>1000</b>

**Note:**

1. Five no local industrial visits / Interaction, one from each of the courses listed from EC 502 to EC506 may be arranged to enable the students to have industry exposure.
2. Duration: one week
3. The students need to submit 2-3 page write up mentioning all salient learning experiences like advance intechnology, its evaluation, application, advantages & disadvantages, expected changes in future etc.,
4. Three weeks of simulated industrial training (Field practices) to be conducted in the institution or in the field is included to enable the students to have field exposure.

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**INDUSTRIAL MANAGEMENT**

<b>Subject Title</b>	:	<b>INDUSTRIAL MANAGEMENT</b>
<b>Subject Code</b>	:	<b>EC-501</b>
<b>Periods/Week</b>	:	<b>04</b>
<b>Periods/semester</b>	:	<b>60</b>

**TIME SCHEDULE**

Sl. No.	Major Topics	Periods	Weightage of marks	Short questions	Essay questions
1.	Overview Of Business	4	6	2	
2.	Management Process	6	13	1	1
3.	Organizational Management	6	13	1	1
4.	Human Resource Management	12	23	1	2
5.	Financial Management	10	16	2	1
6.	Materials Management	8	13	1	1
7.	Project Management	14	26	2	2
	<b>Total</b>	<b>60</b>	<b>110</b>	<b>10</b>	<b>8</b>

**OBJECTIVES**

Upon completion of the course the student shall be able to

**1.0 Explain the basics of Business**

- 1.1 Define Business
- 1.2 State the Types of Business ( Service, Manufacturing, Trade)
- 1.3 Explain the business procedures in Engineering sector ( Process industry, Textile industry, Chemical industry, Agro industry,)
- 1.4 State the need for Globalization.

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- 1.5 List the Advantages & Disadvantages of globalization w.r.t. India.
- 1.6 Explain the importance of Intellectual Property Rights (I.P.R.)
- 2.0 Explain the Management Process:**
- 2.1 Define Management.
- 2.2 Explain the concept of management
- 2.3 Explain the Different Levels of management
- 2.4 Explain Administration & management
- 2.5 State the principles of Scientific management by F.W.Taylor
- 2.6 State the principles of Management by Henry Fayol (14 principles)
- 2.7 List the Functions of Management
- i) Planning
  - ii) Organizing
  - iii) Directing
  - iv) Controlling
- 2.8 Explain the four Functions of Management.
- 3.0 Appreciate the need for Organizational Management**
- 3.1 Define Organization
- 3.2 List the Types of organization :a) Line b) Line & staff c) Functional d) Project
- 3.3 Explain the four types of organization.
- 3.4 Define departmentation.
- 3.5 Explain the following types of departmentations
- i) Centralized & Decentralized
  - ii) Authority & Responsibility
  - iii) Span of Control
- 3.6 Explain the Forms of ownership
- i) Proprietorship
  - ii) Partnership
  - iii) Joint stock
  - iv) Co-operative Society
  - v) Govt. Sector

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- 4.0 Appreciate the need for Human Resource Management**
- 4.1 Define Personal Management.
- 4.2 Explain the functions of Personal Management
- 4.3 Define Staffing .
- 4.4 State the importance of HR Planning.
- 4.5 Explain the various Recruitment Procedures.
- 4.6 Explain the need for Training & Development .
- 4.7 State the various types of training procedures( Induction, Skill Enhancement etc)
- 4.8 State the different types of Leaderships,
- 4.9 Explain the Maslow's Theory of Motivation
- 4.10 Explain the Causes of accident and the Safety precautions to be followed.
- 4.11 Explain the importance of various Acts - Factory Act, ESI Act, Workmen Compensation Act, Industrial Dispute Act etc.
- 5.0 Explain the basics of Financial Management**
- 5.1 State the Objectives of Financial Management.
- 5.2 State the Functions of Financial Management.
- 5.3. State the necessity of Capital Generation & Management.
- 5.4 List the types of Capitals.
- 5.5 List the Sources of raising Capital.
- 5.6 Explain the Types of Budgets
- i) Production Budget (including Variance Report )
  - ii) Labour Budget.
- 5.7 Describe Profit & Loss Account ( only concepts) .
- 5.8 Describe the proforma of Balance Sheet.
- 5.9 Explain
- i) Excise Tax ,
  - ii) Service Tax
  - iii) Income Tax
  - iv) VAT
  - v) Custom Duty.
- 6.0 Explain the importance of Materials Management**

- 6.1. Define Inventory Management (No Numerical).
- 6.2 State the objectives of Inventory Management.
- 6.3 Explain ABC Analysis.
- 6.4 State Economic Order Quantity.
- 6.5 Describe the Graphical Representation of Economic Order Quantity.
- 6.6 State the objectives of Purchasing.
- 6.7 State the functions of Purchase Department.
- 6.8 Explain the steps involved in Purchasing.
- 6.9 State the Modern Techniques of Material Management.
- 6.10 Describe the JIT / SAP / ERP packages.

### 7.0 Explain the importance of Project Management

- 7.1 State the meaning of Project Management.
- 7.2 Describe the CPM & PERT Techniques of Project Management.
- 7.3 Identify the critical path and find the project duration.
- 7.4 Explain the concept of Break Even Analysis
- 7.5 Define Quality.
- 7.6 State the concept of Quality.
- 7.7 Describe the various Quality Management systems.
- 7.8 Explain the importance of Quality policy, Quality control, Quality Circle.
- 7.9 State the principles of Quality Assurance.
- 7.10 State the concepts of TQM , Kaizen 5's and 6 sigma.
- 7.11 State the constituents of ISO 9000 series standards.

### Course contents :

#### 1.0 Overview of Business:

Business - types of business in various sectors- service, manufacturing & trade- Industrial sectors - Engineering, process, Textile, Chemical, Agro industries - Globalization and effect of globalization - advantages and Disadvantages- Intellectual Property Rights (I.P.R.)

### 2.0 Management process

Concept of management - levels of management - Scientific management - by FW Taylor - Principles of management- functions of management - Administration - management.

### 3.0 Organizational management

Organization - types of organization( line, line & staff, staff & project) - Departmentation - Classification (centralized, decentralized, Authority, Responsibility, and span of co

ntrol - Forms of Ownership - Proprietorship - Partnership - Joint stock - Co-operative society and Government sectors.

### 4.0 Human Resource Management

Personal Management - Staffing - Introduction to HR planning - Recruitment procedures - Types of Trainings -Personal training - skill development training - Leaderships - types - Motivation - Maslows theory - Causes of accidents - safety precautions - Factory Act - Workmen compensation Act - Industrial disputes Act- ESI Act.

### 5.0 Financial Management

Introduction - Objectives of Financial Management - Types of capitals - sources of raising capital - Types of budgets - production budgets - labour budgets - Concept of Profit loss Account - Concept of balance sheet - proforma - types of taxes - brief concepts of - Excise Tax, Service Tax, Income Tax, VAT and custom duty.

### 6.0 Material Management

Inventory Management - objectives of Inventory Management - ABC Analysis - Economic order Quantity - Purchasing - Objectives of purchasing - Functions - Procedures - Material Management - JIT / SAP / ERP.

### 7.0 Project Management

Introduction - CPM & PERT - concept of Break event Analysis - quality system - Definition of Quality , concept of Quality , Quality policy, Quality control, Quality Circle, Quality Assurance, Introduction to TQM- Kaizen 5's and 6 sigma concepts, ISO 9000 series standards.



**REFERENCES**

1. Dr. O.P. Khanna - Industrial Engg & Management-Dhanpath Rai & sons New Delhi
2. Dr. S.C. Saxena & W.H. Newman & E. Kirby Warren-Business Administration & Management - Sahitya Bhavan Agra
3. Andrew R. McGill -The process of Management-Prentice- Hall
4. Rustom S. Davar -Industrial Management-Khanna Publication
5. Banga & Sharma -Industrial Organization & Management -Khanna Publication
6. Jhamb & Bokil -Industrial Management -Everest Publication, Pune.

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**CONSUMER ELECTRONICS**

<b>Subject Title</b>	:	<b>CONSUMER ELECTRONICS</b>
<b>Subject Code</b>	:	<b>EC-502</b>
<b>Periods/Week</b>	:	<b>04</b>
<b>Periods/Semester</b>	:	<b>60</b>

**Rationale:** Consumer Electronics Subject is introduced to meet the needs of consumer electronics Industry. The units in the course are designed to impart the concepts of Audio Video systems, Television, Cable TV, DTH services and other domestic appliances like Microwave ovens and Automatic washing Machines.

**TIME SCHEDULE**

Sl.	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Microphones & Speakers	10	21	2	1 ½
2	Audio Systems	8	13	1	1
3	TV Picture & Composite Video Signal	16	23	1	2
4	Colour Television	8	21	2	1 ½
5	Cable, Satellite and digital TV	10	16	2	1
6	Domestic Appliances	8	16	2	1
	<b>Total</b>	<b>60</b>	<b>110</b>	<b>10</b>	<b>8</b>

**OBJECTIVES**

**Upon completion of the course the student should be able to**

- 1.0 Understand the working of Microphones and Speakers**
  - 1.1 Familiarise with different types of microphones and loud speakers
  - 1.2 List the different types of microphones based on impedance, polar characteristics and principle of working.
  - 1.3 Explain the working of carbon, condenser, Crystal, ribbon and dynamic microphones along with their polar characteristics.

- 1.4 Compare the parameters like sensitivity, noise, frequency response, directivity, output impedance, bias necessity, size, cost and applications of above microphones.
- 1.5 List the ratings of condenser, crystal, carbon, ribbon and dynamic microphones.
- 1.6 Explain the constructional features and principle of operation of PMMC Loudspeaker and its ratings.
- 1.7 Mention the necessity of Baffle for a Loudspeaker
- 1.8 List the four types of Baffles (like open, infinite, bass reflex, acoustic labyrinth)
- 1.9 Explain the constructional details of above types of speakers.
- 1.10 Mention the use of woofers and tweeters.
- 1.11 Mention the need for a Horn loud speaker
- 1.12 Explain the construction of Horn loud speaker
- 1.13 List different types of Horn loud speakers.
- 1.14 Compare the performance characteristics of cone type and horn type loud speakers.
- 1.15 Explain the principle, construction and working of magnetic and crystal headphones
- 1.16 Explain the use of Headphones.
- 1.17 Mention the specifications of Loudspeaker and Microphones.

## **2.0 Understand Audio Systems**

- 2.1 Define speech, music and noise.
- 2.2 Explain frequency response and equalization.
- 2.3 Define the concept of Hi-Fi and Stereo.
- 2.4 State the need of bass, treble, balance, and volume control in stereo amplifier.
- 2.5 Explain a simple circuit showing the above controls.
- 2.6 Explain the principle of magnetic recording and reproduction.
- 2.7 List five advantages and disadvantages magnetic recording.
- 2.8 State the principle of optical recording.
- 2.9 Explain the method of optical recording of sound on film

- 2.10 Explain the working principle of DVD player.
- 2.11 Explain the working of DVD player with block diagram.
- 2.12 Explain MP3 & MP4 formats.
- 2.13 Explain the concept of noise reduction using DOLBY system.
- 2.14 Explain home theatre sound system.
- 2.15 Explain the speaker arrangement and features of Dolby Digital 5.1 Surround Sound(AC3)

## **3.0 Comprehend TV Picture & Composite video signal**

- 3.1 Explain formation of picture.
- 3.2 State the need for horizontal and vertical scanning.
- 3.3 State the frame and field frequencies.
- 3.4 State need for vertical synchronisation, horizontal synchronisation and blanking pulses.
- 3.5 Mention the frequency allocation of T.V. Channels used in India.
- 3.6 Mention Important standards of T.V. transmissions as per C.C.I.R.
- 3.7 List different types of scanning
- 3.8 Distinguish between progressive and interlaced scanning.
- 3.9 Draw the standard scanning pattern in an interlaced scanning.
- 3.10 State the need for interlaced scanning with reference to Bandwidth.
- 3.11 List all different pulses in a composite video signal.
- 3.12 State and compare positive and negative modulation.
- 3.13 Sketch composite video signal as per I.S.I. specification.
- 3.14 State the need for front porch and back porch in blanking pulses.
- 3.15 State the necessity of equalising pulses and serrated vertical blanking pulses.

## **4.0 Understand the working of Colour Television.**

- 4.1 Explain the main characteristic of human eye with regard to perception of colours.
- 4.2 Distinguish between additive and subtractive mixing of colours.

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- 4.3 Explain complementary colours, hue, saturation, and Colour circle.
- 4.4 Explain compatibility in TV system.
- 4.5 List three standards of Colour transmission system NTSC, PAL and SECAM.
- 4.6 Explain how chrominance signals are transmitted on one carrier in PAL system.
- 4.7 Draw the block diagram of a Colour TV transmitter and state the function of each block.
- 4.8 Explain the processing of Colour video signal (PAL system) in a Colour receiver.
- 4.9 Mention different types (like Plasma ,LCD,LED,OLED) of Colour TV monitors
- 4.10 Explain the basic principles of above technologies

### 5.0 Understand the principles of Cable, Satellite and Smart TV

- 5.1 Draw and explain the block diagram of CATV.
- 5.2 Explain the cable TV components such as amplifiers directional couplers and Converters.
- 5.3 Explain the necessity of mid-band and super-band channels
- 5.4 State the need for satellite for TV broadcasting over wide area.
- 5.5 Explain the merits of DTH system
- 5.6 With a block diagram explain DVB-S channel reception with block diagram.
- 5.7 State the need for Set Top Box.
- 5.8 List main features of Projection TV
- 5.9 List applications of Projection TV
- 5.10 Explain the features of HDTV
- 5.11 Explain the features of SMART TV.
- 5.12 List the important specifications of UHD TV

### 6.0 Understand the working of Domestic Appliances

- 6.1 Explain the working principle of Microwave oven

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- 6.2 Explain functional block diagram of Microwave oven
- 6.3 List 3 advantages of Microwave oven
- 6.4 Explain the principle of Induction heater.
- 6.5 Give the reasons for using magnetic metals for use with induction heater.
- 6.6 List the 4 merits of induction heating.
- 6.7 Explain the functional block diagram of Electronic Washing machine
- 6.8 List any three advantages of Fuzzy logic in washing machines
- 6.9 Explain functional block diagram of Camcorder
- 6.10 List the applications of Camcorder

### COURSE CONTENT

#### 1. Microphones and Speakers

Familiarise with different types of microphones and loud speakers-Different types of microphones based on impedance, polar characteristics and principle of working-Working of carbon, condenser, Crystal, ribbon and dynamic microphones along with their polar characteristics-Compare the parameters like sensitivity, noise, frequency response, directivity, output impedance, bias necessity, size, cost and applications of above microphones-Ratings of condenser, crystal, carbon, ribbon and dynamic microphones-Constructional features and principle of operation of PMMC Loudspeaker and its ratings-Necessity of Baffle for a Loudspeaker and types of Baffles (like open, infinite, bass reflex, acoustic labyrinth) and constructional details-Use of woofers and tweeters-Need for a Horn loud speaker with its construction and advantages. Types of horns-Performance characteristics of cone type and horn type loud speakers-Principle, construction and working of magnetic and crystal headphones and their uses-Specifications of Loudspeaker and Microphones.

2. **Audio Systems:** Speech, music and noise-Frequency response and equalization-Concept of Hi-Fi and Stereo-Need of bass, treble, balance, and volume control in stereo amplifier-Simple circuit showing the above controls-Principle of magnetic recording and reproduction-Advantages and disadvantages magnetic recording-Principle of optical recording-Method of optical recording of sound on film-Working principle of DVD player-Working of DVD player with block diagram-MP3 & MP4 formats-Concept of noise reduction using DOLBY system-Home theatre sound

system-Speaker arrangement and features of Dolby Digital 5.1 Surround Sound (AC3).

### 3. **TV Picture & Composite video signal:**

Formation of picture-Need for horizontal and vertical scanning-Frame and field frequencies-Need for vertical synchronisation, horizontal synchronisation and blanking pulses-Frequency allocation of T.V. Channels used in India-Standards of T.V. transmissions as per C.C.I.R-Types of scanning-Distinguish between progressive and interlaced scanning-Standard scanning pattern in an interlaced scanning-Need for interlaced scanning with reference to Bandwidth-Different pulses in a composite video signal-Comparison of positive and negative modulation-Composite video signal as per I.S.I. specification-Need for front porch and back porch in blanking pulses-Necessity of equalising pulses and serrated vertical blanking pulses.

### 4. **Colour Television.**

Main characteristic of human eye with regard to perception of colours-Additive and subtractive mixing of colours-Complementary colours, hue, saturation, and Colour circle-Compatibility in TV system-Standards of Colour transmission system like NTSC, PAL and SECAM-Chrominance signals are transmitted on one carrier in PAL system-Block diagram of a Colour TV transmitter and state the function of each block-Block diagram of a Colour TV receiver and state the function of each block-Processing of Colour video signal (PAL system) in a Colour receiver-Types of Colour TV monitors-Basic principles of above technologies.

### 5. **Principles of Cable, Satellite and Smart TV:**

Block diagram of CATV-Cable TV components such as amplifiers directional couplers and Converters-Necessity of mid-band and super-band channels-Need for satellite for TV broadcasting over wide area-Merits of DTH system- DVB-S channel reception with block diagram-Need for SET TOP BOX-Features of Projection TV-Applications of Projection TV-Features of HDTV-Features of SMART TV-Important specifications of UHD TV.

### 6. **Domestic Appliances:**

Working principle of Microwave oven-Functional block diagram of Microwave oven-Advantages of Microwave oven-Principle of Induction

heater-Reasons for using magnetic metals for use with induction heater-Merits of induction heating-Functional block diagram of Electronic Washing machine-Advantages of Fuzzy logic in washing machines-Functional block diagram of Camcorder-Applications of Camcorder.

### REFERENCE BOOKS:

1. Electronic communication systems by Roy Blake, Thomson Delmar.
2. Colour Television by R.R.Gulati. TMH
3. How electronic things work.& what to do when they don't -Robert L. Goodman, -TMH
4. Consumer electronics by SP Bali, -Pearson publications.
5. Digital Satellite Television Handbook By Mark E. Long -Newnes publications

## INDUSTRIAL ELECTRONICS

<b>Subject Title</b>	:	<b>Industrial Electronics</b>
<b>Subject Code</b>	:	<b>EC-503</b>
<b>Periods/Week</b>	:	<b>04</b>
<b>Periods/Semester</b>	:	<b>60</b>

**Rationale:** Industrial Electronics subject is included in the VI semester to make the students understand the applications of Electronic principles they have learnt in the previous semesters. This course will no doubt, make the students feel confident to face the interviews and work in the field when they join the industries.

### TIME SCHEDULE

SI	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Power Electronic Devices	16	26	2	2
2	Transducers & Ultrasonics	14	26	2	2
3	Industrial heating & Welding	10	21	2	1 ½
4	PLC & Programming	12	21	2	1 ½
5	Control Engg	8	16	2	1
	<b>Total</b>	<b>60</b>	<b>110</b>	<b>10</b>	<b>8</b>

### OBJECTIVES

Upon completion of this course a student should be able to

#### 1.0 Understand the construction and working of Power Electronic Devices

- 1.1 List different thyristor family devices.
- 1.2 Sketch the circuit symbols for each device.
- 1.3 Explain constructional details of SCR.
- 1.4 Explain the working of SCR using two Transistor analogy.
- 1.5 Explain the Volt-Ampere characteristics of SCR.
- 1.6 Mention the important ratings of SCR.

- 1.7 Define *forward break over voltage, latching current, holding current, turn on triggering time, turn off time* of SCR.
  - 1.8 Explain the construction of GTO SCR
  - 1.9 Compare the characteristics of GTO SCR and SCR.
  - 1.10 Distinguish between SUS, SBS, SCS & LASCR
  - 1.11 Explain SCR circuit triggering by UJT with a circuit diagram.
  - 1.12 Draw input and Output waveforms.
  - 1.13 Mention the use of SCR in single phase and three phase Power rectifiers.
  - 1.14 Explain the construction of Diac.
  - 1.15 Explain the Volt-ampere characteristics of Diac
  - 1.16 Explain the construction of Triac.
  - 1.17 Explain the Volt-ampere characteristics of Triac.
  - 1.18 Explain different modes of Triac triggering.
  - 1.19 Explain the Phase control circuit using Diac and Triac for AC power control.
  - 1.20 Draw the input and output waveforms.
  - 1.21 Mention the differences between BJT and Power BJT.
  - 1.22 Explain the working of Insulated gate Bipolar transistor (IGBT),
  - 1.23 Explain the need for protection of power devices (snubber circuit).
  - 1.24 Give important specifications of power electronic devices from Manufacturer's data sheet .
  - 1.25 List the six important applications of power electronic devices.
  - 1.26 Explain the working of MOSFET based Inverter circuit.
  - 1.27 With a block diagram explain the working of a) Off Line UPS b) Online UPS
  - 1.28 Explain PWM Voltage control of UPS
  - 1.29 Explain the limitations of series Voltage regulated power supplies
  - 1.30 Explain the working of SMPS with block diagram
  - 1.31 Mention any 3 applications of SMPS
  - 1.32 Explain the working of Servo stabilizer
- #### 2.0 Understand the working of transducers and Ultrasonics

- 2.1 Classify transducers on the basis of principle of operation and applications.
- 2.2 Explain the working principle, construction and applications of strain gauge.
- 2.3 Explain the working principle, construction and applications of potentiometric transducer.
- 2.4 Explain the working principle, construction of capacitive and inductive transducers.
- 2.5 Mention the 6 important applications of above transducers.
- 2.6 Explain the working principle, construction and applications of LVDT.
- 2.7 Explain the working principle and construction of Piezo electric transducer.
- 2.8 List any 3 uses of the Piezo electric transducer
- 2.9 Explain the working principle of RTD & Thermocouple transducer.
- 2.10 Mention the 6 important applications of above transducers.
- 2.11 Explain the application of transducer in Accelerometer, servomotors, and Tachogenerators.
- 2.12 Explain the term Ultrasonic.
- 2.13 Mention methods of generating ultrasonic waves.
- 2.14 Draw and explain pulsed-echo ultrasonic flaw detector
- 2.15 Explain the principle of MEMS devices
- 2.16 Mention their use in modern smart phones and other devices

### 3.0 Industrial Heating & welding

- 3.1 Classify industrial heating methods.
- 3.2 Explain the principle of induction heating.
- 3.3 List four applications of induction heating.
- 3.4 Draw the circuit of HF power source for induction heating and explain its working.
- 3.5 Explain the principle of dielectric heating.
- 3.6 Explain the electrodes used in dielectric heating & method of coupling to RF generator.
- 3.7 Mention the applications of dielectric heating.

- 4.9 Explain the use of statement list .
- 4.10 Explain control systems flow charts.
- 4.11 Write simple Ladder program using bit instructions Timer instructions and counter instructions
- 4.12 List types of PLCs.
- 4.13 List the features of popular PLCs like Siemens , Allenbradly .
- 4.14 List any 4 applications of PLCS in the industry.

### 5.0 Control Engineering

- 5.1 Define system and Control system.
- 5.2 Classify control systems
- 5.3 Explain the basic block diagram of control system
- 5.4 Explain an open loop control system.
- 5.5 Give examples for open loop control system.
- 5.6 Give three merits and demerits of open loop control.
- 5.7 Explain the closed loop system with the help of a block diagram.
- 5.8 Give Examples for closed loop system
- 5.9 Compare Open loop and closed loop control systems.
- 5.10 Define Transfer function
- 5.11 Explain the use of Laplace transforms in control systems

### COURSE CONTENT

1. **Power Electronic Devices** - Different thyristor family devices- circuit symbols - Constructional details of SCR- Working of SCR using two Transistor analogy- Volt-Ampere characteristics of SCR- Ratings of SCR- forward break over voltage, latching current, holding current, turn on triggering time, turn off time of SCR- Construction of GTO SCR-Compare the characteristics of GTO SCR and SCR- Constructional details of Diac & Triac- Volt-ampere characteristics of Diac & Triac under forward/ Reverse bias- Different modes of Triac triggering- SUS, SBS, SCS & LASCR- SCR circuit triggering by UJT - input and Output waveforms- Use of SCR in single phase and three phase Power rectifiers- Construction of Diac- Volt-ampere characteristics of Diac - Construction

of Triac- Volt-ampere characteristics of Triac- Different modes of Triac triggering- Phase control circuit using Diac and Triac for AC power control- input and output waveforms- Differences between BJT and Power BJT-BJT, MOS-Controlled thyristors (MCT) with characteristics- Working of Insulated gate Bipolar transistor (IGBT)- Need for protection of power devices- Important specifications of power electronic devices from Manufacturer's data sheet - Important applications of power electronic devices- Working of MOSFET based Inverter circuit-With a block diagram explain the working of a) Off Line UPS b) Online UPS- PWM Voltage control of UPS- Limitations of series Voltage regulated power supplies- Working of SMPS with block diagram- Applications of SMPS- Working of Servo stabilizer .

