REGULATIONS, CURRICULUM AND SYLLABUS

for

B. TECH

INSTRUMENTATION & CONTROL ENGINEERING

PONDICHERY UNIVERSITY
PONDICHERY-605 014
1. Conditions for Admission:

(a) Candidates for admission to the first semester of the 8 semester B.Tech Degree programme should be required to have passed:

The Higher Secondary Examination of the (10+2) curriculum (Academic Stream) prescribed by the Government of Tamil Nadu or any other examination equivalent thereto with minimum of 45% marks (a mere pass for OBC and SC/ST candidates) in aggregate of subjects – Mathematics, Physics and any one of the following optional subjects: Chemistry / Biotechnology/ Computer Science / Biology (Botany & Zoology) or an Examination of any University or Authority recognized by the Executive Council of the Pondicherry University as equivalent thereto.

(b) For Lateral entry into third semester of the eight semester B.Tech programme:

The minimum qualification for admission is a pass in three year diploma or four year sandwich diploma course in engineering / technology with a minimum of 60% marks (50% marks for OBC and a mere pass for SC/ST candidates) in aggregate in the subjects covered from 3rd to final semester or a pass in any B.Sc. course with mathematics as one of the subjects of study with a minimum of 60% marks (50% marks for OBC and a mere pass for SC/ST candidates) in aggregate in main and ancillary subjects excluding language subjects. The list of diploma programs approved for admission for each of the degree programs is given in Annexure A.

2. Age Limit:

The candidate should not have completed 21 years of age as on 1st July of the academic year under consideration. For Lateral Entry admission to second year of degree programme, candidates should not have completed 24 years as on 1st July of the academic year under consideration. In the case of SC/ST candidates, the age limit is relaxable by 3 years for both the cases.

3. Duration of Programme:

The Bachelor of Technology degree programme shall extend
over a period of 8 consecutive semesters spread over 4 academic years – two semesters constituting one academic year. The duration of each semester shall normally be 15 weeks excluding examinations.

4. Eligibility for the award of Degree:

No candidate shall be eligible for the award of the degree of Bachelor of Technology, unless he/she has undergone the course for a period of 8 semesters (4 academic years) / 6 semesters (3 academic years for Lateral Entry candidates) in the faculty of Engineering and has passed the prescribed examinations in all the semesters.

5. Branches of Study:

- Branch I - Civil Engineering
- Branch II - Mechanical Engineering
- Branch III - Electronics & Communication Engineering
- Branch IV - Computer Science & Engineering
- Branch V - Electrical & Electronics Engineering
- Branch VI - Chemical Engineering
- Branch VII - Electronics & Instrumentation Engineering
- Branch VIII - Information Technology
- Branch IX - Instrumentation & Control Engineering
- Branch X - Biomedical Engineering

or any other branches of study as and when offered. The branch allocation shall be ordinarily done at the time of admission of the candidate to the first semester.

6. Subjects of Study:

The subjects of study shall include theory and practical courses as given in the curriculum and shall be in accordance with the prescribed syllabus. The subjects of study for the first two semesters shall be common for all branches of study.

7. Examinations:

The theory and practical examinations shall comprise continuous assessment throughout the semester in all subjects as well as university examinations conducted by Pondicherry University at the end of the semester (November / December or April / May).

(a) Theory courses for which there is a written paper of 75 marks
in the university examination.

The Internal Assessment marks of 25 has to be distributed as 10 marks each for two class tests and 5 marks for class attendance in the particular subject. The distribution of marks for attendance is as follows.

- 5 marks for 95% and above
- 4 marks for 90% and above but below 95%
- 3 marks for 85% and above but below 90%
- 2 marks for 80% and above but below 85%
- 1 mark for 75% and above but below 80%

In total, three tests are to be conducted and the better two are to be considered for assessment.

(b) Practical courses for which there is a university practical examination of 50 marks:

The internal assessment marks of 50 has to be distributed as 20 marks for the periodic practical works and records submitted thereof, 15 marks for an internal practical examination, 5 marks for an internal viva voce, and 10 marks for class attendance in the particular subject. The distribution of marks is as given below.

- 10 marks for 95% and above
- 8 marks for 90% and above but below 95%
- 6 marks for 85% and above but below 90%
- 4 marks for 80% and above but below 85%
- 2 marks for 75% and above but below 80%

8. Requirement for appearing for University Examination:

A candidate shall be permitted to appear for university examinations at the end of any semester only if:

(i) He / She secures not less than 75% overall attendance arrived at by taking into account the total number of periods in all subjects put together offered by the institution for the semester under consideration.

(Candidates who secure overall attendance greater than 60% and less than 75% have to pay a condonation fee as prescribed by University along with a medical certificate obtained from a medical officer not below the rank of Asst. Director)

(ii) He / She earns a progress certificate from the Head of the
institution for having satisfactorily completed the course of study in all the subjects pertaining to that semester.

(iii) His / Her conduct is found to be satisfactory as certified by the Head of the institution.

A candidate who has satisfied the requirement (i) to (iii) shall be deemed to have satisfied the course requirements for the semester.

9. Procedure for completing the course:

A candidate can join the course of study of any semester only at the time of its normal commencement and only if he/she has satisfied the course requirements for the previous semester and further has registered for the university examinations of the previous semester in all the subjects as well as all arrear subjects if any.

However, the entire course should be completed within 14 consecutive semesters (12 consecutive semesters for students admitted under lateral entry).

10. Passing Minimum:

(i) A candidate shall be declared to have passed the examination in a subject of study only if he/she secures not less than 50% of the total marks (Internal Assessment plus University examination marks) and not less than 40% of the marks in University examination.

(ii) A candidate who has been declared “Failed” in a particular subject may reappear for that subject during the subsequent semesters and secure a pass. However, there is a provision for revaluation of failed or passed subjects provided he/she fulfills the following norms for revaluation.

(a) Applications for revaluation should be filed within 4 weeks from the date of declaration of results or 15 days from the date of
receipt of marks card whichever is earlier.

(b) The candidate should have attended all the college examinations as well as university examinations.

(c) If a candidate has failed in more than two papers in the current university examination, his/her representation for revaluation will not be considered.

(d) The request for revaluation must be made in the format prescribed duly recommended by the Head of the Institution along with the revaluation fee prescribed by the University.

The internal assessment marks obtained by the candidate shall be considered only in the first attempt for theory subjects alone. For the subsequent attempts, University examination marks will be made up to the total marks. Further the University examination marks obtained in the latest attempt shall alone remain valid in total suppression of the University examination marks obtained by the candidate in earlier attempts.

11 Award of Letter Grades:

The assessment of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain points, will be awarded as per the range of total marks (out of 100) obtained by the candidate, as detailed below:

<table>
<thead>
<tr>
<th>Range of Total</th>
<th>Letter</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90 to 100</td>
<td>S</td>
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<tr>
<td>80 to</td>
<td>A</td>
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<tr>
<td>70 to</td>
<td>B</td>
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<tr>
<td>60 to</td>
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<td>50 to</td>
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<td>5</td>
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<tr>
<td>0 to</td>
<td>F</td>
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</table>

Incomplete FA

‘F’ denotes failure in the course. ‘FA’ denotes absent / detained as per clause 8.
After results are declared, grade sheets will be issued to the students. The grade sheets will contain the following details:

(a) The college in which the candidate has studied.

(b) The list of courses enrolled during the semester and the grades scored.

(c) The Grade