## 2. Transducers & Ultrasonics

Classification of transducers on the basis of principle of operation and applications- Working principle, construction and applications of strain gauge- Working principle, construction and applications of potentiometric transducer- Working principle, construction of capacitive and inductive transducers- Important applications of transducers- Working principle, construction and applications of LVDT- Working principle and construction of Piezo electric transducer-Uses for the Piezo electric transducer- Working principle of RTD & Thermocouple transducer-Important applications of above transducers- Application of transducer in Accelerometer, servomotors, and Tachogenerators-Methods of generating ultrasonic waves-Draw and explain pulsed-echo ultrasonic flaw detector- Principle of MEMS devices- Their uses in modern smart phones and other devices.

3. **Industrial heating & welding**-Industrial heating methods- Principle of induction heating- Applications of induction heating-HF power source for induction heating - Principle of dielectric heating- Electrodes used in dielectric heating & method of coupling to RF generator- Applications of dielectric heating. Welding- types of Electrical welding- Principle of resistive welding- Circuit of AC resistive welding - Applications of resistive welding- Other welding Techniques.

4. **PLCs & Programming**-Need for PLC and its programming- Basic principle of PLCs- Power supply module, CPU, Bus unit, and I/O Module, Interfacing Module and programmer module- PLC scan method- Ladder logic symbols- Meaning of above symbols- Current flow (Forward and Reverse current)-Ladder diagrams-Uses of statement list- Control systems flow charts-Ladder program using bit instructions, timer instructions and counter instructions-Types of PLCs-Features of popular PLCs like Siemens, Allenbradly -Applications of PLCS in the industry-Relay logic control panel – PLC based control panel - Architecture of PLC.

5. **Control Engineering**- Definition of the System and Control system and its classification- Basic block diagram of control system-Open loop control system with examples-Merits and demerits of open loop control- Closed loop system with the help of a block diagram- Examples for closed loop system-Comparison of Open and closed loop control systems- Transfer function-Uses of Laplace transforms in control systems.

## REFERENCE BOOKS:

1. Power Electronics by P.C.Sen Tata McGraw-Hill Education
2. Industrial Electronics and Control by S.K.Bhattacharya, S.Chatterjee TTTI Chandigarh –TES
3. Industrial And Power Electronics (Paperback) By: G. K. Mithal (Author) | Khanna Publishers
4. Control Systems Engineering by I. J. Nagrath And M. Gopal New Age Publisher, New Delhi
5. PLCs & SCADA : Theory and Practice by Rajesh Mehra, Vikrant Vij - Laxmi Publications

## MICRO CONTROLLER APPLICATIONS

**Subject Title** : **Micro Controller Applications**  
**Subject Code** : **EC- 504**  
**Periods/Week** : **04**  
**Periods/Semester** : **60**

**Rationale:** Microcontroller applications is introduced to further develop the concepts learnt in IV semester by giving theoretical inputs at application level. This course will make the students feel confident in the present Electronic industry.

### TIME SCHEDULE

SI	Major Topics	No. of Periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Hardware Interface	10	16	2	1
2	Interfacing External Memory	15	26	2	2
3	Interfacing 8255 PPI	15	26	2	2
4	Interfacing with RTC	10	26	2	2
5	Control Applications	10	16	2	1
	<b>Total</b>	<b>60</b>	<b>110</b>	<b>10</b>	<b>8</b>

### OBJECTIVES

Upon completion of the course the student should be able to

#### 1.0 Understand hardware interfacing

- 1.1 Explain the need for hardware Interfacing
- 1.2 List various types of Interfacing devices
- 1.3 Mention the functions of each of the above Interfacing devices
- 1.4 List the types of ADC chips (Parallel/Serial Interfacing)
- 1.5 Explain the choice of selecting ADC chip

- 1.6 Mention the Number and Specification of ADC chips
- 1.7 Compare the resolution vs Step size of various ADCs
- 1.8 Give Pin Out diagram of ADC0804 chip
- 1.9 Explain the functions of Various pins of ADC0804
- 1.10 Give Formula for determining Clock Frequency of ADC0804
- 1.11 Distinguish between Analog Ground and Digital Ground
- 1.12 With the help of a Circuit Diagram explain the Clock Source for ADC 0804
- 1.13 Write an ALP for Interfacing ADC0804 and Explain
- 1.14 Mention the use of ADC0808 /ADC0809 for Data Acquisition
- 1.15 Mention the need for DAC interfacing
- 1.16 With the help of a circuit Interfacing DAC 808
- 1.17 Explain the use of DAC0808 for generating a sine wave with an ALP
- 1.18 Explain Interfacing temperature sensors to 8051
- 1.19 List Various types of Temperature sensors
- 1.20 Give Specifications of LM34 and LM35
- 1.21 With the help of a circuit explain the interfacing of LM35 to 8051
- 1.22 Explain the need for Signal conditioning for interfacing

#### 2.0 Understand Interfacing External Memory

- 2.1 Explain semiconductor memories with respect to memory capacity, organization and speed
- 2.2 List the various types of Memories used and give Typical IC numbers of each type
- 2.3 Interpret the memory capacity from the IC number
- 2.4 Explain the Choice of selection of a memory for a particular application
- 2.5 List any 6 popular UV EPROM chips and explain the pin configuration of any one
- 2.6 Explain the concept of Checksum with an example
- 2.7 Compare SRAM , DRAM , NVRAM and Flash Memories
- 2.8 Explain the organisation of a DRAM



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- 2.9 Explain memory address decoding 740LS138 3 X 8 decoder
  - 2.10 Explain the concept of ONCHIP and External ROM
  - 2.11 Explain interfacing with external ROM
  - 2.12 Explain data memory space of 8051 and accessing
  - 2.13 Explain interfacing of large external memory (256KB)
  - 2.14 Explain the DATA Movement in External RAM using MOVX instruction  
With an example ( small program to read 100 bytes of data from Port1 and save the data In External RAM location 1000H)

### 3.0 Understand Interfacing 8255 PPI Chip

- 3.1. Explain the need for port Expansion
- 3.2. Explain expansion of I/O ports using 8255
- 3.3. Mention the features of 8255
- 3.4. Give the PIN configuration of 8255
- 3.5. List 3 ports of 8255 and Explain their features
- 3.6. Define the three modes of operation of 8255
- 3.7. Explain the concept of MODE selection using control register
- 3.8. Give 8255 Control word Format(I/O) mode
- 3.9. With the help of a circuit explain Interfacing 8255 to 8051
- 3.10. Define the term memory mapped I/O and Explain its application
- 3.11. Explain the interfacing of LCD with 8051 using 8255
- 3.12. Explain programming of 8255 in simple I/O mode using 'C' language

### 4.0 Understand Interfacing RTC

- 4.1 Define the RTC (Real Time Clock)
- 4.2 Explain the need for RTC (Real Time Clock)
- 4.3 List Some Popular RTC ICs
- 4.4 Explain the features of DS12887
- 4.5 Give the Pin configuration of DS12887 IC

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- 4.6 Explain with the help a of a circuit diagram the interfacing of DS12887 to 8051
  - 4.7 Explain Address map of DS12887
  - 4.8 Mention the steps involved in setting the time in DS12887
  - 4.9 Explain the interrupt and alarm features of DS12887
  - 4.10 Mention the application of RTC for a generation of a square wave

### 5.0 Understand microcontroller applications

- 5.1 Explain the need of relays and opto couplers for interfacing
- 5.2 Give the numbers of 3 commonly used Opto coupler ICs
- 5.3 Compare Opto- Coupler and Opto- isolator
- 5.4 Explain with the help of a circuit diagram the Interfacing 8051 to a relay  
For driving a 12 V lamp
- 5.5 Explain with a circuit diagram interfacing a solid state relay to drive a mains operated motor
- 5.6 Explain with the help of a circuit Diagram Interfacing a stepper motor to 8051
- 5.7 Write a ALP to run stepper motor continuously
- 5.8 Explain the controlling of stepper motor using opto isolator
- 5.9 write a program in C for the above application
- 5.10 Explain pulse width modulation (PWM)
- 5.11 Explain the use of PWM for controlling the speed of small DC motor.
- 5.12 Draw the interfacing circuit for Control of a small DC motor using opto isolator a)Darlington Transistor b) MOSFET
- 5.13 Write a program in C for PWM speed Control of a small DC motor.
- 5.14 Explain traffic controller application with the help of a Block Diagram
- 5.15 Explain the application of a temperature controller with the help of a Block Diagram.

**COURSE CONTENT****1.0 Hardware Interfacing:**

Need for hardware Interfacing-Variety types of Interfacing devices- Functions of each of the above Interfacing devices-Types of ADC chips (Parallel/Serial Interfacing)-Choice of selecting ADC chip- Number and Specification of ADC chips-Resolution vs Step size of various ADCs- Pin Out diagram of ADC0804 chip-Functions of Various pins of ADC0804- Formula for determining Clock Frequency of ADC0804- Analog Ground and Digital Ground-With the help of a Circuit Diagram explain the Clock Source for ADC 0804- ALP for Interfacing ADC0804 and Explain-Use of ADC0808 /ADC0809 for Data Acquisition-Need for DAC interfacing-With the help of a circuit Interfacing DAC 808-Use of DAC0808 for generating a sine wave with an ALP - Interfacing temperature sensors to 8051- Various types of Temperature sensors- Specifications of LM34 and LM35- Interfacing of LM35 to 8051-Need for Signal conditioning for interfacing.

**2.0 Interfacing External Memory:**

Semiconductor memories with respect to memory capacity, organization and speed-Variety types of Memories used and give Typical IC numbers of each type-Memory capacity from the IC number- Choice of selection of a memory for a particular application-Popular UV EPROM chips and explain the pin configuration of any one-Concept of Checksum with an example-Compare SRAM, DRAM, NVRAM and Flash Memories- Organisation of a DRAM-Memory address decoding 740LS138 3 X 8 decoder-Concept of ONCHIP and External ROM-Interfacing with external ROM-Data memory space of 8051 and accessing-Interfacing of large external memory (256KB)- DATA Movement in External RAM using MOVX instruction-With an example ( small program to read 100 bytes of data from Port1 and save the data In External RAM location 1000H).

**3.0 Interfacing 8255 PPI Chip:**

Need for port Expansion-Expansion of I/O ports using 8255-Features of 8255- PIN configuration of 8255-Ports of 8255 and Explain their features- Modes of operation of 8255-Concept of MODE selection using control register- 8255 Control word Format(I/O) mode- Interfacing 8255 to 8051- Term memory mapped I/O and its application-Interfacing of LCD with 8051 using 8255-Programming of 8255 in simple I/O mode using 'C' language.

**4.0 Interfacing RTC:**

RTC (Real Time Clock)-Need for RTC (Real Time Clock)- Some Popular RTC ICs-Features of DS12887- Pin configuration of DS12887 IC- Interfacing of DS12887 to 8051- Address map of DS12887-Steps involved in setting the time in DS12887-Interrupt and alarm features of DS12887- Application of RTC for a generation of A square wave.

**5.0 Microcontroller applications:**

Need of relays and opto couplers for interfacing-Commonly used Opto coupler ICs-Compare Opto- Coupler and Opto- isolator- Interfacing 8051 to a relay for driving a 12 V lamp-Interfacing a solid state relay to drive a mains operated motor- Interfacing a stepper motor to 8051- ALP to run stepper motor continuously-Controlling of stepper motor using opto isolator-Program in C for the above application-Pulse width modulation (PWM)-Use of PWM for controlling the speed of small DC motor- Interfacing circuit for Control of a small DC motor using opto isolator a)Darlington Transistor b) MOSFET-Program in C for PWM speed Control of a small DC motor-Traffic controller application with the help of a Block Diagram-Application of a temperature controller with the help of a Block Diagram.

**159****REFERENCE BOOKS:**

1. The 8051 Micro controller and Embedded systems , by Muhammad Ali Mazidi, Janice Mazidi, Janice Gillispie Mazidi Pearson-Prenticehall publication
2. Programming customizing the 8051 Microcontroller by Myke Predko TMH
3. Microcontrollers (theory and applications) by Ajay V Deshmukh
4. Microcontroller By Kenneth J. Ayala -Thomson Delmar publications

## ELECTRONIC PRODUCT DESIGN & QUALITY ASSURANCE

<b>Subject Title</b>	: <b>Electronic Product Design and Quality Assurance</b>
<b>Subject Code</b>	: <b>EC-505</b>
<b>Periods/Week</b>	: <b>04</b>
<b>Periods/Semester</b>	: <b>60</b>

**Rationale:** This is a new subject introduced in the final year based on the suggestions from the industry. This subject is aimed to make the students understand the steps involved in circuit design and quality assurance. This course helps the students immediately adapt to the procedures in R&D departments in the industry.

### TIME SCHEDULE

Sl	Major Topics	No of Periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Product Design and Development Stages	14	29	3	2
2	PCB design	14	26	2	2
3	Hardware design and Testing	12	16	2	1
4	Product testing	12	26	2	2
5	Documentation	06	13	1	1
<b>Total</b>		<b>60</b>	<b>110</b>	<b>10</b>	<b>8</b>

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## OBJECTIVES

**On completion of the study a student should be able to**

### 1.0 Understand Product design and Development stages

- 1.1 Explain the concept of product development with a block diagram.
- 1.2 Give classification of an Electronic Product.
- 1.3 Explain The Techno Commercial Feasibility of a product.
- 1.4 Explain customer requirements
- 1.5 Explain R&D prototype Assessment of reliability.
- 1.6 Explain factors for reliability of equipment.
- 1.7 Explain quality considerations.
- 1.8 List 6 reasons for failure.
- 1.9 Explain Bath tub curve
- 1.10 Explain Concept of Ergonomic and aesthetic considerations of pilot production
- 1.11 Explain Product packaging and storage
- 1.12 Estimate power supply requirements
- 1.13 List two types of Power supply protection devices
- 1.14 Define Noise reduction.
- 1.15 Explain Grounding
- 1.16 Explain Shielding and guarding techniques
- 1.17 Explain Thermal management

### 2.0 Explain PCB design

- 2.1 List 6 important properties of Laminates
- 2.2 General layout considerations for analog and digital circuits
- 2.3 Explain routing for better Decoupling
- 2.4 Mention Recommendations for decoupling and bypassing.
- 2.5 Explain layout considerations for mixed signal circuits
- 2.6 Explain Component mounting considerations.
- 2.7 study of packages for discrete devices and ICs calculation of parasitic elements in PCB

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- 2.8 List two types of High speed EMI reduction methods in PCB designing
- 2.9 Define Cross talk
- 3.0 Understand Hardware design and Testing**
- 3.1 Use of logic analyzer ,
- 3.2 Explain the use of Digital storage oscilloscope in testing .
- 3.3 Explain Mixed signal oscilloscope for hardware testing ,
- 3.4 List two types of signal integrity issues
- 3.5 State the uses and limitations of different types of analysis
- 3.6 Explain DC operating point analysis
- 3.7 Explain Ac analysis, Transient analysis
- 3.8 Explain the use of Software tools for simulation and testing.
- 4.0 Understand Product testing**
- 4.1 Explain the importance of product testing
- 4.2 Mention the concept of Environmental testing
- 4.3 Explain Dry heat testing
- 4.4 Explain Vibration testing
- 4.5 Explain random testing.
- 4.6 Explain Bump testing
- 4.7 Explain Temperature extreme testing for linear and step stress profiles
- 4.8 Explain Vibration & temperature cycling
- 4.9 Explain EMI EMC compliance testing standardization
- 4.10 Explain UL and CE Certification of industrial electronic products.
- 5.0 Understand Documentation**
- 5.1 Explain the importance of documentation
- 5.2 List types of documentation.
- 5.3 Explain types of documents
- 5.4 List the six important rules for preparing effective document
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- 5.5 Explain PCB documentation
- 5.6 Explain Assembly and fabrication related documentation Laminate grade
- 5.7 Explain preparing a manual document
- 5.8 Explain the details of service manual
- 5.9 Explain test report/manuals
- 5.10 Explain product documentation Bill of materials Production test specifications

### COURSE CONTENT

- 1. Product design and Development stages**-Concept of product development with a block diagram-Classification of an Electronic Product- Techno Commercial Feasibility of a product-Customer requirements-R&D prototype Assessment of reliability-Factors for reliability of equipment-Quality considerations- Reasons for failure-Bath tub curve-Concept of Ergonomic and aesthetic considerations of pilot production-Product packaging and storage-Estimation of power supply requirements-Types of Power supply protection devices-Noise reduction-Shielding and guarding techniques-Thermal management.
- 2. PCB design:** Important properties of Laminates-General layout considerations for analog and digital circuits- Power and ground Traces, routing for better Decoupling, Recommendations for decoupling and bypassing, layout considerations for mixed signal circuits, Component mounting considerations,study of packages for discrete devices and ICs calculation of parasitic elements in PCB,High speed EMI reduction methods in PCB designing, cross talk,
- 3. Hardware design and Testing:**Use of logic analyzer-Digital storage oscilloscope- Mixed signal oscilloscope for hardware testing-Types of signal integrity issues -Use and limitations of different types of analysis-DC operating point analysis- Ac analysis-Transient analysis- Use of Software tools for simulation and testing.
- 4. Product testing:**Importance of product testing,Environmental testing: Dry heat, Vibration-Temperature cycling- Random testing- Bump and Humidity tests as specified in IS standards- Temperature extreme testing for linear and step stress profiles- EMI EMC compliance testing standardization-UL and CE Certification of industrial electronic products,

5. **Documentation** : Importance of documentation- Assembly and fabrication related documentation- Laminate grade- Drilling details- Plating- Bare board testing- Product documentation- User manual- Service maintenance manual- Bill of materials -Production test specifications.

**REFERENCE BOOKS:**

1. Electronic Product Design, R.G.Kaduskar, V.B.Baru, Wiley India
2. Printed Circuit Board design and technology-Walter CBosshart TMH-CEDT
3. Handbook of Printed Circuit manufacturing – Raymond H. Clark (Van Nostrand Reinhold Company, New York)
4. Electronic testing and fault diagnosis –G.C. Loveday (Ah wheeler Publication, India)

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**MOBILE COMMUNICATION**

<b>Subject Title</b>	:	<b>Mobile Communication</b>
<b>Subject Code</b>	:	<b>EC-506</b>
<b>Periods/Week</b>	:	<b>04</b>
<b>Periods/Semester</b>	:	<b>60</b>

**Rationale:** The Course Mobile communication is included keeping the ever growing man power requirements in Telecommunications Industry. This course covers the fundamentals of mobile communications.

**TIME SCHEDULE**

Sl	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Introduction to wireless communication system	8	16	2	1
2	Cellular system design fundamentals	14	26	2	2
3	Multiple access techniques	16	26	2	2
4	Digital Cellular mobile system	14	26	2	2
5	Modern wireless communication systems	8	16	2	1
	<b>Total</b>	<b>60</b>	<b>110</b>	<b>10</b>	<b>8</b>

**OBJECTIVES**

**Upon completion of the course the student should be able to**

- 1.0 Know wireless communication system**
- 1.1 List the limitations of conventional mobile phone system.
  - 1.2 Mention the evolution of cellular mobile communication system.
  - 1.3 Define the terms mobile station and base station

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- 1.4 State the functions of Mobile switching centre (MSC)
  - 1.5 List various channels in mobile communication
  - 1.6 Define voice and control channels in mobile communication
  - 1.7 Define Roamer
  - 1.8 List the features of various mobile radio systems around the world
  - 1.9 Define simplex, half duplex and full duplex channels.
  - 1.10 Distinguish between frequency division duplex (FDD) and time division duplex (TDD).
  - 1.11 Define uplink and downlink channels in mobile communication
  - 1.12 Draw the block diagram of a basic cellular system.
  - 1.13 Explain the process of call progress in a cellular telephone system

## **2.0 Understand Cellular system design fundamentals**

- 2.1 State the need for cellular concept in mobile communication
- 2.2 State the need for hexagonal cell site.
- 2.3 Explain the concept of Frequency reuse.
- 2.4 Explain capacity of a mobile cellular system.
- 2.5 Define the term Cell
- 2.6 Define the term cluster
- 2.7 Explain the capacity of a cellular system
- 2.8 State the relation between capacity and cluster size.
- 2.9 State the probable sizes of cluster with formula.
- 2.10 Define co-channel interference.
- 2.11 State the relation between co-channel interference and system capacity.
- 2.12 Define Hand-off in mobile communication
- 2.13 Explain channel assignment strategies
- 2.14 List two methods of improving channel capacity
- 2.15 Explain Cell splitting and sectoring
- 2.16 Define micro-cell concept
- 2.17 Define umbrella cell

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- 2.18 Solve problems on system capacity.

## **3.0 Understand Multiple access techniques**

- 3.1 State the need for multiple access techniques
- 3.2 List the three types of multiple access techniques.
- 3.3 Explain FDMA
- 3.4 List the features of FDMA
- 3.5 Explain TDMA
- 3.6 Draw the TDMA frame structure
- 3.7 List the features of TDMA
- 3.8 Explain the concept of spread spectrum technique
- 3.9 List two types of spread spectrum techniques
- 3.10 Explain the Direct sequence spread spectrum (DSSS) technique
- 3.11 Explain the frequency hopped spread spectrum (FHSS) multiple access technique.
- 3.12 Explain code division multiple access technique.
- 3.13 List the features and advantages of CDMA
- 3.14 Compare FDMA, TDMA and CDMA
- 3.15 State near-far effect in CDMA
- 3.16 Explain the concept of soft hand off and power control in CDMA

## **4.0 Comprehend Digital Cellular mobile system**

- 4.1 List the specifications of analog mobile phone system (Advanced mobile phone system AMPS).
- 4.2 Explain the radio interface of AMPS.
- 4.3 State the features of Narrow band AMPS (N-AMPS)
- 4.4 List the demerits of analog cellular system.
- 4.5 Mention the features of digital cellular system.
- 4.6 Explain the United States Digital Cellular system (IS-54)
- 4.7 Explain the radio interface specifications of USDC
- 4.8 Explain the Global system for mobile communication (GSM)

- 4.9 Explain the GSM architecture with block diagram.
- 4.10 List various interfaces in GSM architecture
- 4.11 Explain the GSM radio subsystem
- 4.12 Explain the frame structure of the GSM
- 4.13 List the service and security aspects of GSM.
- 4.14 Compare AMPS and GSM
- 4.15 List the advantages of GSM over AMPS
- 5.0 Know Modern wireless communication systems**
- 5.1 Mention the demerits of GSM system.
- 5.2 List the features of GPRS
- 5.3 List the features of EDGE
- 5.4 Compare the features of GSM, GPRS and EDGE systems
- 5.5 List specifications of Digital European Cordless Telecommunication (DECT) system.
- 5.6 Draw the architecture of DECT
- 5.7 Explain the architecture of DECT
- 5.8 Basic concept of Wireless local loop (WLL)
- 5.9 List the salient features of 3G system
- 5.10 List the advantages of 3G over earlier versions
- 5.11 List the basic concepts of 4G aspects

## COURSE CONTENT

1. **Introduction to wireless communication systems** : Limitations of conventional mobile phone system-Evolution of cellular mobile communication system-Mobile station and base station-Functions of Mobile switching centre (MSC)-Various channels in mobile communication-Voice and control channels in mobile communication-Roamer-Features of various mobile radio systems around the world-Simplex, half duplex and full duplex channels-Frequency division duplex (FDD) and time division duplex (TDD)-Uplink and downlink channels in

mobile communication-Block diagram of a basic cellular system-Call progress in a cellular telephone system

2. **Cellular system design fundamentals**: Need for cellular concept in mobile communication-Hexagonal cell site-Frequency reuse-Capacity of a mobile cellular system-Definition of the term Cell-Cluster- Relation between capacity and cluster size- Probable sizes of cluster with formula-Co-channel interference- Relation between co-channel interference and system capacity- Hand-off in mobile communication- Channel assignment strategies-Methods of improving channel capacity-Cell splitting and sectoring- Micro-cell concept- Umbrella cell- Problems on system capacity.
3. **Multiple access techniques**: Need for multiple access techniques-Types of multiple access techniques-FDMA-Features of FDMA- TDMA-TDMA frame structure-Features of TDMA-Concept of spread spectrum technique-Types of spread spectrum techniques-Direct sequence spread spectrum (DSSS) technique- Frequency hopped spread spectrum (FHSS) multiple access technique-Code division multiple access technique-Features and advantages of CDMA- Comparision of FDMA, TDMA and CDMA- Near-far effect in CDMA-Concept of soft hand off and power control in CDMA.
4. **Digital Cellular mobile system** : Specifications of analog mobile phone system (Advanced mobile phone system AMPS)-Radio interface of AMPS-Features of Narrow band AMPS (N-AMPS)-Demerits of analog cellular system-Features of digital cellular system-United States Digital Cellular system (IS-54)-Radio interface specifications of USDC-Global system for mobile communication (GSM)-GSM architecture with block diagram-Various interfaces in GSM architecture-GSM radio subsystem-Frame structure of the GSM-Service and security aspects of GSM-Comparison of AMPS and GSM-Advantages of GSM over AMPS.
5. **Modern wireless communication systems**: Demerits of GSM system-Features of GPRS and EDGE-Compare the features of GSM, GPRS and EDGE systems-Specifications of Digital European Cordless Telecommunication (DECT) system-Architecture of DECT- Basic concept of Wireless local loop (WLL)-Salient features of 3G system-Advantages of 3G over earlier versions-Basic concepts of 4G.

**REFERENCE BOOKS:**

1. Mobile and Personal communication systems and services by Raj Pandya, PHI
2. Wireless communications-Principles and practice by Theodore S. Rappaport, PEARSON
3. Mobile Cellular Telecommunications-Analog and Digital systems by William C. Y. Lee, McGrawHill
4. Mobile Communications by Jochen Schiller, PEARSON

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**INDUSTRIAL ELECTRONICS LAB PRACTICE**

<b>Subject Title</b>	: <b>Industrial Electronics Lab Practice</b>
<b>Subject Code</b>	: <b>EC-507</b>
<b>Periods/Week</b>	: <b>06</b>
<b>Periods/Semester</b>	: <b>90</b>

**Rationale:** Industrial Electronics lab is included in the VI semester to make the students industry ready by giving them practical inputs and making them experiment with Power Electronic devices which are in wide usage in Industry. This helps the students to get better job opportunities and work with confidence.

**TIME SCHEDULE**

<b>Sl</b>	<b>Major Topics</b>	<b>Periods</b>
1	Power devices	9
2	UJT Circuits	6
3	Power control Techniques	12
4	Inverter & Servo Stabilizers	15
5	Sensors and Transducers	18
6	PLC	30
	<b>TOTAL</b>	<b>90</b>

**I. Power devices**

1. Identify Power Semiconductor devices SCR, TRIAC, DIAC, SUS SBS, MOSFET, IGBT, LASCR, UJT, HEATSINKS, OPTO COUPLERS MCT2E, MOC 3011 .



2. Plot the characteristics of MOSFET and determine gate source threshold voltage
  - a) Implement a MOSFET switch and control a 6V lamp using NAND gate
3. Plot the characteristics of SCR and determine Triggering current
  - a) To Verify 3 methods of switching off scr.
  - b) To design a simple burglar alarm circuit using SCR and test it

## II. UJT Circuits

4. Plot the characteristics and determine the intrinsic standoff ratio of UJT
5. Construct UJT Relaxation oscillator circuit and observe the output waveforms on CRO

## III. Power Control Techniques

6. Trigger the SCR by UJT and control output Power
7. Plot the characteristics of TRIAC and DIAC
  - a) Verify that TRIAC can be triggered by positive and negative pulses
  - b) Verify 3 methods of switching off TRIAC
8. Implement 100 watt 230V AC Lamp Control circuit using Optocoupler MOC3011 and 4Amps TRIAC.
9. Vary the speed of a 1 phase 230V AC motor using TRIAC-DIAC phase control
  - a) Observe the waveforms at the gate terminal and load using isolation transformer on CRO
  - b) Replace the motor with a 230 volts incandescent lamp and observe the waveforms on CRO

## IV. Inverter , Servo Stabilizers & Constant Voltage Transformers

10. Implement a square wave inverter circuit with centre tapped transformer ,power MOSFETS and Plot regulation characteristics.
11. Vary the speed of a small DC motor using pulse width modulation
12. Draw the regulation characteristics of servo stabilizer
13. Assemble a servo Stabilizer and test.
14. Plot the Regulation characteristics of Constant Voltage Transformer.

## V. Sensors and Transducers

15. Draw the performance characteristics of LVDT
16. Plot the performance characteristics of Thermocouple
17. Draw the performance characteristics of RTD
18. Measure the temperature using IC LM 335
19. Implement an ON/OFF temperature controller using IC LM335
20. Draw the characteristics of Load cell

## VI. Programmable Logic Controllers

21. Get familiarized with PLC tutor or PSIM
22. Implement basic logic gates using PLCs
  - a) implement basic gates using PLC
  - b) Implement XOR , XNOR gates using PLC
23. Implement delay timers using PLC
24. Implement on timer and off timer using PLC
25. Implement up counter and down counter
26. Implement start/Stop Motor control
27. Implement Two way switch control
28. Implement sequential motor control (3 Motors) with a delay
29. Implement Motor forward and reverse direction control.
30. Implement a Traffic Light controller

**Competencies and Key competencies to be achieved**

Exp no	Name of the experiment (NO of Periods)	Competencies	Key competencies
1	To Identify Power Semiconductor devices SCR, TRIAC, DIAC,, SUS SBS, MOSFET, IGBT, LASCR, UJT, HEATSINKS, OPTO COUPLERS MCT2E, MOC 3011 .(3)	<ul style="list-style-type: none"> <li>➤Identify of SCR, TRIAC , DIAC</li> <li>➤Identify various SCR family devices and their symbols</li> <li>➤Identify their symbols &amp;Terminals</li> <li>➤Read the data sheets and identifythe terminals</li> <li>➤Note down the typical applications from the data sheet</li> </ul>	<ul style="list-style-type: none"> <li>▪Identify of SCR, TRIAC , DIAC</li> <li>▪Identify various SCR family devices and their symbols</li> <li>▪Identify their symbols &amp;Terminals</li> <li>▪Read the data sheets and identifythe terminals</li> <li>▪Note down the typical applications from the data sheet</li> </ul>
2	To plot the characteristics of MOSFET and determine gate source threshold voltage a)To implement a MOSFET switch and control a 6V lamp using NAND Gate .(3)	<ul style="list-style-type: none"> <li>➤Identify MOSFET and its package</li> <li>➤Interpret specifications from datasheets</li> <li>➤Test the MOSFET using digital multimeter.</li> <li>➤Rig up the circuit</li> <li>➤Interface with TTL Gates</li> </ul>	<ul style="list-style-type: none"> <li>▪Identify MOSFET and its package</li> <li>▪Interpret specifications from datasheets</li> <li>▪Test the MOSFET using digital multimeter.</li> <li>▪Rig up the circuit</li> <li>▪Interface with TTL Gates</li> </ul>
3	To plot the characteristics of SCR and determine Triggering current a) To Verify 3 methods of switching off SCR. b) To design a simple burglar alarm circuit using SCR and test it .(3)	<ul style="list-style-type: none"> <li>➤Identify the SCR by its package &amp; Number</li> <li>➤Rig up the circuit</li> <li>➤Carefully apply Micro Amperes of current to Gate</li> <li>➤Note the trigger current</li> <li>➤Commutate SCR</li> <li>➤Use SCR in circuits</li> </ul>	<ul style="list-style-type: none"> <li>▪Rig up the circuit</li> <li>▪Carefully apply Micro Amperes of current to Gate</li> <li>▪Note the trigger current</li> <li>▪Commutate SCR</li> <li>▪Use SCR in circuits</li> </ul>

4	To plot the characteristics and determine the intrinsic standoff ratio of UJT .(3)	<ul style="list-style-type: none"> <li>➤Identify UJT by its package &amp; Number</li> <li>➤Test the UJT using digital multimeter.</li> <li>➤Rig up the circuit</li> <li>➤Determine intrinsic standoff Ratio</li> </ul>	<ul style="list-style-type: none"> <li>▪Rig up the circuit</li> <li>▪Test the UJT using digital multimeter.</li> <li>▪Determine intrinsic standoff Ratio</li> </ul>
5	To construct UJT Relaxation oscillator circuit and observe the output waveforms on CRO.(3)	<ul style="list-style-type: none"> <li>➤Identify UJT by its package &amp; Number</li> <li>➤Test the UJT using digital multimeter.</li> <li>➤Rig up the circuit</li> <li>➤Observe the output at Emitter .B1 and B2 on CRO</li> <li>➤Use UJT for saw tooth wave generation</li> </ul>	<ul style="list-style-type: none"> <li>▪Test the UJT using digital multimeter.</li> <li>▪Rig up the circuit</li> <li>▪Observe the output at Emitter .B1 and B2 on CRO</li> <li>▪Use UJT for saw tooth wave generation</li> </ul>
6	To Trigger the SCR by UJT and control FW Rectified 30V DC output Power .(3)	<ul style="list-style-type: none"> <li>➤ Rig up the circuit</li> <li>➤Test he circuit</li> <li>➤Observe the UJT Trigger waveform on CRO</li> <li>➤Observe &amp; Measure the load Voltage on CRO</li> <li>➤Observe the effect of changing RC Values</li> </ul>	<ul style="list-style-type: none"> <li>▪ Test he circuit</li> <li>▪ Observe the UJT Trigger waveform on CRO</li> <li>▪ Observe &amp; Measure the load Voltage on CRO</li> <li>▪ Observe the effect of changing RC Values</li> </ul>
7	To plot the characteristics of TRIAC and DIAC a) To verify that TRIAC can be triggered by positive and negative pulses b) To Verify 3 methods of switching off TRIAC.(3)	<ul style="list-style-type: none"> <li>➤Identify TRIAC by its number &amp; its package</li> <li>➤Identify the terminals by observation &amp; with DMM</li> <li>➤Apply trigger pulse</li> <li>➤Estimate TRIAC rating by its size</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify TRIAC by its number &amp; its package</li> <li>▪ Identify the terminals by observation &amp; with DMM</li> <li>▪ Apply trigger pulse</li> <li>▪ Estimate TRIAC rating by its size</li> </ul>
8	To implement 100 watt 230V AC Lamp Control circuit using Optocoupler MOC3011 and 4Amps TRIAC. .(3)	<ul style="list-style-type: none"> <li>➤Identify CA3011 opto-coupler terminals</li> <li>➤Test the optocoupler with DMM</li> <li>➤Rig up the circuit</li> <li>➤Test the circuit by applying low (1.5V) at input</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify CA3011 opto-coupler terminals</li> <li>▪ Test the optocoupler with DMM</li> <li>▪ Rig up the circuit</li> <li>▪ Test the circuit by applying low (1.5V) at input</li> </ul>

9	To vary the speed of a 1 phase 230V AC motor using TRIAC-DIAC phase control.(3)  a) Observe the waveforms at the gate terminal and load using isolation transformer on CRO b) Replace the motor with a 230 volts incandescent lamp and observe the waveforms on CRO c) Measure the output power with watt meter.	<ul style="list-style-type: none"> <li>➤ Select the TRIAC &amp; DIAC</li> <li>➤ Identify the terminals</li> <li>➤ Test them with DMM</li> <li>➤ Rig up the circuit</li> <li>➤ Observe the distorted output wave form on CRO</li> <li>➤ Measure the output power with wattmeter</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify the terminals</li> <li>▪ Test them with DMM</li> <li>▪ Rig up the circuit</li> <li>▪ Observe the distorted output wave form on CRO</li> <li>▪ Measure the output power with wattmeter</li> </ul>
10	To assemble a PWM inverter circuit with centre tapped Transformer, Power MOSFETS and Test .(3)	<ul style="list-style-type: none"> <li>➤ Identify the parts</li> <li>➤ Assemble the parts</li> <li>➤ Make Electrical connections</li> <li>➤ Connect to the battery</li> <li>➤ Observe polarity</li> <li>➤ Test the inverter on Load</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify the parts</li> <li>▪ Assemble the parts</li> <li>▪ Make Electrical connections</li> <li>▪ Connect to the battery</li> <li>▪ Observe polarity</li> <li>▪ Test the inverter on Load</li> </ul>
11	To Vary the speed of a Small DC motor using pulse width modulation .(3)	<ul style="list-style-type: none"> <li>➤ Identify the board</li> <li>➤ Note down the PWM IC number (LM 3524) pin configuration</li> <li>➤ Note down the number of Power Transistor</li> <li>➤ Measure the speed</li> <li>➤ Observe the effect of PWM on CRO</li> </ul>	<ul style="list-style-type: none"> <li>▪ Note down the PWM IC number (LM 3524) pin configuration</li> <li>▪ Note down the number of Power Transistor</li> <li>▪ Measure the speed</li> <li>▪ Observe the effect of PWM on CRO</li> </ul>
12	To draw the regulation characteristics of servo stabilizer.(3)	<ul style="list-style-type: none"> <li>➤ Assemble the circuit</li> <li>➤ Connect variable lamp load</li> <li>➤ Apply variable input voltage using Auto Transformer</li> <li>➤ Measure output voltage</li> <li>➤ Note upper &amp; Lower voltage cut off points</li> </ul>	<ul style="list-style-type: none"> <li>▪ Apply variable input voltage using Auto Transformer</li> <li>▪ Measure output voltage</li> <li>▪ Note upper &amp; Lower voltage cut off points</li> </ul>

13	To assemble a servo Stabilizer and Test.(3)	<ul style="list-style-type: none"> <li>➤ Identify the parts</li> <li>➤ Assemble the parts</li> <li>➤ Make Electrical connections</li> <li>➤ Test the Servo stabilizer on load</li> <li>➤ Apply variable Input voltage</li> <li>➤ Determine Upper &amp; Lower cut off Voltages</li> <li>➤ Observe rate of Voltage correction</li> </ul>	<ul style="list-style-type: none"> <li>▪ Assemble the parts</li> <li>▪ Make Electrical connections</li> <li>▪ Test the Servo stabilizer on load</li> <li>▪ Apply variable Input voltage</li> <li>▪ Determine Upper &amp; Lower cut off Voltages</li> <li>▪ Observe rate of Voltage correction</li> </ul>
14	To plot the Regulation characteristics of Constant Voltage Transformer. .(3)	<ul style="list-style-type: none"> <li>➤ Identify CVT and its terminals</li> <li>➤ Make Electrical connections</li> <li>➤ Connect variable lamp load</li> <li>➤ Apply variable input voltage using Auto Transformer</li> <li>➤ Measure output voltage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify CVT and its terminals</li> <li>▪ Make Electrical connections</li> <li>▪ Connect variable lamp load</li> <li>▪ Apply variable input voltage using Auto Transformer</li> <li>▪ Measure output voltage</li> </ul>
15	To draw the performance characteristics of LVDT.(3)	<ul style="list-style-type: none"> <li>➤ Identify LVDT</li> <li>➤ Connect the set up</li> <li>➤ Carefully Change the LVDT core position and measure transducer output in steps</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify LVDT</li> <li>▪ Connect the set up</li> <li>▪ Carefully Change the LVDT core position and measure transducer output in steps</li> </ul>
16	To plot the performance characteristics of Thermocouple transducer.(3)	<ul style="list-style-type: none"> <li>➤ Identify Thermocouple transducer</li> <li>➤ Prepare experimental set up</li> <li>➤ Increase the temperature in steps</li> <li>➤ Measure the output voltage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify Thermocouple transducer</li> <li>▪ Prepare experimental set up</li> <li>▪ Increase the temperature in steps</li> <li>▪ Measure the output voltage</li> </ul>
17	To draw the performance characteristics of RTD.(3)	<ul style="list-style-type: none"> <li>➤ Identify RTD transducer</li> <li>➤ Prepare experimental set up</li> <li>➤ Increase the temperature in steps</li> <li>➤ Measure the output voltage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify RTD transducer</li> <li>▪ Prepare experimental set up</li> <li>▪ Increase the temperature in steps</li> <li>▪ Measure the output voltage</li> </ul>
18	To measure the temperature using IC LM 335.(3)	<ul style="list-style-type: none"> <li>➤ Identify LM335 IC</li> <li>➤ Identify its terminals</li> <li>➤ Rig up the basic circuit</li> <li>➤ Increase the temperature in steps</li> <li>➤ Note down the</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify LM335 IC</li> <li>▪ Identify its terminals</li> <li>▪ Rig up the basic circuit</li> <li>▪ Increase the temperature in steps</li> <li>▪ Note down the</li> </ul>

19	To implement an ON /OFF temperature controller using IC LM335 .(3)	<ul style="list-style-type: none"> <li>➤ Identify and select the components</li> <li>➤ Identify the terminals of LM 335</li> <li>➤ Rig up the circuit</li> <li>➤ Connect the relay board</li> <li>➤ Apply heat and set the cut off temperature</li> <li>➤ Test over designed Temperature Range</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify and select the components</li> <li>▪ Identify the terminals of LM 335</li> <li>▪ Rig up the circuit</li> <li>▪ Connect the relay board</li> <li>▪ Apply heat and set the cut off temperature</li> <li>▪ Test over designed Temperature Range</li> </ul>
20	To draw the characteristics of Load cell.(3)	<ul style="list-style-type: none"> <li>➤ Identify Load cell transducer</li> <li>➤ Prepare experimental set up</li> <li>➤ Increase the Load in steps</li> <li>➤ Measure the output voltage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify Load cell transducer</li> <li>▪ Prepare experimental set up</li> <li>▪ Increase the Load in steps</li> <li>▪ Measure the output voltage</li> </ul>
<b>▪ PART B – PLC Experiments/Simulation</b>			
21	To get familiarized with PLC tutor or PSIM PLC simulator(3)	<ul style="list-style-type: none"> <li>➤ Identify the PLC</li> <li>➤ Note down the manufacturer's details</li> <li>➤ Get acquainted with symbols and ladder diagrams</li> <li>➤ Identify the sections of PSIM GUI</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify the PLC</li> <li>▪ Note down the manufacturer's details</li> <li>▪ Get acquainted with symbols and ladder diagrams</li> <li>▪ Identify the sections of PSIM GUI</li> </ul>
22	To Implement basic logic gates using PLCs a. To implement basic gates using PLC  b. To implement XOR XNOR gates using PLC.(3)	<ul style="list-style-type: none"> <li>➤ Implement the circuit Using PSIM</li> <li>➤ Verify the truth tables of Logic Gates</li> <li>➤ Verify the truth table of XOR &amp; XNOR Gates</li> </ul>	<ul style="list-style-type: none"> <li>▪ Implement the circuit Using PSIM</li> <li>▪ Verify the truth tables of Logic Gates</li> <li>▪ Verify the truth table of XOR &amp; XNOR Gates</li> </ul>
23	To implement delay timers using PLC.(3)	<ul style="list-style-type: none"> <li>➤ Develop Ladder diagram</li> <li>➤ Implement Using PSIM</li> <li>➤ Simulate and verify</li> </ul>	<ul style="list-style-type: none"> <li>▪ Develop Ladder diagram</li> <li>▪ Implement Using PSIM</li> <li>▪ Simulate and verify</li> </ul>
24	To implement on timer and off timer using PLC.(3)	<ul style="list-style-type: none"> <li>➤ Develop Ladder diagram</li> <li>➤ Implement Using PSIM</li> <li>➤ Simulate and verify</li> </ul>	<ul style="list-style-type: none"> <li>▪ Develop Ladder diagram</li> <li>▪ Implement Using PSIM</li> <li>▪ Simulate and verify</li> </ul>

25	To implement up counter and down counter.(3)	<ul style="list-style-type: none"> <li>➤ Develop Ladder diagram</li> <li>➤ Implement Using PSIM</li> <li>➤ Simulate and verify</li> </ul>	<ul style="list-style-type: none"> <li>▪ Develop Ladder diagram</li> <li>▪ Implement Using PSIM</li> <li>▪ Simulate and verify</li> </ul>
26	To implement start/Stop Motor control.(3)	<ul style="list-style-type: none"> <li>➤ Develop Ladder diagram</li> <li>➤ Implement Using PSIM</li> <li>➤ Simulate and verify</li> </ul>	<ul style="list-style-type: none"> <li>▪ Develop Ladder diagram</li> <li>▪ Implement Using PSIM</li> <li>▪ Simulate and verify</li> </ul>
27	To implement Two way switch control.(3)	<ul style="list-style-type: none"> <li>➤ Develop Ladder diagram</li> <li>➤ Implement Using PSIM</li> <li>➤ Simulate and verify</li> </ul>	<ul style="list-style-type: none"> <li>▪ Develop Ladder diagram</li> <li>▪ Implement Using PSIM</li> <li>▪ Simulate and verify</li> </ul>
28	To implement sequential motor control Motors with a delay(3)	<ul style="list-style-type: none"> <li>➤ Develop Ladder diagram</li> <li>➤ Implement Using PSIM</li> <li>➤ Simulate and verify</li> </ul>	<ul style="list-style-type: none"> <li>▪ Develop Ladder diagram</li> <li>▪ Implement Using PSIM</li> <li>▪ Simulate and verify</li> </ul>
29	To implement Motor forward and reverse direction control. .(3)	<ul style="list-style-type: none"> <li>➤ Develop Ladder diagram</li> <li>➤ Implement Using PSIM</li> <li>➤ Simulate and verify</li> </ul>	<ul style="list-style-type: none"> <li>▪ Develop Ladder diagram</li> <li>▪ Implement Using PSIM</li> <li>▪ Simulate and verify</li> </ul>
30	To implement a Traffic Light controller.(3)	<ul style="list-style-type: none"> <li>➤ Develop Ladder diagram</li> <li>➤ Implement Using PSIM</li> <li>➤ Simulate and verify</li> </ul>	<ul style="list-style-type: none"> <li>▪ Develop Ladder diagram</li> <li>▪ Implement Using PSIM</li> <li>▪ Simulate and verify</li> </ul>

**LIFE SKILLS**  
(Common to all Branches)

<b>Subject Title</b>	:	<b>Life skills</b>
<b>Subject Code</b>	:	<b>EC- 508</b>
<b>Periods per week</b>	:	<b>03</b>
<b>Period per semester</b>	:	<b>45</b>

**TIME SCHEDULE**

Sl No.	Major Topics	No. of periods
1.	Concept of life skills	03
2.	Enhancing self esteem	03
3.	Goal setting	03
4.	Positive attitude	03
5.	Managing emotions	06
6.	Stress management	06
7.	Time management	03
8.	Interpersonal skills	03
9.	Creativity	03
10.	Problem solving and Decision making skills	03
11.	Assertiveness	06
12.	Leadership skills & Team spirit	03
TOTAL		45

**Note: No Written Examination**

The students may be asked to demonstrate 1 or 2 skills from unit 2 to unit 12.

**Marks:** Internal – 40; External - 60

**OBJECTIVES**

On the completion of the course the students shall be able to

**1.0 Understand the concept of Life Skills**

- 1.1 Define Life Skills
- 1.2 Explain need and impact of Life Skills Programme
- 1.3 List the elements of Life Skills
- 1.4 Identify the sources of Life Skills

**2.0 Understand the concept of Self esteem**

- 2.1 Define the term self esteem
- 2.2 Explain the concept of Self esteem
- 2.3 List the characteristics of High Self esteem
- 2.4 List the characteristics of Low Self esteem
- 2.5 Explain the advantages of High Self esteem
- 2.6 Explain the behaviour patterns of Low self esteem
- 2.7 Explain the causes of Low self esteem
- 2.8 List the steps to build a positive Self esteem

**Practicals**

Exp No	Exercise	Activity (Questionnaire / Game and Role play)
1.	Identifying the Behaviour	<ul style="list-style-type: none"> <li>• Identifying the behavior patterns of low self-esteem people.</li> </ul>
2.	Practice Positive Self Esteem	<ul style="list-style-type: none"> <li>• Steps to build a positive self esteem</li> </ul>

**3.0 Understand the concept of Goal setting**

- 3.1 Define the term Goal
- 3.2 Explain the significance of Goal setting
- 3.3 Explain the following concepts
  - a) Wish b) Dream c) Goal
- 3.4 Explain the reasons for not setting goals
- 3.5 Explain effective goal setting process
- 3.6 List the barriers to reach goals

**Practicals**

Exp No	Exercise	Activity
1.	Differentiate among Wish, Dream and Goal	<ul style="list-style-type: none"> <li>• Draw a picture of Your Self/ Your Country/ Your Society after 10yrs.</li> <li>• Discussion: Setting Personal Goals</li> <li>• Story Telling</li> <li>• Identifying of barriers</li> <li>• Analysis barriers</li> <li>• Overcoming barriers</li> </ul>

**4.0 Practise positive attitude**

- 4.1 Define Attitude
- 4.2 Explain the concept of positive attitude
- 4.3 Explain the concept of negative attitude
- 4.4 Explain the effects of negative attitude
- 4.5 Identify the attitude of self and peers
- 4.6 Explain the effect of peers on self and vice-versa.
- 4.7 List the steps to enhance positive attitude
- 4.8 Explain the strategies to enhance positive attitude

**Practicals**

Exp No	Exercise	Activity (Psychological Instrument/ Game & Role play)
1.	Identify Positive attitude	<ul style="list-style-type: none"> <li>• To study &amp; to identify the attitude of self and peer</li> <li>• List &amp; practise the strategies to enhance positive attitude.</li> </ul>
2.	Observe	<ul style="list-style-type: none"> <li>• Positive attitudes of self and Peers</li> <li>• Negative attitudes of self and Peers</li> </ul>
3.	Practice Strategies to enhance Positive attitude	<ul style="list-style-type: none"> <li>• Celebrating success</li> <li>• Listing successes</li> </ul>

**5.0 Practise managing emotions****5.1 Explain the concept of emotion**

- 5.2 List the different types of emotions
- 5.3 Differentiate between positive and negative emotions
- 5.4 Identify the type of emotion
- 5.5 Explain the causes of different types of emotions.

- 5.6 Implement methods to manage major emotions ( anger / depression )
- 5.7 Define Emotional Intelligence.
- 5.8 Explain the method to enhance Emotional Intelligence.

### Practicals

Exp No	Exercise	Activity (Story / simulated situational act /GD & Role play)
1.	Identify the Type of Emotion	<ul style="list-style-type: none"> <li>To identify the type and to study the cause of the emotion.</li> </ul>
2	Managing Emotions	<ul style="list-style-type: none"> <li>Managing major emotions -Anger and Depression</li> </ul>

### 6.0 Practise stress management skills

- 6.1 Define Stress
- 6.2 Explain the concept of stress
- 6.3 List the types of stress
- 6.4 Explain the causes of stress
- 6.5 Comprehend the reactions to stress
- a) Physical      b) Cognitive      c) Emotional      d) Behavioural
- 6.6 Explain the steps involved in coping with stress by
- a) Relaxation      b) Meditation      c) Yoga
- 6.7 Practice stress relaxing techniques by 3 methods.
- a) Relaxation      b) Meditation      c) Yoga
- 6.8 Comprehend changing personality and cognitive patterns.
- 6.9 Observe changing personality and cognitive patterns.

### Practicals

Exp No	Exercise	Activity(Questionnaire /Interview and practice)
1	Identify the type of stress	<ul style="list-style-type: none"> <li>To study &amp; to identify the type and causes of stress.</li> </ul>
2	Stress –Relaxation Techniques	<ul style="list-style-type: none"> <li>Practice some simple Stress –Relaxation Techniques, Meditation, Yoga.</li> </ul>

Practise some simple Stress –Relaxation Techniques, Meditation, Yoga.

### 7.0 Practice Time Management Skills

- 7.1 Define Time management.
- 7.2 Comprehend the significance of Time management.
- 7.3 Explain the strategies to set priorities.
- 7.4 List the steps to overcome barriers to effective Time management.
- 7.5 Identify various Time stealers.
- 7.6 Explain Time-Management skills.
- 7.7 List different Time-Management skills.
- 7.8 Comprehend the advantages of Time-Management skills.

### Practicals

Exp No	Exercise	Activity ( Group work and Games)
1	Identify Time stealers	<ul style="list-style-type: none"> <li>Assign a activity to different Groups –Observe the time of accomplishing the task, Identify the time stealers.</li> </ul>
2.	Practice Time-Management skills	<ul style="list-style-type: none"> <li>Perform the given tasks- Games</li> </ul>

### 8.0 Practise Interpersonal skills

- 8.1 Explain the significance of Interpersonal skills.
- 8.2 List the factors that prevent building and maintaining positive relationships.
- 8.3 Advantages of positive relationships.
- 8.4 Disadvantages of negative relationships

### Practicals

Exp No	Exercise	Activity
1.	Identify Relationships	<ul style="list-style-type: none"> <li>Positive Relationships, Negative Relationships – Factors that affect them- Through a story</li> </ul>
2.	Practise Rapport building	<ul style="list-style-type: none"> <li>Exercises on Rapport building</li> <li>Developing Correct Body Language</li> </ul>

**9.0 Understand Creativity skills**

- 9.1 Define Creativity
- 9.2 List the synonyms like Invention, Innovation and Novelty
- 9.3 Distinguish between Creativity , Invention, Innovation, and Novelty
- 9.4 Discuss the factors that lead to creative thinking like observation and imitation , improvement etc.
- 9.5 Distinguish between Convergent Thinking and Divergent Thinking
- 9.6 Explain various steps involved in Scientific approach to creative thinking namely
- a) Idea generation b) Curiosity c) Imagination d) Elaboration e) Complexity
- f) Abstraction and simplification g) Divergent Thinking h) Fluency
- i) Flexibility j) Persistence k) Intrinsic Motivation l) Risk taking
- m) Projection/empathy n) Originality o) Story telling p) Flow.
- 9.7 List the Factors affecting the creativity in Individuals.
- 9.8 Give the concept of Vertical thinking and Lateral thinking.
- 9.9 Explain the importance of Lateral thinking.
- 9.10 Compare Lateral thinking and Vertical thinking

**Practicals**

Exp No	Exercise	Activity (Games and Group work)
1	Observe any given object	<ul style="list-style-type: none"> <li>Identifying finer details in an object</li> </ul>
2.	Imagine	<ul style="list-style-type: none"> <li>Imagining a scene</li> <li>Modifying a story (introduce a twist)</li> <li>Improving a product</li> <li>Finding different uses for a product</li> </ul>
3	Skills	<ul style="list-style-type: none"> <li>Making paper craft</li> </ul>
4	Product development	<ul style="list-style-type: none"> <li>Brain storming session</li> </ul>
5	Developing originality	<ul style="list-style-type: none"> <li>Come up with original solutions for a given problem</li> </ul>

**10.0 Understand Problem Solving and Decision Making Skills**

- 10.1 Define a Problem
- 10.2 Analyze the performance problems

- 10.3 Categorize the problems
- 10.4 List the barriers to the solutions to problems.

**Practicals**

Exp No	Exercise	Activity (Brainstorming – checklist technique free association, attribute listing)
1	Gathering the facts and Data and Organizing the information.	<ul style="list-style-type: none"> <li>Information gathering and organizing</li> <li>Identifying the solutions to the problem</li> <li>Identifying the barriers to the solutions</li> <li>Zeroing on Optimum solution</li> </ul>
2.	Problem solving	<ul style="list-style-type: none"> <li>Games on Problem solving</li> </ul>

**11.0 Understand Assertive and Non Assertive behaviour**

- 11.1 List the 3 types of Behaviours 1. Assertive 2. Non assertive (passive) 3. Aggressive Behaviour 4. Submissive behaviours
- 11.2 Discuss the personality of a person having above behaviours
- 11.3 Explain the usefulness of assertive behaviour in practical situations.
- 11.4 Explain the role of effective communication in reflecting assertive attitude
- 11.5 Give examples of Assertive statements a) Assertive request b) assertive NO
- 11.6 Explain the importance of goal setting
- 11.7 Explain the method of Conflict resolution.
- 11.8 Discuss the methods of controlling fear and coping with criticism.

**Practicals**



Exp No	Exercise	Activity ( Simulated situational act)
1	Observation of behavior	<ul style="list-style-type: none"> <li>Identifying different personality traits from the body language</li> </ul>
2.	Practicing assertiveness	<ul style="list-style-type: none"> <li>Write statements</li> <li>Reaction of individuals in a tricky situation</li> <li>Facing a Mock interview</li> <li>Detailing the characteristics of peers</li> <li>setting goals – Games like throwing a coin in a circle</li> <li>Giving a feedback on a )Successful program</li> <li>b) Failed project</li> <li>Self disclosure</li> </ul>
3	Skills	<ul style="list-style-type: none"> <li>Dealing with a critic</li> <li>Saying NO</li> <li>Dealing with an aggressive person</li> </ul>
4	Simulation	<ul style="list-style-type: none"> <li>Role play- skit</li> </ul> <ol style="list-style-type: none"> <li>Assertive statements</li> <li>goal setting</li> <li>self disclosure</li> </ol>

## 12.0 Practise Leadership Skills

- 12.1 Explain the concept of leadership
- 12.2 List the traits of an effective leader
- 12.3 Distinguish between Managing and leading
- 12.4 List the 3 leadership styles
- 12.5 Compare the above styles of leadership styles
- 12.6 Discuss choice of leadership style
- 12.7 Explain the strategies to develop effective leadership.
- 12.8 Explain the importance of Decision making
- 12.9 Explain the procedure for making effective decisions.

### Practicals

Exp No	Exercise	Activity ( Games and Group work)
1	Observation	<ul style="list-style-type: none"> <li>Questionnaire</li> </ul>
2.	Identification of a Leader	<ul style="list-style-type: none"> <li>Give a task and observe the leader</li> <li>Discuss the qualities and his /her leadership style</li> <li>Ask the other members to identify the leadership qualities</li> <li>Reflection on the self</li> </ul>
3	Skills	<ul style="list-style-type: none"> <li>Decision making – followed by discussion</li> </ul>
4	Building Team spirit	<ul style="list-style-type: none"> <li>Motivation – Intrinsic and Extrinsic</li> </ul> Training- Communication- Challenge

## Competencies for Practical Exercises

S.No	Title	Competency	Key competencies
1.	Concept of life skills	<ul style="list-style-type: none"> <li>Explain need and impact of Life skills</li> </ul>	
2.	Enhancing self esteem	<ul style="list-style-type: none"> <li>Follow the steps to build a positive self esteem</li> </ul>	
3.	Goal setting	<ul style="list-style-type: none"> <li>Practise the effective goal setting process</li> </ul>	
4.	Positive attitude	<ul style="list-style-type: none"> <li>Practise the steps to enhance positive attitude.</li> <li>Observe the effects of peers on self and vice-versa.</li> </ul>	Practise the steps to enhance positive attitude
5.	Managing emotions	<ul style="list-style-type: none"> <li>Practise the steps to manage emotional intelligence</li> <li>Identify different types of emotions</li> <li>Exercise control over Emotions</li> </ul>	Identify different types of emotions
6.	Stress management	<ul style="list-style-type: none"> <li>Practise stress management techniques</li> </ul>	
7.	Time management	<ul style="list-style-type: none"> <li>Practise Time management techniques</li> </ul>	
8.	Interpersonal skills	<ul style="list-style-type: none"> <li>Identify positive and Negative Relations</li> </ul>	
9.	Creativity	<ul style="list-style-type: none"> <li>Lead a small group for accomplishment of a given task.</li> <li>Build positive relationships.</li> </ul>	Build positive relationships.
10.	Problem solving and Decision making skills	<ul style="list-style-type: none"> <li>Identify the various Problem solving and Decision making skills</li> <li>Make appropriate decision</li> </ul>	Identify the various Problem solving and Decision making skills
11.	Assertive and non Assertive behaviour	<ul style="list-style-type: none"> <li>Practise Assertive and non Assertive behavior</li> </ul>	
12.	Leadership skills	<ul style="list-style-type: none"> <li>Exhibit Leadership skills</li> </ul>	Exhibit Leadership skills

**COURSE CONTENT****1.0 Concept of life skills**

Definition of life skills, Need and impact of life skills programme

**2.0 Enhancing self esteem**

Concept, Characteristics of high and low self esteem people, Advantages of high self esteem, Causes of low self esteem- Identification of behaviour patterns of low self esteem – Practice session of Questionnaire / Game -Steps to build positive self esteem – Practice session of Role play

**3.0 Goal setting**

Significance of goal setting, Concepts of Wish, Dream, and Goal Identify Wish, Dream, and Goal and differentiate among them. Reasons for not setting the goals, Barriers to reach goals, Identify Barriers, Effective goal setting process & Practise Effective goal setting

**4.0 Positive attitude**

concept effects of negative attitude, attitude of self and peers, effect of peers on self and vice-versa, steps to enhance positive attitude, strategies to enhance positive attitude

**5.0 Managing emotions**

Problem-definition, performance problems, Categorize the problems, barriers to the solutions to problems.

**6.0 Stress management**

concept of stress, Types of stress, causes of stress, reactions of stress, coping with stress, stress relaxing techniques, changing personality and cognitive patterns

**7.0 Time management**

Definition, significance of various Time stealers, Time management, strategies to set priorities, steps to overcome barriers, Time-Management skills- its advantages.

**8.0 Interpersonal skills**

Significance of Interpersonal skills, positive relationships- Advantages, negative relationships- Disadvantages

**9.0 Creativity**

Definition, Invention, Innovation, Novelty, Creative Thinking, observation and imitation, improvement, Expertise, skill, and motivation, components of Creativity, Convergent Thinking and Divergent Thinking, various steps involved in Scientific approach to creative thinking namely, Factors

affecting the creativity in Individuals, Vertical Thinking and Lateral Thinking.

**10.0 Problem solving and Decision making skills**

Definition, performance problems –analysis, categorizing, barriers to the solutions to problems.

**11.0 Assertive and non Assertive behaviour**

Types of Behaviours – their characteristics, need for controlling and avoiding aggressive behaviours, making and refusing an assertive request – their evaluation, importance of goal setting, method of giving feed back.

**12.0 Leadership skills**

Concept, importance, Role of a Leader in an Organization, Traits of an effective leader, Managing and leading, leadership styles-their comparison, theories of leadership, strategies to develop effective leadership, importance of Decision making, concept of ethical leadership and moral development.

**REFERENCE**

1. Robert Nlussier, Christopher F. Achua Leadership: Theory, Application, & Skill development: Theory, Application.

## MICROCONTROLLER APPLICATIONS LAB PRACTICE

<b>SUBJECT TITLE</b>	<b>: Microcontroller Applications Lab Practice</b>
<b>SUBJECT ODE</b>	<b>: EC-509</b>
<b>PERIODS/WEEK</b>	<b>: 03</b>
<b>PERIODS/SEMESTER</b>	<b>: 45</b>

**Rationale:** Microcontroller Applications Lab Practice is included in the same semester to ensure contiguity and give an opportunity for the students to reinforce their theoretical knowledge by practically verifying in the laboratory. care has been taken to match the Experiments with field requirements.

### TIME SCHEDULE

S. No.	EXPERIMENTS	No. of Periods
1.	Practice with Microcontroller Kit	06
2.	Practice Instruction set	09
3.	Implement Counters, Timers Interrupts and Flags	15
4	Practice Interfacing	15
<b>Total</b>		<b>45</b>

#### LIST OF EXPERIMENTS

#### I. Familiarization with Microcontroller Kit & Simulators

##### 1. Practice with microcontroller kits and Simulators

- Familiarize with 8051 Microcontroller Kit
- Familiarize with 8051 simulator EDSIM 51 ( or similar)
- Write small ALP to verify different register addressing techniques

##### II. 8051 Instruction set

##### 2. Practice **Arithmetic instructions of 8051**

- Write an ALP to demonstrate Addition , subtraction , division and multiplication of 8 bit numbers using immediate data access.
- Write an ALP to Add and Subtract 16 bit numbers
- Write an ALP to find the Square and Cube of a decimal number
- Write an ALP to find LCM of given 3 decimal numbers
- Write an ALP To find HCF of given 3 decimal numbers

##### 3. Practice **Data transfer instructions**

- Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X40-0X49 (without overlap)
- Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X35-0X39 (with overlap)
- Write an ALP to Block exchange – 10bytes of data between 0X30-0X39 to 0X40-0X49
- Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X1000-0X1009 (Internal to external memory or vice versa)

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##### 4. Practice **Data Manipulation**

- Find Smallest/Largest number in 10bytes of data from 0X30-0X39 (R3 – should store the smallest/largest number and R4 – should store address of the smallest/largest number)
- Search for an element in the 10 bytes of data from 0X30-0X39 (R3 =1, if element is found else R3=0)
- Sort 10bytes of data from 0X30-0X39 in Ascending order
- Sort 10bytes of data from 0X30-0X39 in Descending order

##### 5. Practice **Boolean & Logical instructions :**

- Find 2's complement of a number using (CPL) instruction
- Convert Packed to Unpacked BCD (bit Masking) Using (ANL) Instruction
- Convert ASCII to BCD Using(XRL) instruction.

##### III. Implement **Counters ,Timers Interrupts and Flags**

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6. Implement a HEX up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter)

a) implement BCD(00-99) up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter)

7. **Implement Delays and Timers**

a) Write a program in assembly language and in "C" produce required time delay a) by Using instructions only b) by Using Timers

b) Write a program in assembly language and C to verify Call and return instructions with port programming

c) Write a program in assembly language and C to verify Logical or Delay loop using Call and return instructions

8. **Use 8051 Interrupts and Flags**

Write a program to generate a square wave of 50 Hz on pin 1.2 . Assume that crystal frequency is 11.0592 MHz using timer.

IV. **Practice Interfacing Techniques**

9. **Micro controller interfacing**

a) Interfacing Switches and LEDS to 8051

i) Make an LED connected to port 1.5, light up for specific time on pressing a switch connected to port 2.3

ii) Write a Program to make an LED connected to pin 1.7 to blink at a specific rate

i ii) Connect a Relay in place of LED to control a AC 230 V Lamp

10. Interface 3-digit 7SEGMENT LED DISPLAY using timer for digit scan

a) Interface a Single DOTMATRIX DISPLAY and display the given number

11. Interface a (3x4 matrix) Key Board to 8051

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12. Control the direction of rotation of a small DC motor

13. Interface I<sup>2</sup>C BUS Device using DS1307 IC .

a) Interface a) ADC IC b) DAC IC

b) Interface Microcontroller serial interface to PC COM port

14. **Burn executable code into EPROM**

a) Burn executable code into flash memory for 89C51

**Competencies and Key Competencies**

Exp No	Name of the Experiment (No of Periods)	Competencies	Key Competencies
1	To practice with microcontroller kits and Simulators (3)  a) To Familiarize with 8051 Microcontroller Kit  b) To Familiarize with 8051 simulator EDSIM 51 ( or similar)  c) To Write small ALP to verify different register addressing techniques	<ul style="list-style-type: none"> <li>➤ Identify the component assemblies in the kit</li> <li>➤ Enter the ALP at the specified address and execute</li> <li>➤ Use the simulator for the same ALP and verify the register contents and the Flags</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the ALP at the specified address and execute</li> <li>▪ Use the simulator for the same ALP and verify the register contents and the Flags</li> </ul>
2	To Practice Arithmetic instructions of 8051 (3)  a) Write an ALP to demonstrate Addition , subtraction , division and multiplication of 8 bit numbers using immediate data access.  b) Write an ALP to Add and Subtract 16 bit numbers  c) Write an ALP to find the Square and Cube of a decimal number  d) Write an ALP to find LCM of given 3 decimal numbers  e) Write an ALP To find HCF of given 3 decimal numbers	<ul style="list-style-type: none"> <li>➤ Enter the ALP at the specified address and execute</li> <li>➤ Use Arithmetic Instructions</li> <li>➤ Use the simulator for the same ALP and verify the register contents</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the ALP at the specified address and execute</li> <li>▪ Use Arithmetic Instructions</li> <li>▪ Use the simulator for the same ALP and verify the register contents</li> </ul>

3	<p>To Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X40-0X49 (without overlap) (3)</p> <p>a) Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X35-0X39 (with overlap)</p> <p>b) Write an ALP to Block exchange – 10bytes of data between 0X30-0X39 to 0X40-0X49</p> <p>c) Write an ALP to Block move - 10bytes of data from 0X30-0X39 to 0X1000-0X1009 (Internal to external memory or vice versa)</p>	<ul style="list-style-type: none"> <li>➤ Enter the ALP at the specified address and execute</li> <li>➤ Use DATA Transfer Instructions</li> <li>➤ Use the simulator for the same ALP and verify the Memory contents</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the ALP at the specified address and execute</li> <li>▪ Use Arithmetic Instructions</li> <li>▪ Use the simulator for the same ALP and verify the register contents</li> </ul>
4	<p>To Practice Data Manipulation (3)</p> <p>a) To find Smallest/Largest number in 10bytes of data from 0X30-0X39 (R3 – should store the smallest/largest number and R4 – should store address of the smallest/largest number)</p> <p>b) To Search for an element in the 10 bytes of data from 0X30-0X39 (R3 =1, if element is found else R3=0)</p> <p>c) To Sort 10bytes of data from 0X30-0X39 in Ascending order</p> <p>d) To Sort 10bytes of data from 0X30-0X39 in Descending order</p>	<ul style="list-style-type: none"> <li>➤ Enter the ALP at the specified address and execute</li> <li>➤ Use Logical Instructions</li> <li>➤ Use the simulator for the same ALP and verify the result</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the ALP at the specified address and execute</li> <li>▪ Use Arithmetic Instructions</li> <li>▪ Use the simulator for the same ALP and verify the register contents</li> </ul>

5	<p>To implement a HEX up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter) (3)</p> <p>b) To implement BCD(00-99) up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter)</p>	<ul style="list-style-type: none"> <li>➤ Enter the ALP at the specified address and execute</li> <li>➤ Use timer/Counter</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the ALP at the specified address and execute</li> <li>▪ Use timer/Counter</li> </ul>
6	<p>To implement a HEX up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter) (3)</p> <p>a) To implement BCD(00-99) up/down counter - (Program should check value @R0=0X30, if 0X30=0 then up counter else down counter)</p>	<ul style="list-style-type: none"> <li>➤ Enter the ALP at the specified address and execute</li> <li>➤ Use timer/Counter</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the ALP at the specified address and execute</li> <li>▪ Use timer/Counter</li> </ul>
7	<p>To Implement Delays using Timers (3)</p> <p>a) To write a program in assembly language and in "C" produce required time delay a) by Using instructions only b) by Using Timers</p> <p>b)To write a program in assembly language and C to verify Call and return instructions with port programming</p> <p>c) To write a program in assembly language and C to verify Logical or Delay loop using Call and return</p>	<ul style="list-style-type: none"> <li>➤ Enter the "C" program in the simulator</li> <li>➤ Debug and execute</li> <li>➤ Use CALL and RET Instructions</li> <li>➤ Verify STACK Contents in the Simulator</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the "C" program in the simulator</li> <li>▪ Debug and execute</li> <li>▪ Use CALL and RET Instructions</li> <li>▪ Verify STACK Contents in the Simulator</li> </ul>

8	<p>To Use 8051 Interrupts and Flags (3)</p> <p>To Write a program to generate a square wave of 50 Hz on pin 1.2 . Assume that crystal frequency is 11.0592 MHz using timer.</p>	<ul style="list-style-type: none"> <li>➤ Enter the ALP at the specified address</li> <li>➤ Calculate the</li> <li>➤ Timer Data to be loaded for 50 Hz</li> <li>➤ Execute the Program</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the ALP at the specified address</li> <li>▪ Calculate the</li> <li>▪ Timer Data to be loaded for 50 Hz</li> <li>▪ Execute the Program</li> </ul>
9	<p>Micro controller interfacing</p> <p>a) Interfacing Switches and LEDS to 8051 (3)</p> <p>i) To make an LED connected to port 1.5, light up for specific time on pressing a switch connected to port 2.3</p> <p>ii) To Write a Program to make an LED connected to pin 1.7 to blink at a specific rate</p> <p>ii) To Connect a Relay in place of LED to control a AC 230 V Lamp</p>	<ul style="list-style-type: none"> <li>➤ Enter the ALP at the specified address</li> <li>➤ Rig up the circuit</li> <li>➤ Execute the Program</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the ALP at the specified address</li> <li>▪ Rig up the circuit</li> <li>▪ Execute the Program</li> </ul>
10	<p>To Interface 3-digit 7SEGMENT LED DISPLAY using timer for digit scan (3)</p> <p>a) To Interface a Single DOTMATRIX DISPLAY and display the given number</p> <p>b) To Interface a (3x4 matrix) Key Board to 8051</p> <p>c)To control the direction of rotation of a small DC motor</p>	<ul style="list-style-type: none"> <li>➤ Rig Up the circuit</li> <li>➤ Enter The C Program in the simulator</li> <li>➤ Debug and Execute</li> </ul>	<ul style="list-style-type: none"> <li>▪ Rig Up the circuit</li> <li>▪ Enter The C Program in the simulator</li> <li>▪ Debug and Execute</li> </ul>
11	<p>To Interface a (3x4 matrix) Key Board to 8051 (3)</p>	<ul style="list-style-type: none"> <li>➤ Rig Up the circuit</li> <li>➤ Enter The C Program in the simulator</li> <li>➤ Debug and Execute</li> </ul>	<ul style="list-style-type: none"> <li>▪ Rig Up the circuit</li> <li>▪ Enter The C Program in the simulator</li> <li>▪ Debug and Execute</li> </ul>

12	To control the direction of rotation of a small DC motor (3)	<ul style="list-style-type: none"> <li>➤ Rig Up the circuit</li> <li>➤ Enter The C Program in the simulator</li> <li>➤ Debug and Execute</li> </ul>	<ul style="list-style-type: none"> <li>▪ Rig Up the circuit</li> <li>▪ Enter The C Program in the simulator</li> <li>▪ Debug and Execute</li> </ul>
13	To interface I <sup>2</sup> C BUS Device using DS1307 IC . (6)  a) To interface i) ADC IC ii) DAC IC  b) To interface Microcontroller serial interface to PC COM port	<ul style="list-style-type: none"> <li>➤ Rig Up the circuit</li> <li>➤ Enter The C Program in the simulator</li> <li>➤ Debug and Execute</li> </ul>	<ul style="list-style-type: none"> <li>▪ Rig Up the circuit</li> <li>▪ Enter The C Program in the simulator</li> <li>▪ Debug and Execute</li> </ul>
14	To Burn executable code into EPROM (3)  b) To burn executable code into flash memory for 89C51	<ul style="list-style-type: none"> <li>➤ Compile the C Program</li> <li>➤ Use the Programmer SW to Load the .HEX file into the Programmer Memory</li> <li>➤ To burn the code into EPROM/FLASH Memory of Controller</li> <li>➤ To SECURE the CODE by programming the LOCK feature</li> </ul>	<ul style="list-style-type: none"> <li>▪ Compile the C Program</li> <li>▪ Use the Programmer SW to Load the .HEX file into the Programmer Memory</li> <li>▪ To burn the code into EPROM/FLASH Memory of Controller</li> <li>▪ To SECURE the CODE by programming the LOCK feature</li> </ul>

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**FIELD PRACTICES**

<b>Subject Title</b>	:	<b>Field Practices</b>
<b>Subject code</b>	:	<b>EC-510</b>
<b>Periods/Week</b>	:	<b>07</b>
<b>Periods/Semester</b>	:	<b>105</b>

**Rationale:** Field practices subject is introduced as an alternate for industrial Training. This course is aimed at imparting same skills a student would acquire in the industry during the initial training period. In other words, an industry-like environment is simulated in the institution during this course to prepare the students for industry.

**TIME SCHEDULE**

S. No.	EXPERIMENT	No. of Periods
1.	Standard practices in the Industry	10
2.	Manufacturing	35
3.	Maintenance & Servicing	36
4	Organising	12
5	Documentation & Data processing	12
	Total	105

**Note :**

- i), **All the seven periods should be conducted on the same day for practice and to ensure contiguity.**
- ii) **General List Of Industry Practices are mentioned ( Other Industry practices may be added)**
- I. **Standard practices in the Industry**

- 
1. Practice Industrial Safety, First Aid, dress code, tie, shoe etc...)
    - i) To Keep workplace clean and tidy.
    - ii) To handle material with due precautions and care
    - iii) To maintain/house keeping the Laboratories/work area
  - iv) To follow Industry Mannerisms and Etiquette ( Greeting , Smiling , Shaking hands - Polite conversation, Requesting etc) –To practice the use first aid and fire extinguishers
- II. Manufacturing**
2. a) carry out following activities
    - i) Prepare wires ii) Practice wire bunching iii) Make wire tips/joints iv) Keep the component set ready for population on PCB
  - b) Set up layout for work space for fabrication .
  - c) Supervise Manufacturing/ Testing activities.
3. Practice soldering of SMD components
  4. Design /Prepare drawing for an electronic circuit/ equipment
    - i) Manually
    - ii) Using software tools
  5. Fabricate /Rig up Prototype circuit
    - i) To prepare circuit boards for the experiments mentioned in the curriculum and test.
  6. Prepare required test jigs or circuits for the above and test
  7. Trouble shoot the faults in the equipment using CRO, DMM, Logic Analyzer etc.
  8. Carry out Reverse Engineering(Decode the circuit from a circuit board and interpret/identify the circuit
  9. Follow the standard procedures/Instructions given in the Equipment manual to operate and set up the equipment
  10. Work with sophisticated tools/equipment used in electronic industry as per standard procedure
  11. Use software tools like Pspice , Multisim , Matlab etc and design the circuits

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12. Carry out Quality assurance Tests
- III. Maintenance & Servicing**
13. Maintain
    - a) Electrical wiring/equipment in the laboratory
    - b) Institute Earthing
    - c) UPS Batteries
  14. Maintain/Troubleshoot computers and Computer Networks in the institute
  15. Install and Test equipment like i) UPS ii) inverters, iii) Servo stabilizers
- IV. Organising**
16. Prepare
    - i) Inventory,
    - ii) follow industry procedures,
    - iii) Maintain log
    - iv) housekeeping v) Documentation
  17. Carry out market survey to find the resources , Equipment suppliers etc.
  18. Organize seminars , Events and presentations.
    - i) To Set up Computer-LCD projector / PA system , etc
- I. Documentation & Data processing**
19. practice Data processing on computer
    - i) Browse the internet and search for the most relevant information on latest trends in communication engineering (or any other engineering topic) and prepare a report /presentation
  20. Prepare Project reports/Manuals for the kits prepared



**Competencies and Key Competencies to be achieved**

Exp No	Name of the Experiment	Competencies	Key Competencies
1	To Practice Industrial Safety, First Aid, dress code, tie, shoe etc...) i) To Keep workplace clean and tidy. ii) To maintain the Laboratories iii) To follow Industry Mannerisms and Etiquette ( Greeting , Smiling , Shaking hands - Polite conversation, Requesting etc) – iv) To practice the use first aid and fire extinguishers	<ul style="list-style-type: none"> <li>➤ Clean the equipment</li> <li>➤ Follow Industry mannerisms</li> <li>➤ Use first aid &amp; act under emergencies</li> <li>➤ Maintain Laboratories</li> </ul>	<ul style="list-style-type: none"> <li>▪ Follow Industry mannerisms</li> <li>▪ Maintain Laboratories</li> <li>▪ Use first aid &amp; act under emergencies</li> </ul>
2	To carryout following activities i) prepare wires ii) Practice wire bunching iii) Make wire tips/joints iv) Keep the component set ready for population on PCB  b) To Prepare layout for workspace to carry fabrication  c) To Supervise fabrication activities	To prepare <ul style="list-style-type: none"> <li>➤ Wire tips</li> <li>➤ Bunching</li> <li>➤ Select components</li> <li>➤ Set up experiment</li> <li>➤ Supervise</li> </ul>	<ul style="list-style-type: none"> <li>▪ To prepare</li> <li>▪ Wire tips</li> <li>▪ Bunching</li> <li>▪ Select components</li> <li>▪ Set up experiment</li> <li>▪ Supervise</li> </ul>
3	To Practice soldering of SMD components	<ul style="list-style-type: none"> <li>➤ Handle SMD components</li> <li>➤ Solder SMD components with proper precautions</li> <li>➤ Testing the soldered joints</li> </ul>	<ul style="list-style-type: none"> <li>▪ Handle SMD components</li> <li>▪ Solder SMD components with proper precautions</li> <li>▪ Testing the soldered joints</li> </ul>

4	To Design /Prepare drawing for an electronic circuit/ equipment i) Manually ii) Using software tools	<ul style="list-style-type: none"> <li>➤ Prepare drawings /Circuits and layouts both manually and by using computer</li> </ul>	<ul style="list-style-type: none"> <li>▪ Prepare drawings /Circuits and layouts both manually and by using computer</li> </ul>
5	To fabricate /Rig up Prototype circuit	<ul style="list-style-type: none"> <li>➤ To prepare prototypes</li> <li>➤ Carry out necessary modifications</li> <li>➤ Testing</li> <li>➤ Troubleshooting</li> <li>➤ Search resources</li> </ul>	<ul style="list-style-type: none"> <li>▪ To prepare prototypes</li> <li>▪ Carry out necessary modifications</li> <li>▪ Testing</li> <li>▪ Troubleshooting</li> <li>▪ Search resources</li> </ul>
6	To prepare required test jigs or circuits for the above and test	<ul style="list-style-type: none"> <li>➤ Prepare/Design suitable test jigs</li> <li>➤ Test the circuits</li> </ul>	<ul style="list-style-type: none"> <li>▪ Prepare/Design suitable test jigs</li> <li>▪ Test the circuits</li> </ul>
7	To Trouble shoot the faults in the equipment using 4 Channel DSCRO DMM, Logic Analyzer Spectrum analyzer etc.	<ul style="list-style-type: none"> <li>➤ Identify the fault</li> <li>➤ Troubleshoot</li> <li>➤ Replace/Substitute</li> <li>➤ Rectify the problem</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify the fault</li> <li>▪ Troubleshoot</li> <li>▪ Replace/Substitute</li> <li>▪ Rectify the problem</li> </ul>
8	To carry out Reverse Engineering(Decode the circuit from a circuit board and interpret/identify the circuit	<ul style="list-style-type: none"> <li>➤ Reading the circuit Diagrams</li> <li>➤ Identifying the circuit in the PCB</li> <li>➤ Decoding the circuit</li> <li>➤ Preparing a drawing</li> <li>➤ Verifying the drawing</li> <li>➤ Implement the circuit</li> <li>➤ Testing the circuit</li> <li>➤ Modifying</li> <li>➤ Prepare prototype</li> </ul>	<ul style="list-style-type: none"> <li>▪ Reading the circuit Diagrams</li> <li>▪ Identifying the circuit in the PCB</li> <li>▪ Decoding the circuit</li> <li>▪ Preparing a drawing</li> <li>▪ Verifying the drawing</li> <li>▪ Implement the circuit</li> <li>▪ Testing the circuit</li> <li>▪ Modifying</li> <li>▪ Prepare prototype</li> </ul>
9	To follow the standard procedures/Instructions given in the Equipment manual to operate and set up the equipment	<ul style="list-style-type: none"> <li>➤ Read the Instructions and Follow</li> <li>➤ operate the equipment as per procedure</li> <li>➤ Verify the results</li> </ul>	<ul style="list-style-type: none"> <li>▪ Read the Instructions and Follow</li> <li>▪ operate the equipment as per procedure</li> <li>▪ Verify the results</li> </ul>
10	To work with sophisticated tools/equipment used in electronic industry as per standard procedure	<ul style="list-style-type: none"> <li>➤ work with sophisticated tools/equipment used in electronic industry as per standard procedure</li> <li>➤ Follow due precautions</li> </ul>	<ul style="list-style-type: none"> <li>▪ work with sophisticated tools/equipment used in electronic industry as per standard procedure</li> <li>▪ Follow due precautions</li> </ul>

11	To use software tools like Pspice , Multisim , Matlab or any other simulation softwares. and design the circuits	<ul style="list-style-type: none"> <li>➤ use software tools like Pspice , Multisim , Matlab etc for designing the circuits</li> <li>➤ Implement the circuit</li> <li>➤ Modify using software tools</li> </ul>	<ul style="list-style-type: none"> <li>▪use software tools like Pspice , Multisim , Matlab etc for designing the circuits</li> <li>▪Implement the circuit</li> <li>▪Modify using software tools</li> </ul>
12	To Carry out Quality assurance Tests	<ul style="list-style-type: none"> <li>➤ Use test equipment</li> <li>➤ Follow pre testing &amp;Post testing procedures</li> <li>➤ Troubleshoot Design</li> </ul>	<ul style="list-style-type: none"> <li>▪Use test equipment</li> <li>▪Follow pre testing &amp;Post testing procedures</li> <li>▪Troubleshoot Design</li> </ul>
13	To maintain a) Electrical wiring/equipment in the laboratory b) Institute Earthing c) UPS Batteries	<ul style="list-style-type: none"> <li>➤ Replace fuses-</li> <li>➤ Repair Power cords</li> <li>➤ Replace faulty Sockets and Plugs</li> <li>➤ Replace faulty Tube lights/Lamps</li> <li>➤ Maintain earthing</li> <li>➤ Maintain UPS Batteries</li> </ul>	<ul style="list-style-type: none"> <li>▪Replace fuses-</li> <li>▪Repair Power cords</li> <li>▪Replace faulty Sockets and Plugs</li> <li>▪Replace faulty Tube lights/Lamps</li> <li>▪Maintain earthing</li> <li>▪Maintain UPS Batteries</li> </ul>
14	To maintain/Troubleshoot computers and Computer Networks in the institute	<ul style="list-style-type: none"> <li>➤ Act as Computer administrator in the computer lab</li> <li>➤ Maintain LAN</li> <li>➤ Install/Run Antivirus</li> <li>➤ Remove unwanted files</li> <li>➤ Rectify any computer problems</li> </ul>	<ul style="list-style-type: none"> <li>▪Act as Computer administrator in the computer lab</li> <li>▪Maintain LAN</li> <li>▪Install/Run Antivirus</li> <li>▪Remove unwanted files</li> <li>▪Rectify any computer problems</li> </ul>
15	To Install and Test equipment like i) UPS ii) inverters, iii) Servo stabilizers	<ul style="list-style-type: none"> <li>➤ Install Laboratory Equipment as per procedure</li> <li>➤ Install UPS</li> <li>➤ Make special wiring for UPS/Inverter</li> <li>➤ Install Servo Stabilizer</li> </ul>	<ul style="list-style-type: none"> <li>▪Install Laboratory Equipment as per procedure</li> <li>▪Install UPS</li> <li>▪Make special wiring for UPS/Inverter</li> <li>▪Install Servo Stabilizer</li> </ul>
16	To prepare i) Inventory ii) follow industry procedures, iii) Maintain log iv) housekeeping	<ul style="list-style-type: none"> <li>➤ Prepare Bill of materials</li> <li>➤ Material requirement</li> <li>➤ Place indent</li> <li>➤ Maintain log</li> <li>➤ Reporting</li> <li>➤ House keeping</li> </ul>	<ul style="list-style-type: none"> <li>▪Prepare Bill of materials</li> <li>▪Material requirement</li> <li>▪Place indent</li> <li>▪Maintain log</li> <li>▪Reporting</li> <li>▪House keeping</li> </ul>

17	To carry out market research to find the resources	<ul style="list-style-type: none"> <li>➤ Identify the product/component</li> <li>➤ Search for similar / same items</li> <li>➤ Compare features</li> <li>➤ Check thePrice/cost effectiveness</li> <li>➤ Test the product for suitability</li> <li>➤ Find the Suppliers</li> </ul>	<ul style="list-style-type: none"> <li>▪Identify the product/component</li> <li>▪Search for similar / same items</li> <li>▪Compare features</li> <li>▪Check the cost effectiveness</li> <li>▪Test the product for suitability</li> <li>▪Find the Suppliers</li> </ul>
18	To organize seminars Events and presentations.  i) To Set up Computer-LCD projector / PA system , etc	<ul style="list-style-type: none"> <li>➤ Organize Events/Seminars</li> <li>➤ Exhibit Leadership qualities</li> <li>➤ Show Creativity</li> <li>➤ Time management skills</li> <li>➤ Set up laptop LCD projector etc for the event</li> </ul>	<ul style="list-style-type: none"> <li>▪Organize Events/Seminars</li> <li>▪Exhibit Leadership qualities</li> <li>▪Demonstrate Creativity</li> <li>▪Use Time management skills</li> <li>▪Set up laptop LCD projector etc for the event</li> </ul>
19	To practice Data processing on computer  i) To browse the internet and search for the most relevant information on latest trends in communication engineering (or any other engineering topic) and prepare a report /presentation	<ul style="list-style-type: none"> <li>➤ Use computer</li> <li>➤ Browse internet &amp;search</li> <li>➤ Download information</li> <li>➤ Convert formats</li> <li>➤ Prepare reports</li> <li>➤ Prepare Presentation</li> <li>➤ Save them into cloud storage</li> </ul>	<ul style="list-style-type: none"> <li>▪Use computer for</li> <li>▪Checking mails/assignments/ notices etc</li> <li>▪Upload /Download information</li> <li>▪Search the web for required information</li> <li>▪Prepare laboratory Documentation</li> </ul>
20	To prepare Project reports/Manuals for the kits prepared	<ul style="list-style-type: none"> <li>➤ Use MS Word</li> <li>➤ Browse and search the internet</li> <li>➤ Download information</li> <li>➤ Convert formats</li> </ul>	<ul style="list-style-type: none"> <li>▪Use MS Word</li> <li>▪Browse and search the internet</li> <li>▪Download information</li> <li>▪Convert formats</li> </ul>

# VI SEMESTER

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## DIPLOMA IN ELECTRONICS & COMMUNICATION ENGINEERING SCHEME OF INSTRUCTIONS AND EXAMINATIONS

### VI Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / Sem	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam	Total Marks
<b>THEORY:</b>								
EC- 601	Advanced Communication Systems	4	-	60	3	20	80	100
EC-602	Data communication & Computer Networking	4	-	60	3	20	80	100
EC - 603	Optical Fibre Communication	4	-	60	3	20	80	100
EC - 604	Computer Hardware	4	-	60	3	20	80	100
EC - 605	Advanced Microcontrollers & DSP	4	-	60	3	20	80	100
EC - 606	Digital Circuit Design through Verilog HDL	4	-	60	3	20	80	100
<b>PRACTICAL:</b>								
EC- 607	Computer HW, Networking & OFC Lab Practice	-	6	90	3	40	60	100
EC -608	Verilog HDL Programming Lab Practice	-	3	45	3	40	60	100
EC -609	Advanced Microcontroller Lab Practice	-	3	45	3	40	60	100
EC-610	Project work	-	6	90	3	40	60	100
<b>TOTAL</b>		<b>24</b>	<b>18</b>	<b>630</b>		<b>280</b>	<b>720</b>	<b>1000</b>

*Note:*

- Five local industrial visits / Interaction, one for each of the courses listed from EC 602 to EC 606 may be arranged to enable the students to have industry exposure.
- Duration: one week The students need to submit a write up of two to three pages mentioning all salient learning experiences like advance in technology, its evaluation, application, advantages & disadvantages, expected changes in future etc.,.
- Industries: Embedded systems ,Power electronics, Cellular communication etc

## ADVANCED COMMUNICATION SYSTEMS

<b>Subject Title</b>	:	<b>Advanced Communication Systems</b>
<b>Subject Code</b>	:	<b>EC-601</b>
<b>Periods/Week</b>	:	<b>04</b>
<b>Periods/Semester</b>	:	<b>60</b>

**Rationale:** Advanced Communication systems subject is a core subject aimed to impart sufficient theoretical inputs in Transmission lines Microwave devices, Radars, and satellite communication to keep in pace with the fast changing technology.

### TIME SCHEDULE

SI	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Transmission Lines	10	16	2	1
2	Microwave components and Tubes	14	26	2	2
3	Microwave semiconductor devices and MICs	10	16	2	1
4	RADAR	13	26	2	2
5	Satellite Communication	13	26	2	2
	<b>Total</b>	60	110	10	8

### OBJECTIVES

**Upon completion of the course the student should be able to**

**Understand the working of Transmission Lines**

- 1.1 List different types of Transmission Lines.
- 1.2 Draw the Electrical equivalent circuit of a Transmission line.
- 1.3 Define Primary and Secondary constants of a Transmission line.
- 1.4 Explain the transmission line equations
- 1.5 Derive the expressions for attenuation and phase constants
- 1.6 Define group and phase velocities in transmission lines

- 1.7 Explain the concept of Infinite Line
- 1.8 Define lossless Line
- 1.9 List two types of distortions in transmission lines
- 1.10 Derive the condition for distortion less line
- 1.11 Define Reflection coefficient and SWR
- 1.12 Derive the relation between Reflection Coefficient & SWR
- 1.13 Explain the need for impedance matching in transmission lines.
- 1.14 Impedance Matching using quarter wave transmission line.
- 1.15 Explain single stub matching in transmission lines.

### 2.0 Microwave Components and Tubes

- 2.1 State the need for microwave devices.
- 2.2 List the various bands in microwave frequency range.
- 2.3 Define rectangular and circular waveguides.
- 2.4 Explain Boundary conditions for Rectangular waveguides
- 2.5 Explain various modes of operation of waveguides.
- 2.6 Define dominant mode and cut-off wavelength in rectangular waveguide.
- 2.7 Calculate the cut-off frequency, cut-off wavelength, guide wavelength, phase velocity, group velocity and characteristic impedance in rectangular waveguide.
- 2.8 State the need for microwave bends, corners and twists
- 2.9 List different T-Junctions
- 2.10 Explain the working of E-Plane Tee and H-Plane Tee.
- 2.11 Explain the working of Magic Tee
- 2.12 State the need for isolators and circulators
- 2.13 Explain the working of Isolator
- 2.14 Explain the working of Circulator.
- 2.15 Explain the construction and working of Multi cavity Klystron amplifier.
- 2.16 List the applications of Multi cavity Klystron and Cavity resonator
- 2.17 Explain the construction and working of Reflex Klystron oscillator
- 2.18 List the applications of Reflex Klystron.

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- 2.19 Explain the construction and working of Magnetron oscillator
  - 2.20 List the applications of Magnetron.
  - 2.21 Explain the construction and working of Travelling Wave Tube amplifier
  - 2.22 List the applications of TWTA.

### **3.0 Microwave Semiconductor Devices and MICs**

- 3.1 State the need for microwave semiconductor devices
- 3.2 Distinguish between ordinary semiconductor devices and microwave semiconductor devices.
- 3.3 Define Gunn Effect.
- 3.4 Explain constructional features and working principle of GUNN diode
- 3.5 List the applications of GUNN diode.
- 3.6 State the Tunnelling phenomena
- 3.7 Explain the working of Tunnel diode
- 3.8 List the other semiconductor microwave devices like IMPATT and TRAPPAT diodes
- 3.9 List the applications of IMPATT & TRAPATT diodes
- 3.10 List the advantages of microwave semiconductor devices over electron beam devices.
- 3.11 State the need for Microwave Integrated Circuits (MICs)
- 3.12 Explain the working of micro-strip antenna
- 3.13 List the applications of micro-strip antennas.

### **4.0 Understand the principles of RADAR**

- 4.1 State the basic principle of Radar with a block diagram.
- 4.2 Derive the basic Radar range equation.
- 4.3 Predict the range performance factors from range equation.
- 4.4 Draw and explain the block diagram of pulsed Radar system.
- 4.5 State the need for duplexer in Radar
- 4.6 Explain the working of branch type Duplexer with sketch.
- 4.7 List the types of indicators used in radar systems.

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- 4.8 Briefly explain A-scope and PPI displays.
  - 4.9 State the disadvantages of pulsed radar.
  - 4.10 Explain the Doppler Effect.
  - 4.11 Explain the principle of CW radar
  - 4.12 Draw and explain the block diagram of CW radar.
  - 4.13 List the limitations of a CW Radar
  - 4.14 Explain the working of FM CW Radar.
  - 4.15 Explain the application of FM CW Radar as altimeter
  - 4.16 Draw and explain the block diagram of MTI Radar.
  - 4.17 List the applications of various Radar systems.
  - 4.18 Explain the principle of instrument landing system.

### **5.0 Understand the principle of working of satellite communication**

- 5.1 State the need for satellite communication
- 5.2 Define foot print of a satellite
- 5.3 Explain the basic structure and uses of microwave links.
- 5.4 Explain fixed microwave link with block diagram.
- 5.5 List the advantages of satellite communication over terrestrial radio communication.
- 5.6 Explain geostationary satellites and satellites in lower orbits.
- 5.7 List the advantages and disadvantages geostationary satellites.
- 5.8 Define azimuth and elevation with reference to satellites.
- 5.9 Define terms apogee and perigee.
- 5.10 Define uplink frequency and down link frequency
- 5.11 List the functions of a transponder
- 5.12 List three types transponders used in satellites (single conversion, double conversion and regenerative)
- 5.13 Explain the working of the three types of transponders.
- 5.14 Explain bandwidth allocation of a satellite.
- 5.15 List the three methods of increasing satellite capacity

- 5.16 Explain the methods of increasing channel capacity. Frequency reuse, polarization and spatial isolation).
- 5.17 Draw and explain the block diagram of communication satellite.
- 5.18 Draw and explain the block diagram of Earth station.
- 5.19 Explain the working of GPS
- 5.20 List the applications of satellites.

## COURSE CONTENT

### 1. Transmission Lines:

types of Transmission Lines- Electrical equivalent circuit of a Transmission line- Primary and Secondary constants of a Transmission line-Transmission line equations-Expressions for attenuation and phase constants-Group and phase velocities in transmission lines-Concept of Infinite Line-Lossless Line-Types of distortions in transmission lines-Condition for distortion less line- Reflection coefficient and SWR-Relation between Reflection Coefficient & SWR-Need for impedance matching in transmission lines-Impedance Matching using quarter wave transmission line- Single stub matching in transmission lines.

### 2. Microwave components and Tubes:

Need for microwave devices-Variou bands in microwave frequency range-Rectangular and circular waveguides- Boundary conditions for Rectangular waveguides-Variou modes of operation of waveguides-Dominant mode and cut-off wavelength in rectangular waveguide- Calculation of cut-off frequency, cut-off wavelength, guide wavelength, phase velocity, group velocity and characteristic impedance in rectangular waveguide-Need for microwave bends, corners and twists- T-Junctions-Working of E-Plane Tee and H-Plane Tee- Working of Magic Tee-Need for isolators and circulators- Working of Isolator- Working of Circulator-Construction and working of Multi cavity Klystron amplifier- Applications of Multi cavity Klystron-Cavity resonator- Construction and working of Reflex Klystron oscillator- Applications of Reflex Klystron- Construction and working of Magnetron oscillator- Applications of Magnetron-Construction and working of Travelling Wave Tube amplifier-Applications of TWTA.

### 3. Microwave Semiconductor Devices and MICs:

Need for microwave semiconductor devices-Ordinary semiconductor devices and microwave semiconductor devices-Gunn Effect-Explain constructional features and working principle of GUNN diode-

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Applications of GUNN diode- Tunnelling phenomena-Working of Tunnel diode-Other semiconductor microwave devices like IMPATT and TRAPPAT diodes-Applications of IMPATT & TRAPATT diodes-Advantages of microwave semiconductor devices over electron beam devices-Need for Microwave Integrated Circuits (MICs)-Working of micro-strip antenna-Applications of micro-strip antennas.

### 4. Principles of RADAR:

Basic principle of Radar with a block diagram-Basic Radar range equation-Range performance factors from range equation-Block diagram of pulsed Radar system-Need for duplexer in Radar-Working of branch type Duplexer with sketch-Types of indicators used in radar systems- A-scope and PPI displays-Disadvantages of pulsed radar- Doppler Effect-Explain the principle of CW radar-Block diagram of CW radar-Limitations of a CW Radar-Working of FM CW Radar-Application of FM CW Radar as altimeter-Block diagram of MTI Radar-Applications of various Radar systems-Principle of instrument landing system.

### 5. Satellite Communication:

Need for satellite communication-Foot print of a satellite-Basic structure and uses of microwave links-Fixed microwave link with block diagram-Advantages of satellite communication over terrestrial radio communication-Geostationary satellites and satellites in lower orbits-Advantages and disadvantages geostationary satellites-Azimuth and elevation with reference to satellites-Apogee and perigee-Uplink frequency and down link frequency-Functions of a transponder-Types of transponders used in satellites (single conversion, double conversion and regenerative)-Working of the three types of transponders-Bandwidth allocation of a satellite-Methods of increasing satellite capacity-Methods of increasing channel capacity- Frequency reuse, polarization and spatial isolation)-Block diagram of communication satellite-Block diagram of Earth station-Working of GPS-Applications of satellites.

## REFERENCE BOOKS:

1. Electronic communication system by George Kennedy, TMH
2. Electronic communications systems by Roy Blake, Thomson Delmar,2002.
3. Introduction to RADAR Engineering by Merryll I Skolnik. TMH
4. Microwave Integrated circuits by Samuel Leo 3 ed.-Prentice Hall

## DATA COMMUNICATIONS AND COMPUTER NETWORKS

<b>Subject Title</b>	:	<b>Data Communications and Computer Networks</b>
<b>Subject Code</b>	:	<b>EC-602</b>
<b>Periods/Week</b>	:	<b>04</b>
<b>Periods/Semester</b>	:	<b>60</b>

**Rationale:** The Knowledge of Data communications and communication and computer networks is essential for Electronics & Communication engineering students as everything from Banking to Railway ticket booking being completely computerized there are ample opportunities for the students to get good jobs .

### TIME SCHEDULE

Sl	Major Topics	No. of periods	Marks	Short Answer Questions	Essay Questions
1	Basics of Data communication and OSI Layer	10	21	2	1 ½
2	Concepts of LAN & DLL Protocols	16	26	2	2
3	IP addressing & Network Layer Protocols	12	21	2	1 ½
4	WAN Protocols	10	21	2	1 ½
5	Web Applications & Network Security	12	21	2	1 ½
	<b>Total</b>	60	110	10	8

### OBJECTIVES

Upon completion of this course the student should be able to:

#### 1.0 Understand the Basics of Data communication & OSI Layer

1.1 Define data communication

- 1.2 State the need for data communication networking.
- 1.3 Distinguish between analog and digital data.
- 1.4 Define computer network and state its use.
- 1.5 Draw the ISO: OSI 7 layer architecture and explain the function of each layer.
- 1.6 List the different types of physical transmission media.
- 1.7 Explain the use of UTP, STP, Coaxial and Fiber optic cable in networking.
- 1.8 Define simplex, half-duplex and full-duplex communication.
- 1.9 Define bandwidth and throughput of a physical medium.
- 1.10 List the three types of switching techniques used in networking.
- 1.11 Explain circuit switching, packet switching and message switching.
- 1.12 Explain virtual circuit
- 1.13 Explain datagram approach in packet switching

#### 2.0 Understand the concepts of LAN and DLL protocols

- 2.1 Define Local area network and state its use.
- 2.2 Explain different network topologies (Bus, Star, Ring)
- 2.3 Compare the performances of the three topologies.
- 2.4 Explain the working of token ring network.
- 2.5 Explain the use of different networking devices such as repeater/hub, switch, bridge in constructing networks
- 2.6 Differentiate between repeater, switch and bridges.
- 2.7 State the need for protocols in computer networks.
- 2.8 State the need for framing in data link layer.
- 2.9 Explain the Ethernet frame format (IEEE 802.3).
- 2.10 State the need for flow control and error control protocols.
- 2.11 Explain the point-to-point protocol (PPP).
- 2.12 Explain CSMA/CD and CSMA/CA.
- 2.13 Explain the topology of wireless LAN and explain its frame format (IEEE 802.11).
- 2.14 Discuss FDDI and its properties.

- 2.15 Explain the Bluetooth technology.  
2.16 Mention the applications of WAP.

### 3.0 Understand IP addressing and Network layer protocols

- 3.1 Define the terms Internet and Intranet.  
3.2 Define internet protocol.  
3.3 Distinguish between connection oriented (virtual circuit) and connectionless (datagram) services.  
3.4 Classify the two types of Internet Protocol addressing IPv4 and IPv6 and state the need for IPv6.  
3.5 Explain classful addressing and classless addressing in IPv4.  
3.6 Explain Internet protocol version-6 (IPv6) addressing.  
3.7 Explain the use of routers in networking  
3.8 Explain the concept of routers and routing.  
3.9 Define cut through & store-and-forward and adaptive switch mechanisms.  
3.10 Explain the packet transfer mechanism using routers and IP address.  
3.11 Explain the internal architecture of ISP.  
3.12 Explain Dial up access, leased line, DSL, ISDN types of internet connectivity for an individual user/ organization.

### 4.0 Understand WAN protocols

- 4.1 Explain WAN architecture.  
4.2 List the three commonly used WAN technologies.  
4.3 Explain the working of X.25 WAN Protocol  
4.4 Explain the FRAME relay WAN Protocol.  
4.5 Explain ATM WAN Protocol.  
4.6 Explain the ARPANET and WWW.  
4.7 Explain different layers of TCP/IP.  
4.8 Explain the features of TCP.  
4.9 Explain Address Resolution Protocol (ARP).  
4.10 Mention the functions of port and sockets.

- 4.11 Explain the features of UDP  
4.12 Explain the connectivity of systems using TCP & UDP  
4.13 Explain the use of Gateways.

### 5.0 Understand Web Applications & Network security.

- 5.1 Mention the role of DNS server.  
5.2 Explain DNS namespace.  
5.3 Explain how email is transferred.  
5.4 Explain POP server and SMTP server.  
5.5 Explain file transfer operation using FTP  
5.6 Explain the working of Web server.  
5.7 Explain the working of Web browser.  
5.8 List HTTP commands.  
5.9 Explain the purpose of proxy server.  
5.10 Explain the use of hyperlinks.  
5.11 Explain the web browser architecture.  
5.12 Explain remote login.  
5.13 State the need for network security.  
5.14 List various security services.  
5.15 Define message confidentiality and message integrity  
5.16 Define message authentication and entity authentication.  
5.17 Explain key management, digital signature and firewalls in securing the networks

### COURSE CONTENT

#### 1.0 Basics of Data communication & OSI Layer

Data communication-Need for data communication networking-Analog and digital data-Computer network and state its use- ISO: OSI 7 layer architecture and explain the function of each layer-Types of physical transmission media-Use of UTP, STP, Coaxial and Fiber optic cable in networking-Simplex, half-duplex and full-duplex communication-Bandwidth and throughput of a physical medium-Types of switching



techniques used in networking-Circuit switching, packet switching and message switching-Virtual circuit and datagram approaches in packet switching.

## 2.0 Concepts of LAN and DLL protocols:

Local area network and state its use-Network topologies (Bus, Star, Ring)-Compare the performances of the three topologies-Working of token ring network-Use of different networking devices such as repeater/hub, switch, bridge in constructing networks-Repeater, switch and bridges-Need for protocols in computer networks-Need for framing in data link layer- Ethernet frame format (IEEE 802.3)-Need for flow control and error control protocols-Point-to-point protocol (PPP)- CSMA/CD and CSMA/CA-Topology of wireless LAN and its frame format (IEEE 802.11)- FDDI and its properties- Bluetooth technology-Applications of WAP.

## 3.0 IP addressing and Network layer protocols:

Internet and Intranet-Define internet protocol-Connection oriented (virtual circuit) and connectionless (datagram) services-Types of Internet Protocol addressing IPv4 and IPv6 and state the need for IPv6-Classful addressing and classless addressing in IPv4- Internet protocol version-6 (IPv6) addressing-Use of routers in networking-Concept of routers and routing-Cut through & store-and-forward and adaptive switch mechanisms-Packet transfer mechanism using routers and IP address-Internal architecture of ISP- Dial up access, leased line, DSL, ISDN types of internet connectivity for an individual user/ organization.

## 4.0 WAN protocols:

WAN architecture-Three commonly used WAN technologies-Working of X.25 WAN Protocol- FRAME relay WAN Protocol- ATM WAN Protocol-ARPANET and WWW-Different layers of TCP/IP-Features of TCP- Address Resolution Protocol (ARP)-Functions of port and sockets-Features of UDP-Connectivity of systems using TCP & UDP-Use of Gateways.

## 5.0 Understand Web Applications & Network security:

Role of DNS server- DNS namespace-Email transfer- POP server and SMTP server-File transfer operation using FTP-Working of Web server-Working of Web browser- HTTP commands-Purpose of proxy server-Use of hyperlinks-Web browser architecture-Remote login-Need for network security-Various security services-Message confidentiality and

message integrity-Message authentication and entity authentication-Key management, digital signature and firewalls in securing the networks.

## REFERENCE BOOKS:

1. Data and Computer Communications: William Stallings 7<sup>th</sup> edition. PHI .
2. Data Communication and Networking: Behrouz Forouzan 3rd edition.TMH.
3. Computer Networks by Tanenbaum. Andrew S.- Prentice Hall (India) Network .
4. Data Communication and Networking by Godbole TMH .
5. Communication Technology by Ata Elahi –Thomson Delmar.

## OPTICAL FIBER COMMUNICATION

<b>Subject Title</b>	:	<b>Optical Fibre Communication</b>
<b>Subject Code</b>	:	<b>EC-603</b>
<b>Periods/Week</b>	:	<b>04</b>
<b>Periods/Semester</b>	:	<b>60</b>

**Rationale:** Optical fibre communication is introduced as a separate course keeping fast growing trends of communication Engineering in mind and to meet the needs of Internet and Mobile communications industry

### TIME SCHEDULE

SI	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Basics of Fiber Optic Communication	10	16	2	1
2	Fiber Drawing Process and cabling	12	21	2	1 ½
3	Fiber Optic Components	12	26	2	2
4	Fiber Optic Devices	16	31	2	2½
5	WDM and Optical Networks	10	16	2	1
	<b>Total</b>	60	110	10	8

### OBJECTIVES

**Upon completion of the course the student should be able to**

#### **Understand the basics of Fibre Optic Communication**

- 1.1 Mention the advantages of Light wave communication system over EM wave systems.
- 1.2 Mention different optical spectral bands.
- 1.3 List the three generations of optical fibres
- 1.4 Explain the structure of optical fibre
- 1.5 Classify optical fibres based on refractive index profile

- 1.6 List the types of fibres based on core diameter
- 1.7 Define Single mode fibre (SMF)
- 1.8 Define multimode fibre (MMF)
- 1.9 List the advantages of SMFs over MMFs.
- 1.10 Define Snell's law in optics
- 1.11 Explain Total internal reflection in optical fibre.
- 1.12 Define acceptance angle
- 1.13 Define cone of acceptance.
- 1.14 Define numerical aperture (NA)
- 1.15 Derive the expression for NA in terms of core and cladding refractive indices.
- 1.16 List the advantages of optical fibres over other communication media

#### **2.0 Comprehend Fibre manufacturing and cabling**

- 2.1 List the four types of fibre drawing processes.
- 2.2 Explain Outside Vapour Phase Oxidation (OVPO) method
- 2.3 Explain Vapour phase Axial Deposition (VAD) method
- 2.4 Explain Modified Chemical Vapour Deposition (MCVD) method
- 2.5 Explain Plasma activated Chemical Vapour Deposition (PCVD) method.
- 2.6 List the different structural elements used for cable design.
- 2.7 List the two types of fibre optic cables.
- 2.8 Explain the characteristics of loose buffered cable
- 2.9 Explain the characteristics of tight buffered cable
- 2.10 List various losses in optical fibres.
- 2.11 Explain intrinsic and extrinsic losses
- 2.12 Classify different types of dispersions occur in optical fibres.
- 2.13 Explain Group velocity dispersion
- 2.14 Distinguish between inter modal and intra modal dispersion.
- 2.15 Define wave guide dispersion
- 2.16 Explain Polarization mode dispersion

**3.0 Understand Fibre Optic components and measuring instruments**

- 3.1 List various fibre optic components
- 3.2 Mention the need for connectors in FOC
- 3.3 State the function of splice in optical fibres
- 3.4 List two types of connectors.
- 3.5 List two types of splices.
- 3.6 Distinguish between mechanical splice and fusion splice
- 3.7 Predict different losses occur due to improper splicing
- 3.8 State the need for optical coupler/splitter
- 3.9 List different optical couplers
- 3.10 Explain the working of an optical coupler
- 3.11 State the need for isolator in OFC
- 3.12 Explain the working of isolator.
- 3.13 List different types of measuring/testing instruments used in the field of OFC.
- 3.14 Explain the use of optical power meters
- 3.15 State the use of optical attenuators
- 3.16 Explain the working of Optical Time Domain Reflectometer (OTDR).

**4.0 Know Fibre Optic Devices**

- 4.1 List two types of sources used in OFC
- 4.2 Mention salient features of an optical source
- 4.3 List two types of detectors used in OFC
- 4.4 Mention important features of an optical detector
- 4.5 Explain the construction and working of an LED
- 4.6 State the principle of LASER.
- 4.7 Explain the construction and working of LASER source.
- 4.8 List the differences between LED and LASER sources
- 4.9 Explain the construction and working of PIN photo diode.
- 4.10 Explain the construction and working of APD (Reach through APD)

- 4.11 Explain the need for repeater/regenerator in FOC
- 4.12 List three types of repeaters
- 4.13 Compare R, 2R and 3R repeaters.
- 4.14 Distinguish between repeaters and optical amplifiers.
- 4.15 Draw the block diagram of Erbium Doped Fibre Amplifier (EDFA).
- 4.16 Explain the principle and operation of EDFA
- 4.17 Draw the block diagram of fibre optic communication system and explain each block.
- 4.18 List the other applications of LED and LASER

**5.0 Understand Wavelength Division Multiplexing & Optical Networks**

- 5.1 Define optical time domain multiplexing
- 5.2 Mention the limitations of time division multiplexing (OTDM) in FOC
- 5.3 Define wavelength division multiplexing.
- 5.4 Explain the need for WDM in fibre optic communication
- 5.5 List two types of WDM systems
- 5.6 Distinguish between wideband WDM and narrowband WDM (DWDM)
- 5.7 Draw the block diagram of WDM system
- 5.8 Draw and explain the block diagram of DWDM
- 5.9 List three types of network topologies
- 5.10 Explain bus, ring and star topologies used in fibre optic networks.
- 5.11 State the use of fibre optic cables in local area networks.
- 5.12 Explain the use of fibres in Ethernet and Gigabit Ethernet.
- 5.13 Explain the use of fibre optic cables for use in submarines.
- 5.14 Explain the use of fibres in local telephone and cable T.V (FTTH)

**COURSE CONTENT****1.0 Basics of Fibre Optic Communication:**

Advantages of Light wave communication system over EM wave systems.-  
 Different optical spectral bands- Different generations of optical fibres-  
 Structure of optical fibre-Classification of optical fibres based on refractive

index profile- Types of fibres based on core diameter- Single mode fibre (SMF)- Multimode fibre (MMF)- Advantages of SMFs over MMFs- Snell's law in optics- Total internal reflection in optical fibre- Acceptance angle- Define cone of acceptance- Numerical aperture (NA)- Expression for NA in terms of core and cladding refractive indices- Advantages of optical fibres over other communication media

## 2.0 **Fibre manufacturing and cabling:**

Types of fibre drawing processes- Outside Vapour Phase Oxidation (OVPO) method- Vapour phase Axial Deposition (VAD) method- Modified Chemical Vapour Deposition (MCVD) method- Plasma activated Chemical Vapour Deposition (PCVD) method- Different structural elements used for cable design- Types of fibre optic cables- Characteristics of loose buffered cable

characteristics of tight buffered cable- Various losses in optical fibres- Intrinsic and extrinsic losses- Classification of dispersions that occur in optical fibres- Group velocity dispersion- Inter modal and intra modal dispersion- Wave guide dispersion- Polarization mode dispersion

## 3.0. **Fibre Optic components and measuring instruments:**

Various fibre optic components- Need for connectors in FOC- Function of splice in optical fibres- Types of connectors- Types of splices- Mechanical splice and fusion splice- different losses occur due to improper splicing- Need for optical coupler/splitter- Different optical couplers- Working of an optical coupler- Need for isolator in OFC - Working of isolator. different types of measuring/testing instruments used in the field of OFC- Use of optical power meters- Use of optical attenuators- Working of Optical Time Domain Reflectometer (OTDR)

## 4.0. **Fibre Optic Devices:**

Types of sources used in OFC- Features of an optical source- Types of detectors used in OFC- important features of an optical detector- Construction and working of an LED- Principle of LASER- Construction and working of LASER source- Differences between LED and LASER sources- Construction and working of PIN photo diode- construction and working of APD (Reach through APD)- Need for repeater/regenerator in FOC- Types of repeaters- Compare R, 2R and 3R repeaters- comparison of repeaters and optical amplifiers- block diagram of Erbium Doped Fibre Amplifier (EDFA)- principle and operation of EDFA- Block

diagram of fibre optic communication system - Other applications of LED and LASER

## 5.0 **Wavelength Division Multiplexing & Optical Networks:**

Optical time domain multiplexing- Limitations of time division multiplexing (OTDM) in FOC- Wavelength division multiplexing- Need for WDM in fibre optic communication- Types of WDM systems- Wideband WDM and narrowband WDM (DWDM)- Block diagram of WDM system- Block diagram of DWDM- Types of network topologies- Bus, Ring and Star topologies used in fibre optic networks- Fibre optic cables in local area networks- Fibres in Ethernet and Gigabit Ethernet- Optic cables for use in submarines- Fibres in local telephone and cable T.V (FTTH)

### **REFERENCE BOOKS:**

1. Optical Fiber Communications by Gerd Keiser McGraw Hill
2. Optical fiber and Laser- Principles and applications by Anuradha De, New Age publications
3. Optical fiber communications-Principles and practice, John M. Senior, Pearson Publications
4. Optical Fiber Communications and Its Applications – S.C.Gupta, 2004, PHI.

**COMPUTER HARDWARE**

<b>Subject Title</b>	:	<b>Computer Hardware</b>
<b>Subject Code</b>	:	<b>EC-604</b>
<b>Periods /Week</b>	:	<b>04</b>
<b>Periods/Semester</b>	:	<b>60</b>

**Rationale :** Computer Hardware subject is included in the V semester as the understanding of computer and its associated hardware is rather a necessity for survival in the present situation. Units are designed to give a clear understanding of Computer Hardware including Operating system. The knowledge of computer hardware makes the students eligible for jobs computer industry also.

**TIME SCHEDULE**

Sl.	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Mother Board	16	26	2	2
2	Computer Peripherals	12	26	2	2
3	Computer accessories	12	16	2	1
4	Windows OS	10	26	2	2
5	PC assembly & Software Installation	10	16	2	1
	<b>Total</b>	60	110	10	8

**OBJECTIVES**

**Upon completion of the course the student should be able to**

**Understand mother board and its features**

- 1.1 Draw the layout of components in the motherboard.
- 1.2 List various expansion slots available on the motherboard.
- 1.3 List the details of different chipsets.

- 1.4 Explain the processor interface and specifications of processor.
- 1.5 List different types of MEMORIES used in PC.
- 1.6 Explain the use of accelerated graphics port.
- 1.7 List different power supply connectors used for external devices.
- 1.8 Mention different types of serial, parallel and USB ports.
- 1.9 Give 4 reasons for popularity of USB ports
- 1.10 Give the connector details for printer, serial port, mouse, keyboard and USB.

**2.0 Comprehend the use of various computer peripherals**

- 2.1 Explain the Working of Hard Disk and data access.
- 2.2 Explain the storage of data on DVD
- 2.3 Explain the functioning of GRAPHIC CARD.
- 2.4 Explain the functioning of Network card and list its specifications.
- 2.5 List five specifications of monitor.
- 2.6 Explain the working of LCD monitor.
- 2.7 Explain the working principle of Optical mouse.
- 2.8 Explain the working principle of wireless keyboard and mouse.

**3.0 Understand the working of Computer Accessories**

- 3.1 List three types of printers.
- 3.2 Explain the working of dot matrix printer.
- 3.3 Explain the working of Laser printer.
- 3.4 Explain the working of inkjet printer.
- 3.5 Compare the merits of above Printers
- 3.6 Mention the applications of 3D Printers
- 3.7 Explain the working of scanners.
- 3.8 Explain OCR (optical character recognition).
- 3.9 Explain the JPEG and MPEG formats.
- 3.10 Explain the principle of DVD and Writer.

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- 3.11 List out the features of a LAPTOP
  - 3.12 Mention the differences between DESKTOP and LAPTOP.
  - 3.13 List five features of TABLET(TAB)
  - 3.14 List three features of FABLET
  - 3.15 List out important features of TOUCH SCREEN for modern gadgets.

#### **4.0 Understand the windows operating systems.**

- 4.1 Define the Power On Self Test (POST).
- 4.2 Explain the need for BIOS settings.
- 4.3 Explain the booting procedure.
- 4.4 Explain the usage of File Allocation Table (FAT).
- 4.5 Explain the structure and uses of Windows registry
- 4.6 State the purpose of INI and INF files
- 4.7 List important device classes in the device manager.
- 4.8 Explain the purpose of control panel icons
- 4.9 List major types of viruses and ways of removing viruses.
- 4.10 List any five Anti-Virus Software available in market

#### **5.0 Understand PC assembly and software installation**

- 5.1 Explain the steps in assembling a PC.
- 5.2 Explain CMOS set up.
- 5.3 Explain the process of formatting.
- 5.4 Mention the use FDISK.
- 5.5 Explain the use of disk manager and disk partitioning
- 5.6 List important operating systems and their features.
- 5.7 Explain Installation of WINDOWS OS
- 5.8 Mention the uses of Linux OS and ANDROID OS
- 5.9 Explain the need for installation of device drivers.
- 5.10 Explain blocking, damaged sectors, Defragmentation, and Removal of temporary files.

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- 5.11 List different microprocessors (INTEL, MOTOROLA) used for PC applications

### **COURSE CONTENT**

#### **1.0 Mother board and its features:**

Layout of components in the motherboard-Variious expansion slots available on the motherboard-Details of different chipsets-Processor interface and specifications of processor-Types of MEMORIES used in PC-Use of accelerated graphics port-Different power supply connectors used for external devices-Types of serial, parallel and USB ports-Reasons for popularity of USB ports-Connector details for printer, serial port, mouse, keyboard and USB.

#### **2.0 computer peripherals:**

Working of Hard Disk and data access-Storage of data on DVD-Functioning of GRAPHIC CARD- Functioning of Network card-Specifications- Specifications of monitor- Working of LCD monitor-Working principle of Optical mouse- Working principle of wireless keyboard and mouse.

#### **3.0. Computer Accessories**

Types of printers-Working of dot matrix printer.- Working of Laser printer-Working of inkjet printer-Compare the merits of above Printers-Applications of 3D Printers- Working of scanners- OCR (optical character recognition)- JPEG and MPEG formats- Principle of DVD and DVD Writer-Features of a LAPTOP- Differences between DESKTOP and LAPTOP-Features of TABLET(TAB)-Features of FABLET-Important features of TOUCH SCREEN for modern gadgets.

#### **4.0. Windows operating systems.**

Power On Self Test (POST)- Need for BIOS settings- Booting procedure-File Allocation Table (FAT)- Structure and uses of Windows registry-Purpose of INI and INF files- Device classes in the device manager-Purpose of control panel icons- Types of viruses -Ways of removing viruses- Anti-Virus Software

## 5.0 PC assembly and software installation

Steps in assembling a PC- CMOS set up- Process of formatting- Use of FDISK- Disk manager and disk partitioning- Operating systems and their features- Installation of WINDOWS OS - Uses of Linux OS and ANDROID OS- Need for installation of device drivers- blocking, damaged sectors, Defragmentation, and Removal of temporary files- Different microprocessors (INTEL, MOTOROLA) used for PC applications.

### REFERENCE BOOKS:

1. Peter Norton's new inside the PC by Peter Norton, Scott Clark, PHI
2. Microprocessors, PC Hardware and interfacing by N. Mathivanan PHI
3. Trouble shooting your PC by M. David Stone and Alfred Poor, PHI
4. Enhanced guide to managing and maintaining your PC-Third Edition, Thomson IBM PC and CLONES - B.Govindrajalu Tata McGrawhill Publishers
5. Computer Installation and Servicing - D.Balasubramanian Tata McGraw Hill , 2005
6. Computer Installation and Troubleshooting- M.Radhakrishnan ISTE- Learning Materials 2001
7. The complete PC upgrade and Maintenance by Mark Minasi BPB Publication

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## ADVANCED MICRO CONTROLLERS & DSP

<b>Subject title</b>	:	<b>Advanced Micro Controllers &amp; DSP</b>
<b>Subject code</b>	:	<b>EC-605</b>
<b>Periods per week</b>	:	<b>04</b>
<b>Periods / Semester</b>	:	<b>60</b>

**Rationale:** The course Advanced microcontrollers & DSP is introduced in the VI semester keeping in view the vast developments in the field of microcontrollers. This helps the students to get good job opportunities and have them an edge over others .

### TIME SCHEDULE

Sl	Major Topics	Periods	Weightage of Marks	Short Type	Essay Type
1	PIC micro controllers	12	26	2	2
2	Mcs-96 family 16 bit Microcontrollers	12	26	2	2
3	ARM micro controllers	12	26	2	2
4	DSP processor basics	15	16	2	1
5	Embedded systems and RTOS basics	9	16	2	1
	<b>TOTAL</b>	<b>60</b>	<b>110</b>	<b>10</b>	<b>8</b>

**OBJECTIVES:** On completion of the study of the subject a student should be able to comprehend the following:

### 1.0 Understand PIC Micro controller

- 1.1 Explain the RISC architecture
  - a. Explain the RISC Concept
  - b. Compare LIS and RISC Architecture
- 1.2 Mention the features of PIC controllers

- 1.1 Compare PIC16F8XX and PIC16CX/7X families
- 1.2 Explain the block diagrams of ALU operations and PIC16F877
- 1.3 State the Features of PIC16F877
- 1.4 Discuss Architecture of PIC micro controller
- 1.5 Draw Memory and memory map of PIC microcontroller
- 1.6 Explain IO Ports
- 1.7 Explain Timers and CCP Modules
- 1.8 Explain Analogue to Digital Converter (ADC)
- 1.9 Explain Interrupts
- 1.10 Explain Addressing modes of PIC 16F877
- 1.11 Explain Instruction Set of PIC16F877
- 1.12 Explain interfacing of DC motor with PIC Microcontroller.

## **2.0 Understand MCS- 196 family 16 bit Microcontrollers**

- 2.1 Bring out the salient features of MCS – 96 Microcontrollers
- 2.2 Draw and explain the block diagram of 80196 Microcontroller
- 2.3 Explain Internal Architecture of MCS – 96 Microcontrollers
- 2.4 Explain Memory Map of MCS – 96 Microcontrollers
- 2.5 Explain IO Ports and Timers of MCS-96 Microcontrollers
- 2.6 Explain High Speed Outputs and Inputs of MCS – 96 Microcontrollers
- 2.7 Explain Pulse Width Modulated Output of MCS – 96 Microcontrollers
- 2.8 Explain Interrupts of MCS – 96 Microcontrollers
- 2.9 Explain addressing Modes of MCS – 96 Microcontrollers
- 2.10 Explain Instruction set of MCS – 96 Microcontrollers

## **3.0 Understand ARM Microcontrollers**

- 3.1 Explain the RISC Concept
- 3.2 Compare LIS and RISC Architecture
- 3.3 Explain ARM Core Architecture,
- 3.4 List 5 Important Features of ARM controller

- 3.5 Compare the Different versions of ARM controller
- 3.6 Explain Architecture of ARM controllers
- 3.7 Explain Memory Map of ARM controller
- 3.8 Explain Addressing Modes ARM controller
- 3.9 Explain Instruction set of ARM controller
- 3.10 Explain Arithmetic instructions
- 3.11 Explain Registers in ARM controllers.
- 3.12 Explain THUMB Instruction set Extensions of ARM controllers.
- 3.13 Explain the exception handling mechanism of ARM controllers.
- 3.14 Explain the concept of Pipelining in ARM processors controllers.
- 3.15 Mention four application of various versions of ARM controllers.

## **4.0 Understand DSP processor basics.**

- 4.1 Explain the concept of Digital signal processing
- 4.2 Mention the merits of Digital signal processing over analog signal processing
- 4.3 Explain the use of digital filters in Digital signal processing.
- 4.4 Mention the applications of Digital signal processing.
- 4.5 Mention the 3 important signals used in Digital signal processing.
- 4.6 Draw the block diagram of a Digital system.
- 4.7 Mention the names of various blocks and their function..
- 4.8 Explain the function of anti-aliasing filter.
- 4.9 Mention the two types of Filters FIR and IIR used in digital signal processing
- 4.10 Compare FIR and IIR filters from the point of merits
- 4.11 Explain the differences between microprocessors and DSP processors
- 4.12 Distinguish between Offline processing and Real time processing
- 4.13 Explain the concept of circular buffer
- 4.14 Explain Multiplier and Multiplier Accumulator (MAC)
- 4.15 Give the IC numbers of the popular digital signal processors
- 4.16 List versions of TMS 320C5X family



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- 5.0 Comprehend Embedded System basics.**
- 5.1 Explain Embedded System
  - 5.2 Compare Embedded System and General Computing System
  - 5.3 List five Application areas of Embedded System
  - 5.4 Draw general block diagram of an embedded system
  - 5.5 Explain Core of the Embedded System
  - 5.6 Explain Memory management .
  - 5.7 Explain Embedded Firm ware
  - 5.8 Explain Communication Interface
  - 5.9 Explain Operating System Basics
  - 5.10 Explain Tasks, Process and Threads
  - 5.11 Define Multi Processing and Multi Tasking
  - 5.12 Explain Real Time Operating System
  - 5.13 Compare Normal OS and RTOS.
  - 5.14 List three Types of. RTOS
  - 5.15 Explain basics of VXworks RTOS.

#### COURSE CONTENT

- 1. **PIC Micro Controllers** : RISC architecture-RISC Concept-Compare LIS and RISC Architecture-Features of PIC controllers-Compare PIC16F8XX and PIC16CX/7X families-Block diagrams of ALU operations and PIC16F877- Features of PIC16F877-Architecture of PIC micro controller-Memory and memory map of PIC microcontroller- IO Ports-Timers and CCP Modules- Analog to Digital Converter (ADC)-Interrupts-Addressing modes of PIC 16F877-Instruction Set of PIC16F877-Interfacing of DC motor with PIC Microcontroller.
- 2. **MCS – 96 family 16 bit Microcontrollers**:Salient features of MCS – 96 Microcontrollers-Block diagram of 80196 Microcontroller- Internal Architecture of MCS – 96 Microcontrollers- Memory Map of MCS – 96 Microcontrollers - IO Ports and Timers of MCS-96 Microcontrollers- High Speed Outputs and Inputs of MCS – 96 Microcontrollers- Pulse Width

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Modulated Output of MCS – 96 Microcontrollers- Interrupts of MCS – 96 Microcontrollers- Addressing Modes of MCS – 96 Microcontrollers- Instruction set of MCS – 96 Microcontrollers-MCS family- MCS – 96 Microcontrollers-Important Features- Pin Diagram- Internal Architecture- Memory Map- Addressing Modes- Instruction set.

- 3. **ARM Microcontrollers**-RISC Concept-Compare LIS and RISC Architecture- ARM Core Architecture- Important Features of ARM controller-Compare the Different versions of ARM controller- Architecture of ARM controllers- Memory Map of ARM controller- Addressing Modes ARM controller- Instruction set of ARM controller- Arithmetic instructions- Registers of ARM Processors- THUMB-Instruction set Extensions of ARM- Exception handling mechanism of ARM-Concept of Pipelining in ARM processors-Application of various versions of ARM.
- 4. **DSP Processor basics**:Concept of Digital signal processing-Merits of Digital signal processing over analog signal processing-Use of digital filters in Digital signal processing-Applications of Digital signal processing-Important signals used in Digital signal processing-Block diagram of a Digital system-Names of various blocks and their function-Function of anti-aliasing filter-Types of Filters FIR and IIR used in digital signal processing-Compare FIR and IIR filters from the point of merits-Differences between microprocessors and DSP processors- Offline processing and Real time processing-Concept of circular buffer-Multiplier and Multiplier Accumulator (MAC)- IC numbers of the popular digital signal processors-Versions of TMS 320C5X family.
- 5. **Embedded System and RTOS basics** - Embedded System-Compare Embedded System and General Computing System- Application areas of Embedded System-Block diagram of an embedded system- Core of the Embedded System- Memory management- Embedded Firm ware-Communication Interface- Operating System Basics- Tasks, Process and Threads- Multi Processing and Multi Tasking- Real Time Operating System-Compare Normal OS and RTOS- Types of. RTOS-Explain basics of VXworks RTOS.

#### REFERENCE BOOKS:

- 1. Microcontroller Programming: The Microchip PIC By Julio Sanchez, Maria P. Canton CRC Press
- 2. PIC Microcontroller and Embedded Systems, Mazidi, McKinley and Danny Causey, Pearson Education, 2008

3. Advanced Microprocessor And Microcontrollers By B.P. Singh, New age International Publications
4. Micro Processors and Micro Controllers- M.Senthil Kumar, M.Saravanan and S.Jeevanathan Oxford University Press, 1<sup>st</sup> Edn, 2010
5. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

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### DIGITAL CIRCUIT DESIGN THROUGH VERILOG HDL

<b>Subject title</b>	:	<b>Digital Circuit Design Through Verilog HDL</b>
<b>Subject code</b>	:	<b>EC-606</b>
<b>Periods per week</b>	:	<b>04</b>
<b>Periods / Semester</b>	:	<b>60</b>

**Rationale:** The course Digital Circuit Design Through Verilog HDL is introduced in the VI semester keeping in view the vast developments in the field of VLSI Circuits. to helps the students get good job opportunities and have them an edge over others .

#### TIME SCHEDULE

SI	Major Topics	Periods	Weightage of Marks	Short Type	Essay Type
1	Basic Concepts of Verilog HDL	3	13	1	1
2	Design flow for designing VLSI IC	10	16	2	1
3	Gate Level, Data flow and Behavioral Modeling	16	16	2	1
4	Modeling of Combinational Logic Circuits	15	26	2	2
5	Verification and Testing of Verilog modules	10	26	2	2
6	System design concepts	6	13	1	1
	<b>TOTAL</b>	<b>60</b>	<b>110</b>	<b>10</b>	<b>8</b>

**OBJECTIVES:** On completion of the study of the subject a student should be able to understand the following concepts.

#### I. Basic Concepts of VLSI Circuits

- 1.1 Explain the process MOS Transistor fabrication

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- 1.2 List the merits of CMOS technology
  - 1.3 Explain CMOS fabrication process
  - 1.4 List Layout design rules
  - 1.5 Explain layout design rules
  - 1.6 Explain stick diagrams Explain VLSI design flow
  - 1.7 Explain VLSI design specification and design entry
  - 1.8 Explain functional simulation
  - 1.9 Explain Planning placement and Routing (PPR)
  - 1.10 Explain timing simulation
  - 1.11 Explain Fusing/Fabrication into the chip.
  - 1.12 Explain the use of Verilog VHDL in VLSI simulation
- 2.0 Understand Design flow for designing VLSI IC and concepts of Verilog HDL**
- 2.1. Explain the steps involved in the design flow for the VLSI IC design
  - 2.2. Explain the importance of Hardware Description Languages in VLSI design
  - 2.3. Compare VHDL and Verilog HDL
  - 2.4. List the features of Verilog HDL
  - 2.5. Explain the difference between an instantiation and inference of a component.
  - 2.6. Explain differences between modules and module instances in Verilog.
  - 2.7. Explain four levels of abstraction to represent the internals of a module
  - 2.8. Identify the components of a Verilog module definition
  - 2.9. Explain the port connection rules in a module instantiation
  - 2.10. Explain the lexical conventions like number specification, Identifiers keywords, etc
  - 2.11. Explain different data types like value set, nets, registers, vectors, integer, real and time register data types, arrays, memories and strings.
  - 2.12. Explain defparam and localparam keywords
  - 2.13. Explain about system tasks and compiler directives
  - 2.14. Define expressions, operators and operands.
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- 2.15. Explain all types of operators used in the Verilog HDL
- 3.0 Understand concepts of Gate level, Data Flow and Behavioral modeling**
- 3.1. Identify the logic gate primitives provided in Verilog
  - 3.2. Explain the instantiation of gates, gate symbols, and truth tables for and/or and buf/not type gates.
  - 3.3. Explain rise, fall and turn-off delays in the gate level design
  - 3.4. Explain the *initial* and *always* statements.
  - 3.5. Explain the assignment statements in data flow modeling
  - 3.6. Explain different types of delays used in the data flow level modeling
  - 3.7. Explain blocking and nonblocking procedural assignments with examples
  - 3.8. Explain timing controls like delay based timing control and event based timing control.
  - 3.9. Explain conditional statements.
  - 3.10. Explain multiway branching - use case, casex and casez statements.
  - 3.11. Explain the difference between conditional if statement and case statements.
  - 3.12. Explain looping statements such as while, for, repeat, and forever.
  - 3.13. Explain sequential and parallel blocks.
  - 3.14. Explain User Defined Primitives(UDP)
  - 3.15. Explain the hierarchical modeling,
  - 3.16. List the advantages of hierarchical modeling
  - 3.17. Explain modeling techniques in Verilog HDL.
  - 3.18. Design simple logic circuits like adders, subtractors using Behavioral, Data
  - 3.19. Flow and Structural modeling.
- 4.0 Understand Modeling of Combinational and Sequential Logic Circuits**
- 4.1 Design combinational circuits like multiplexers, decoders, encoders, Comparators and ALU
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- 4.2 Design RS, JK, T and D flip flops with Asynchronous and Synchronous Clock and reset
  - 4.3 Explain implementation of shift registers like SISO, SIPO, PISO, PIPO, etc.
  - 4.4 Design synchronous and asynchronous counters
  - 4.5 Design a divide by 3 counter
  - 4.6 Design shift register counters like ring counter, etc.
  - 4.7 Design memories like RAM and ROM.
  - 4.8 Compare RTL level and structural level modelings.

*Note: Use three levels of modelings (behavioral, dataflow and gate level) for the above designs.*

### 5.0 Apply Functional verification and Testing of Verilog modules.

- 5.1 Define test bench module.
- 5.2 Explain the need of a stimulus module.
- 5.3 Explain the structure of stimulus module.
- 5.4 Apply the stimulus modules for combinational and sequential circuits of Verilog designs.
- 5.5 Explain the concept of Finite State Machines.
- 5.6 Explain the Mealy and Moore types of State Machines.
- 5.7 Solve simple problems on Mealy and Moore state machines.
- 5.8 Explain the Design of Mealy above state machine using Verilog HDL.

### 6.0 Understand the system design concepts

- 6.1 Explain various design tools which are useful in different stages of design
- 6.2 List 4 important programmable logic devices
- 6.3 Explain the architecture of PLAs
- 6.4 Explain the architecture of PALs
- 6.5 Explain the architecture of CNLD
- 6.6 Explain the architecture of FPGAs,
- 6.7 Compare above devices

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- 6.8 List any 3 applications of above devices
  - 6.9 Explain the design of UART using FPGA board
  - 6.10 Explain the design of Traffic Light controller using FPGA board

### COURSE CONTENT:

1. **Basic Concepts of verilog HDL:** MOS Transistor fabrication-Merits of CMOS technology- CMOS fabrication process-Layout design rules-Stick diagrams - VLSI design flow- VLSI design specification and design entry-Functional simulation-Planning placement and Routing (PPR)-Timing simulation- Fusing/Fabrication into the chip- Use of Verilog VHDL in VLSI simulation.
2. **Design flow for designing VLSI IC :** Steps involved in the design flow for the VLSI IC design-Importance of Hardware Description Languages in VLSI design-Compare VHDL and Verilog HDL-Features of Verilog HDL-Difference between an instantiation and inference of a component-Differences between modules and module instances in Verilog-Levels of abstraction to represent the internals of a module-Identify the components of a Verilog module definition-Port connection rules in a module instantiation-Lexical conventions like number specification, Identifiers keywords, etc-Different data types like value set, nets, registers, vectors, integer, real and time register data types, arrays, memories and strings-Defparam and localparam keywords-System tasks and compiler directives-Expressions, operators and operands-Types of operators used in the Verilog HDL.
3. **Gate level, Data Flow and Behavioral modeling:**Logic gate primitives provided in Verilog-Instantiation of gates, gate symbols, and truth tables for and/or and buf/not type gates-Rise, fall and turn-off delays in the gate level design-*Initial* and *always* statements- Assignment statements in data flow modeling-Different types of delays used in the data flow level modeling-Blocking and non-blocking procedural assignments with examples-Timing controls like delay based timing control and event based timing control-Conditional statements- Multiway branching - use case, casex and casez statements-Difference between conditional if statement and case statements-Looping statements such as while, for, repeat, and forever-Sequential and parallel blocks- User Defined Primitives(UDP)-Hierarchical modeling-Advantages of hierarchical modeling-Modeling techniques in Verilog HDL-Design simple logic

circuits like adders, subtractors using Behavioral, Data-Flow and Structural modeling.

4. **Modeling of Combinatioal Logic Circuits** Modeling of Combinatioal and Sequential Circuits-Design combinational circuits like multiplexers, decoders, encoders, Comparators and ALU-Design RS, JK, T and D flip flops with Asynchronous and Synchronous Clock and reset-Explain implementation of shift registers like SISO, SIPO, PISO, PIPO, etc-Design synchronous and asynchronous counters-Design a divide by 3 counter-Design shift register counters like ring counter, etc-Design memories like RAM and ROM-Compare RTL level and structural level modelings.
5. **Verification and Testing of Verilog modules:**Test bench module- Need of a stimulus module-Structure of stimulus module-Stimulus modules for combinational and sequential circuits of Verilog designs-Concept of Finite State Machines- Mealy and Moore types of State Machines-Problems on Mealy and Moore state machines- Design of Mealy above state machine using Verilog HDL.
6. **System design concepts:**Various design tools which are useful in different stages of design-Important programmable logic devices-Architecture of PLAs-Architecture of PALs-Architecture of CNLD-Architecture of FPGAs-Comparison-Applications-Design of UART using FPGA board-Design of Traffic Light controller using FPGA board.

#### REFERENCE BOOKS:

1. Digital Design with an Introduction to Verilog HDL 5th Edition by M. Morris Mano and Michael Ciletti –Pearson publishers
2. Verilog HDL: A guide to digital design and synthesis by S. Palnitkar-Prentice Hall PTR Publishers
3. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, IEEE Press, 2004.
4. Fundamentals of Logic Design with Verilog – Stephen. Brown and Zvonko Vranesic, TMH, 2005.

## COMPUTER HARDWARE , NETWORKING & OFCLAB PRACTICE

<b>Subject Title</b>	:	<b>Computer Hardware , Networking &amp; OFC Lab Practice</b>
<b>Subject Code</b>	:	<b>EC-607</b>
<b>Periods/Week</b>	:	<b>06</b>
<b>Periods/Semester</b>	:	<b>90</b>

**Rationale:** With the computer becoming a household item , the need for Computer hardware knowledge need not be stressed. Computer hardware industry is another major area where excellent job opportunities are available. Experiments in Optical fibre communication are also included to give additional practical inputs.

TIME SCHEDULE		
S. No.	PRACTICE	No. of Periods
1.	<b>Computer System(Desktop,Laptop)</b>	<b>45</b>
2.	<b>Computer Peripherals</b>	<b>6</b>
3.	<b>Networking</b>	<b>27</b>
4	<b>Fibre Optics</b>	<b>12</b>
<b>Total</b>		<b>90</b>

#### List of Experiments

##### 1.0 PC Hardware-Identification of System Layout.

1. Identify Basic Computer Hardware and Cables
2. Identify and note down mother board , Components and Chips
3. Identify various Internal and External slots in the mother board and clean them with blower/ Brush.
4. Practice Inserting and Removing RAM with care

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5. Measure the Output voltages of SMPS
  6. Disassemble the PC
  7. Assemble the PC and test
  8. Change CMOS Setup
  9. Install Operating system Windows and Linux
  10. Verify the function of control panel settings.
  11. Partition and format Hard disks.
  12. Install system and application software
    - a) To install & Run antivirus software
  13. Carry out Preventive maintenance of a PC
  14. Take Backup of C drive
  15. Identify Laptop Hardware
  16. Carry out PC Troubleshooting

## 2.0 Printers , Scanners, Cameras

17. Connect , operate and maintain i) Inkjet Printer ii) Laser Printer iii)Scanner iv) Web Cam

## 3. Computer Networking

18. identify and note down the specifications of various networking devices & Cables, Jacks , Connectors, tools etc used in local area networks
  - a) Prepare the UTP cable for cross and direct connections using crimping tool.
19. Transfer files between systems in LAN using FTP Configuration,
  - a) install i Print server in a LAN and share the printer in a network
20. Test the Network using ipconfig, ping / tracet and Netstat utilities and debug the network issues (3)
21. Install and configure Network Devices: HUB ii) Switch iii) Routers
22. Configure Host IP, Subnet Mask and Default Gateway in a system in LAN (TCP/IP Configuration).
  - a) Configure DNS to establish interconnection between systems
23. Transfer files between systems in LAN using FTP Configuration,
  - a) install Print server in a LAN and share the printer in a network

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24. Install and Configure Wireless NIC and transfer files between systems in LAN and Wireless LAN
  25. access a remote desktop using Team viewer software
    - a) store the files in Cloud using Google drive/One drive/Drop box & share
  26. Explore the features of Windows 2000 server

## 4.0 Fiber Optics

27. Set up fiber optic analogue link.
  - a) Set up a fiber optic digital link
28. Verify modulation & Demodulation of light source by pulse width modulation technique.
29. Test Fiber optic Voice Link.
30. Verify the NRZ & RZ modulation formats in Optical Communication.

**Competencies and Key Competencies to be achieved**

Exp No	Name of the Experiment	Competencies	Key Competencies
1	To Identify Basic Computer Hardware and Cables (3)	Identify <ul style="list-style-type: none"> <li>➤ Key board , Mouse, Webcam</li> <li>➤ Front panel indicators switches</li> <li>➤ Front side &amp; rear side connectors. Ports</li> <li>➤ Mark positions of SMPS, Motherboard, FDD, HDD, CD, DVD and add on cards.</li> <li>➤ Power cable, VGA cable, Audio cable</li> </ul>	<ul style="list-style-type: none"> <li>▪ Configure bios setup program and troubleshoot the typical problems using BIOS utility.</li> </ul>
2	To Identify and note down mother board , Components and Chips (1½)	Mother Board installation <ul style="list-style-type: none"> <li>➤ Note the layout of I5/I3/Pentium IV or Pentium Dual core or Pentium Core2 DUO mother board and mark Processor,</li> <li>➤ Identify Chip set ICs. RAM, Cache, Xtal, CMOS Battery</li> <li>➤ Identify CPU cooling fan, I/O slots and I/O ports and various jumper settings.</li> <li>➤ ATX Power connector (Central Processing Unit) socket</li> </ul>	<ul style="list-style-type: none"> <li>▪ Note the layout of I5/I3/Pentium IV or Pentium Dual core or Pentium Core2 DUO mother board and mark Processor, Identify Chip set ICs. RAM, Cache, Xtal, CMOS Battery</li> <li>▪ Identify CPU cooling fan, I/O slots and I/O ports and various jumper settings.</li> <li>▪ ATX Power connector (Central Processing Unit) socket</li> </ul>

3	To Identify various Internal and External slots in the mother board and clean them with blower/ Brush.(1½)	<ul style="list-style-type: none"> <li>▪ Internal : Identify PCI Express 16x slots PCI Express 1x Slot DIMM (Double Inline Memory Module) slots Serial ATA Connector south Bridge IDE connector PCI (Peripheral Component Interconnect) slot BIOS (Basic Input Output System) Chip</li> <li>▪ External : Identify Bus) PortsPS/2 Connectors - USB (Universal Serial - Parallel Port -Game Port Sound card Connectors Display VGA Connector COM (communications) Port</li> </ul>	<ul style="list-style-type: none"> <li>▪ PCI Express 16x slots PCI Express 1x Slot DIMM (Double Inline Memory Module) slots Serial ATA Connector south Bridge IDE connector PCI (Peripheral Component Interconnect) slot BIOS (Basic Input Output System) Chip External :Identify Bus) PortsPS/2 Connectors - USB (Universal Serial - Parallel Port -Game Port Sound card Connectors Display VGA Connector COM (communications) Port</li> </ul>
4	To Practice Inserting and Removing RAM with care(1½)	<ul style="list-style-type: none"> <li>➤ Identify the RAM type SRAM ,DDR ,DDR2 DDR3 by observing the notch</li> <li>➤ Place DIMM with correct orientation</li> <li>➤ Insert with correct force till it is locked</li> <li>➤ Test by slightly pulling</li> <li>➤ Remove DIMM by opening latches on either side</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify the RAM type SRAM ,DDR ,DDR2 DDR3 by observing the notch</li> <li>▪ Place DIMM with correct orientation</li> <li>▪ Insert with correct force till it is locked</li> <li>▪ Test by slightly pulling</li> <li>▪ Remove DIMM by opening latches on either side</li> </ul>
5	To measure the Output voltages of SMPS (1½)	<ul style="list-style-type: none"> <li>➤ Remove the SMPS</li> <li>➤ Identify the ground Short the enable pin to ground Measure the output voltages with DMM</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify the ground</li> <li>▪ Short the enable pin to ground</li> <li>▪ Measure the output voltages with DMM</li> </ul>

6	To disassemble the PC (3)	<ul style="list-style-type: none"> <li>➤ Remove Power cable ,USB, Firewire, Mouse, Keyboard Internet, Ethernet ,Modem cables</li> <li>➤ Remove the rear cabinet screws ,side panel</li> <li>➤ Remove Mother board power cable &amp; Other cables</li> <li>➤ Remove SMPS, CD/DVD drive, HDD</li> <li>➤ Remove mother Board</li> </ul>	<ul style="list-style-type: none"> <li>▪ Remove Power cable, USB, Firewire, Mouse, Keyboard Internet, Ethernet ,Modem cables</li> <li>▪ Remove the rear cabinet screws ,side panel</li> <li>▪ Remove Mother board power cable &amp; Other cables</li> <li>▪ Remove SMPS, CD/DVD drive, HDD</li> <li>▪ Remove mother Board</li> </ul>
7	To assemble the PC and test (3)	<ul style="list-style-type: none"> <li>➤ Install PSU DVD Mother Board Processor heat sink &amp; Fan memory –</li> <li>➤ Connect HDD</li> <li>➤ Clear CMOS by removing jumper</li> <li>➤ Connect power connector, CPU power connector and other connector</li> <li>➤ Connect case fan to mother board</li> <li>➤ Connect sata cables</li> <li>➤ Test connections</li> <li>➤ Fix side panels</li> </ul>	<ul style="list-style-type: none"> <li>▪ Install PSU DVD Mother Board Processor heat sink &amp; Fan memory</li> <li>▪ HDD</li> <li>▪ Clear CMOS by removing jumper</li> <li>▪ Connect power connector, CPU power connector and other connector</li> <li>▪ Connect case fan to mother board</li> <li>▪ Connect sata cables</li> <li>▪ Test connections</li> <li>▪ Fix side panels</li> </ul>
8	To change CMOS Setup(3)	<ul style="list-style-type: none"> <li>➤ Identify manufacturer</li> <li>➤ Open <b>cmos</b> setup</li> <li>➤ Change the boot sequence</li> <li>➤ Enable disable devices/Ports</li> <li>➤ set pass word</li> <li>➤ change Date/Time</li> <li>➤ Explore other features</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify manufacturer</li> <li>▪ Open cmos setup</li> <li>▪ Change boot sequence</li> <li>▪ Enable disable devices/Ports</li> <li>▪ set pass word</li> <li>▪ change Date/Time</li> <li>▪ Explore other features</li> <li>▪</li> </ul>
9	To Install Operating system Windows and Linux (6)	<ul style="list-style-type: none"> <li>➤ Install OS using CD</li> <li>➤ Set up Disk partitioning</li> <li>➤ Install drivers</li> </ul>	<ul style="list-style-type: none"> <li>▪ Install OS using CD</li> <li>▪ Set up Disk partitioning</li> <li>▪ Install drivers</li> </ul>

10	To Verify the function of control panel settings (1½).	<ul style="list-style-type: none"> <li>➤ To verify and Explore control panel features</li> <li>➤ System &amp; Security</li> <li>➤ Network&amp; Internet</li> <li>➤ Hardware &amp; Sound</li> <li>➤ Programs</li> <li>➤ User Accounts</li> <li>➤ Appearance</li> <li>➤ Clock</li> <li>➤ Access device manager and check the status</li> <li>➤ Add or remove hardware devices</li> </ul>	<ul style="list-style-type: none"> <li>▪ To verify and Explore control panel features</li> <li>▪ System &amp; Security</li> <li>▪ Network&amp; Internet</li> <li>▪ Hardware &amp; Sound</li> <li>▪ Programs</li> <li>▪ User Accounts</li> <li>▪ Appearance</li> <li>▪ Clock</li> <li>▪ Access device manager and check the status</li> <li>▪ Add or remove hardware devices</li> </ul>
11	To Partition and format Hard disks(1½)	<ul style="list-style-type: none"> <li>➤ Identify HDD Type IDE/SATA</li> <li>➤ Follow respective procedures</li> <li>➤ Select NTFS/FAT32</li> <li>➤ Backup file</li> <li>➤ Use Windows/ Startup CD</li> <li>➤ Use Disk manger</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify HDD Type IDE/SATA</li> <li>▪ Follow respective procedures</li> <li>▪ Select NTFS/FAT32</li> <li>▪ Backup file</li> <li>▪ Use Windows/ Startup CD</li> <li>▪ Use Disk manger</li> </ul>
12	To Install system and application software (3) a) To install & Run antivirus software	<ul style="list-style-type: none"> <li>➤ Access control panel</li> <li>➤ Install/Uninstall the program</li> <li>➤ Install antivirus through auto run option</li> <li>➤ Explore the antivirus settings</li> </ul>	<ul style="list-style-type: none"> <li>▪ Access control panel</li> <li>▪ Install/Uninstall the program</li> <li>▪ Install antivirus through auto run option</li> <li>▪ Explore the antivirus settings</li> </ul>
13	To Carry out Preventive maintenance of a PC(3)	<ul style="list-style-type: none"> <li>➤ Clean C</li> <li>➤ Scan with antivirus</li> <li>➤ Run Registry clean utility</li> <li>➤ Run Defragmentation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Clean C</li> <li>▪ Scan with antivirus</li> <li>▪ Run Registry clean utility</li> <li>▪ Run Defragmentation</li> </ul>
14	To take Backup of C drive (3)	<ul style="list-style-type: none"> <li>➤ Take Backup of C Drive using Backup utility</li> </ul>	<ul style="list-style-type: none"> <li>▪ Take Backup of C drive using Backup utility</li> </ul>
15	To identify Laptop Hardware(3)	<ul style="list-style-type: none"> <li>➤ Identify the Parts of a Laptop - CPU, Display- HDD, DVD drive - USB Ports HDMI-VGA- Ethernet-SDCard</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify the Parts of a Laptop - CPU, Display- HDD, DVD drive - USB Ports HDMI-VGA- Ethernet-SD Card</li> </ul>



16	To carry out PC Troubleshooting(6)	<ul style="list-style-type: none"> <li>➤ Identify the fault type Hardware/ software</li> <li>➤ Run antivirus and other utilities</li> <li>➤ Run in safe mode</li> <li>➤ Rectify the problem</li> </ul> <p><b>Hardware faults</b></p> <ul style="list-style-type: none"> <li>➤ Faulty cables</li> <li>➤ Dust accumulation</li> <li>➤ Monitor problems</li> <li>➤ Memory problems</li> <li>➤ SMPS problems</li> <li>➤ HDD/CD/ problems</li> <li>➤ Troubleshoot &amp;Rectify</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify the fault type Hardware/ software</li> <li>▪ Run antivirus and other utilities</li> <li>▪ Run in safe mode</li> <li>▪ Rectify the problem</li> </ul> <p><b>Hardware faults</b></p> <ul style="list-style-type: none"> <li>▪ Faulty cables</li> <li>▪ Dust accumulation</li> <li>▪ Monitor problems</li> <li>▪ Memory problems</li> <li>▪ SMPS problems</li> <li>▪ HDD/CD/ problems</li> <li>▪ Troubleshoot &amp;Rectify</li> </ul>
17	To connect , Operate and maintain (6) i) Inkjet Printer ii) Laser Printer iii)Scanner iv) Webcam	<ul style="list-style-type: none"> <li>➤ Connect and operate Printers</li> <li>➤ Remove paper jams</li> <li>➤ Load ink Cartridge</li> <li>➤ Connect to network</li> <li>➤ Use scanner</li> <li>➤ Use webcam</li> </ul>	<ul style="list-style-type: none"> <li>▪ Connect and operate Printers</li> <li>▪ Remove paper jams</li> <li>▪ Load ink Cartridge</li> <li>▪ Connect to Network</li> <li>▪ Use scanner</li> <li>▪ Use webcam</li> </ul>
18	To identify and note down the specifications of various networking devices & Cables, Jacks , Connectors, tools etc used in local area networks (3) a) To Prepare the UTP cable for cross and direct connections using crimping tool.	<ul style="list-style-type: none"> <li>➤ Identify &amp; note down the configurations of Network devices</li> <li>➤ Identify &amp; Select Network cable</li> <li>➤ Select crimping tool</li> <li>➤ Select the cable</li> <li>➤ Decide the connection type</li> <li>➤ Identify the wires as per colour code</li> <li>➤ Arrange the wires</li> <li>➤ Cut &amp; Crimp</li> <li>➤ Test the connection using Ping command</li> </ul>	<ul style="list-style-type: none"> <li>▪ Identify &amp; note down the configurations of Network devices</li> <li>▪ Identify &amp; Select Network cable</li> <li>▪ Select crimping tool</li> <li>▪ Select the cable</li> <li>▪ Decide the connection type</li> <li>▪ Identify the wires as per colour code</li> <li>▪ Arrange the wires</li> <li>▪ Cut &amp; Crimp</li> <li>▪ Test the connection</li> </ul>
19	To Transfer files between systems in LAN using FTP Configuration (3) a) To install Print server in a LAN and share the printer in a network	<ul style="list-style-type: none"> <li>➤ Transfer files between systems in LAN using FTP Configuration,</li> <li>➤ install Print server in a LAN and share the printer in a network</li> </ul>	<ul style="list-style-type: none"> <li>▪ Transfer files between systems in LAN using FTP Configuration,</li> <li>▪ install Print server in a LAN and share the printer in a network</li> </ul>

20	To Test the Network using <i>ipconfig, ping / tracert</i> and Netstat utilities and debug the network issues(3)	<ul style="list-style-type: none"> <li>➤ Use the Utilities like <b><i>ipconfig, ping / tracert</i></b></li> <li>➤ Identify the issue</li> <li>➤ Resolve the problem</li> </ul>	<ul style="list-style-type: none"> <li>▪ Use the Utilities like <i>ipconfig, ping / tracert</i></li> <li>▪ Identify the issue</li> <li>▪ Resolve the problem</li> </ul>
21	To Connect systems in a network using switch. (3) a) Install and configure Network Devices: i) Hub ii) Switch iii) Routers	<ul style="list-style-type: none"> <li>➤ Select the device</li> <li>➤ Connect them</li> <li>➤ Install using Driver software</li> <li>➤ Set password &amp; Configure</li> </ul>	<ul style="list-style-type: none"> <li>▪ Select the device</li> <li>▪ Connect them</li> <li>▪ Install using Driver software</li> <li>▪ Set password &amp; Configure</li> </ul>
22	To Configure Host IP, Subnet Mask and Default Gateway in a system in LAN (TCP/IP Configuration).(3) a) To Configure DNS to establish interconnection between systems	<ul style="list-style-type: none"> <li>➤ Configure Host IP, Subnet Mask</li> <li>➤ Configure DNS server</li> </ul>	<ul style="list-style-type: none"> <li>▪ Configure Host IP, Subnet Mask</li> <li>▪ Configure DNS server</li> </ul>
23	To Transfer files between systems in LAN using FTP Configuration, (3) a) install Print server in a LAN and share the printer in a network	<ul style="list-style-type: none"> <li>➤ Open control panel</li> <li>➤ Access IIS</li> <li>➤ Set up FTP and Test</li> <li>➤ Share the printer</li> </ul>	<ul style="list-style-type: none"> <li>▪ Open control panel</li> <li>▪ Access IIS</li> <li>▪ Set up FTP and Test</li> <li>▪ Share the printer</li> </ul>
24	To Install and Configure Wireless NIC and transfer files between systems in LAN and Wireless LAN(3)	<ul style="list-style-type: none"> <li>➤ Install wireless NIC</li> <li>➤ Configure</li> <li>➤ Set pass word</li> <li>➤ Test</li> </ul>	<ul style="list-style-type: none"> <li>▪ Install wireless NIC</li> <li>▪ Configure</li> <li>▪ Set pass word</li> <li>▪ Test</li> </ul>
25	To access a remote desktop using <i>Team viewer</i> software(3) a) To store the files in Cloud using Google drive/One drive/Drop box & share	<ul style="list-style-type: none"> <li>➤ Install <b><i>Team viewer software</i></b></li> <li>➤ <i>Start the session</i></li> <li>➤ <i>Access desktop remotely</i></li> <li>➤ <i>Video chat</i></li> <li>➤ <i>Close the session</i></li> <li>➤ <i>Use Google drive /One drive/Drop box &amp; share</i></li> </ul>	<ul style="list-style-type: none"> <li>▪ Install <i>Team viewer software</i></li> <li>▪ <i>Start the session</i></li> <li>▪ <i>Access desktop remotely</i></li> <li>▪ <i>Video chat</i></li> <li>▪ <i>Close the session</i></li> <li>▪ <i>Use Google drive /One drive/Drop box &amp; share</i></li> </ul>
26	To Explore the features of Windows 2000 server(3)	<ul style="list-style-type: none"> <li>➤ Use administrative tools</li> <li>➤ Configure server for Network connectivity</li> <li>➤ Sharing a folder</li> <li>➤ Accessing a folder from my network places on Desktop</li> <li>➤ Stopping a shared folder</li> <li>➤ Determine local host address</li> </ul>	<ul style="list-style-type: none"> <li>▪ Use administrative tools</li> <li>▪ Configure server for Network connectivity</li> <li>▪ Sharing a folder</li> <li>▪ Accessing a folder from my network places on Desktop</li> <li>▪ Stopping a shared folder</li> <li>▪ Determine local host address</li> </ul>

27	To Set up fibre optic analogue link.  a) To Set up a fibre optic digital link (3)	<ul style="list-style-type: none"> <li>➤ Identify the Demonstration board, Fiber optic link &amp; Connectors</li> <li>➤ Make connections</li> <li>➤ Test and observe the signal on CRO</li> </ul>	<ul style="list-style-type: none"> <li>▪ Make connections</li> <li>▪ Test and observe the signal on CRO</li> </ul>
28	To verify modulation & Demodulation of light source by pulse width modulation technique. (3)	<ul style="list-style-type: none"> <li>➤ Identify the Demonstration board</li> <li>➤ Fiber optic link &amp; Connectors</li> <li>➤ Make connections</li> <li>➤ Test and observe the signal on CRO</li> </ul>	<ul style="list-style-type: none"> <li>▪ Make connections</li> <li>▪ Test and observe the signal on CRO</li> </ul>
29	To Test Fibre optic Voice Link. (3)	<ul style="list-style-type: none"> <li>➤ Identify the Transmitter &amp; Receiver boards, Fiber optic link &amp; Connectors, Microphone</li> <li>➤ Make connections</li> <li>➤ Test and listen to the voice signal</li> <li>➤ Observe any distortion</li> </ul>	<ul style="list-style-type: none"> <li>▪ Make connections</li> <li>▪ Test and listen to the voice signal</li> <li>▪ Observe any distortion</li> </ul>
30	To Verify the NRZ & RZ modulation formats in Optical Communication.(3)	<ul style="list-style-type: none"> <li>➤ Identify the Demonstration board Fiber optic link &amp; Connectors</li> <li>➤ Make connections</li> <li>➤ Apply digital signal</li> <li>➤ Test and observe the signal on CRO</li> </ul>	<ul style="list-style-type: none"> <li>▪ Make connections</li> <li>▪ Apply digital signal</li> <li>▪ Test and observe the signal on CRO</li> </ul>

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### VERILOG HDL LAB PRACTICE

<b>Subject title</b>	:	<b>Verilog HDL Programming lab Practice</b>
<b>Subject code</b>	:	<b>EC-608</b>
<b>Periods per week</b>	:	<b>03</b>
<b>Periods / Semester</b>	:	<b>45</b>

**Rationale:** This laboratory course is Included to reinforce and practically verify the theoretical inputs learnt in the theory part of this semester without losing the contiguity. Further this course also helps the students to experiment with latest tools used in the VLSI Circuit design which gives the students an edge over others .

#### TIME SCHEDULE

SI No	Major Topics	Periods
1	Implementing basic logic gates	6
2	Combinational circuits	12
3	Sequential circuits	12
4	Registers	9
5	Counters	6
	<b>TOTAL</b>	<b>45</b>

#### List of Experiments:

- Using Xilinx / Modelsim / Multisim or similar software
1. Practicewith MultiSim simulation software for verilog HDL
  2. Implement Basic Logic Gates
  3. Implement i) Half adder and ii) Full Adder
  4. Implement i) Half Subtractor and ii) Full Subtractor
  5. Implement 4-bit Parallel Adder

6. Implement 4:1 Multiplexers
7. Implement 1:4 Demultiplexers
8. Implement 3:8 Decoders
9. Implement 8:3 Encoders
10. Implement 4-bit Comparator
11. Implement SR-Flip flop
12. Implement JK- Flip Flop
13. Implement D- Flip Flop)
14. Implement i) SISO ii) SIPO Shift Registers
15. Implement a Decimal counter

**Competencies and Key Competencies to be achieved**

Exp no	Name of the experiment (NO of Periods)	Competencies	Key competencies
1	To practice with Xilinx/ ModelSim/MultiSim simulation software for verilog HDL (3)	<ul style="list-style-type: none"> <li>➤ Familiarize with Xilinx/ ModelSim / MultiSimInterface</li> <li>➤ Create a directory for the project</li> <li>➤ Start ModelSim and create a new project</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ Start the simulation</li> <li>➤ Add signals to the wave window</li> <li>➤ Recompile changed verilog files</li> <li>➤ Restart/Run the simulation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Familiarize with Xilinx/ ModelSim / MultiSimInterface</li> <li>▪ Create a directory for the project</li> <li>▪ Start ModelSim and create a new project</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ Start the simulation</li> <li>▪ Add signals to the wave window</li> <li>▪ Recompile changed verilog files</li> <li>▪ Restart/Run the simulation</li> </ul>
2	To implement Basic Logic Gates (3)	<ul style="list-style-type: none"> <li>➤ Create a directory for the project</li> <li>➤ Start ModelSim and create a new project</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ Start the simulation</li> <li>➤ Add signals to the wave window</li> <li>➤ Recompile changed verilog files</li> <li>➤ Restart/Run the simulation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Create a directory for the project</li> <li>▪ Start ModelSim and create a new project</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ Start the simulation</li> <li>▪ Add signals to the wave window</li> <li>▪ Recompile changed verilog files</li> <li>▪ Restart/Run the simulation</li> </ul>
3	To implement i) Half adder and ii) Full Adder (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ Start the simulation</li> <li>➤ Add signals to the wave window</li> <li>➤ Recompile changed verilog files</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ Start the simulation</li> <li>▪ Add signals to the wave window</li> <li>▪ Recompile changed verilog files</li> </ul>

4	To implement i) Half Subtractor and ii) Full Subtractor (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>
5	To implement 4-bit Parallel Adder (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>
6	To implement 4:1 Multiplexers (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>
7	To implement 1:8 De-multiplexer (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>
8	To implement 3:8 Decoder (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>
9	To implement 8:3 Encoder (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>

10	To implement 4-bit Comparator (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>
11	To implement SR-Flip flop (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>
12	To implement JK Flip Flop (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>
13	To implement D Flip Flop (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>
14	To implement i) SISO ii) SIPO Shift Register (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>
15	To implement a Decimal counter (3)	<ul style="list-style-type: none"> <li>➤ Design the logic</li> <li>➤ Enter the code</li> <li>➤ Add verilog file to the project</li> <li>➤ Compile your verilog files</li> <li>➤ simulate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Design the logic</li> <li>▪ Enter the code</li> <li>▪ Add verilog file to the project</li> <li>▪ Compile your verilog files</li> <li>▪ simulate</li> </ul>

Note : Implement gate level modeling

**Tools Required:**

Xilinx ISE 9.2i simulator and Modelsim /MultiSimSoftware

## ADVANCED MICRO CONTROLLERS LAB PRACTICE

**Subject title** : Advanced Micro Controllers Lab Practice  
**Subject code** : EC-609  
**Periods per week** : 3  
**Periods / Semester** : 45

**Rationale:** This laboratory course is Included to reinforce and practically verify the theoretical inputs learnt in the theory part of this semester without losing the contiguity. Further this course also helps the students to experiment with Advanced Microcontrollers like ARM which gives the students an edge over others and better employment opportunities.

### TIME SCHEDULE

SI	Major Topics	Periods
1	Programming PIC Controller for data processing	12
2	Interfacing DAC	9
3	Interfacing Sensors & ADC	12
4	Programming ARM Controllers	12
	<b>TOTAL</b>	<b>45</b>

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5. Write a C Program to generate a Square wave by interfacing 8-bit bipolar DAC with PIC16F877
6. Write a C Program to generate a Sine wave by interfacing 8-bit bipolar DAC with PIC16F877
7. Write a C Program to interface ADC module with PIC16F877
8. Write a C Program to generate PWM by interfacing ADC module with PIC16F877
9. Write a C Program to design a digital thermometer to display the temperature in °C using PIC16C71
10. Write a C Program to design a LVDT interfacing with PIC16C71 using AD698
11. Write a C Program to add two 16-bit operands using ARM controller
12. Write a C Program to add two 32-bit operands using ARM controller
13. Write a C Program to subtract two 16-bit operands using ARM controller
14. Write a C Program to multiply two operands using ARM controller
15. Write a C Program to generate a triangular wave using the ARM Controller

### LIST OF EXPERIMENTS

1. Write a C Program for PIC16F877 to add two 16-bit operands
2. Write a C Program for PIC16F877 to add two 32-bit operands
3. Write a C Program for PIC16F877 to subtract two 16-bit operands
4. Write a C Program for PIC16F877 to multiply two operands

**Competencies and Key Competencies to be achieved**

Exp No	Name of the Experiment	Competencies	Key Competencies
1	Write a C PROGRAM FOR PIC16F877to add two 16-bit operands	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Verify the Result</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
2	Write a C PROGRAM FOR PIC16F877to add two 32-bit operands3.	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Verify the Result</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
3	Write a C PROGRAM FOR PIC16F877to subtract two 16-bit operands	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Verify the Result</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
4	Write a C PROGRAM FOR PIC16F877to multiply two operands	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Verify the Result</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
5	Write a C PROGRAM to generate a Square wave by interfacing 8-bit bipolar DAC with PIC16F877	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Observe the Waveform using CRO</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
6	Write a C PROGRAM to generate a Sine wave by interfacing 8-bit bipolar DAC with PIC16F877	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Observe the Waveform using CRO</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
7	Write a C PROGRAM to interface ADC module with PIC16F877 .Use a Variable Analog TEST Signal Observe the readings on Digital Display Interface	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Tabulate the readings</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>

8	Write aC program to generate PWM by interfacing ADC module with PIC16F877	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ RIG Up The Circuit</li> <li>➤ Compile and Execute</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
9	Write aC program to design a digital thermometer to display the temperature in °C using PIC16C71 and Digital Display Unit	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ RIG Up The Circuit</li> <li>➤ Compile and Execute</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
10	Write aC program to design a LVDT interfacing with PIC16C71 using AD698. And observe the readings on Digital Display Unit	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Rig up the circuit</li> <li>➤ Compute and Execute</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
11	Write aC program to add two 16-bit operands using ARM controller	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Verify the Result</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
12	Write aC program to add two 32-bit operands using ARM controller	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Verify the Result</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
13	Write aC program to subtract two 16-bit operands using ARM controller	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Verify the Result</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
14	Write aC program to multiply two operands using ARM controller	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Verify the Result</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>
15	.Write a C Program to generate a triangular WAVE using the ARM Controller	<ul style="list-style-type: none"> <li>➤ Enter the Program in Editor</li> <li>➤ Compile and Execute</li> <li>➤ Observe the Waveform using CRO</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enter the Program in Editor</li> <li>▪ Compile and Execute</li> <li>▪ Verify the Result</li> </ul>

### PROJECT WORK

<b>Subject Title</b>	:	<b>Project Work</b>
<b>Subject Code</b>	:	<b>EC- 610</b>
<b>Periods / Week</b>	:	<b>06</b>
<b>Periods / Semester</b>	:	<b>90</b>

**Rationale:** Project work is intended to provide application level concepts in designing and Implementing suitable solutions to multifarious needs related to Industry as well as Day to day Life . Project work should pave way for i) implementation of Innovative Ideas ii) preparation of prototypes for commercial models.

### TIME SCHEDULE

SI	Major Topics	Periods
1	Literature survey	9
2	Concept modelling	9
3	Seminars( One Seminar before approval and one Seminar after completion of the Project)	6
4	Abstract submission	6
5	Working model of the project	45
6	Project report	15
	<b>Total</b>	<b>90</b>

#### Project work should have the following components

- Literature survey
- Concept modelling

- Seminars( One Seminar before approval and one Seminar after completion of the Project)
- Abstract submission
- Working model of the project
- Project report

### OBJECTIVES

#### Upon completion of the course the student should be able to

- Identify different works to be carried out in the Project.
- Collect relevant information required for the project work.
- Carry out Literature survey.
- Select the most efficient method from the available choices based on preliminary investigation.
- Prepare action plan and schedule for project implementation
- Design the required elements of the project work as per standard practices.
- Implement prototype circuits and test
- Design proper enclosure to house the prototype
- Identify the Tests to be carried out for verification of design parameters
- implement project work and record the results at various stages.
- Prepare project report as per the standard guide lines.

### COURSE CONTENT

Project work is intended to provide application level concepts in designing and Implementing suitable solutions to multifarious needs related to Industry as well as Day to day Life .

Project work should pave way for

- implementation of Innovative Ideas
- preparation of prototypes for commercial models.

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Students should be formed into groups of five each and shall be assigned a problem that calls for application of the knowledge he/she acquired during the course. The faculty members shall provide necessary and also monitor /assess the project progress. The students may be encouraged to implement projects using Aurdino boards / Picaxe / ARM Controllers in the fields of Communication Engineering, Industrial electronics ,Robotics or any other relevant fields. Preparing a working model complete in all respects including proper enclosure, indicators switches, Power cords etc is mandatory.

Every student should prepare a project report and submit the same for assessment which includes his/her contribution in the project work . The end examination in Project work shall consist of Seminar and Viva-voce test to be assessed by a panel of examiners comprising of an External examiner, the Head of Section, and the internal guide.

Other interested faculty members and students may also be invited for attending the seminars.

#### **Scheme of assessment**

1)	Seminar1	10 Marks
2)	Seminar 2	10 Marks
3)	Project Report/Assessment	20 Marks
4)	Project	40 Marks
5)	Viva-Voce	20 Marks
Total Marks		100

**213**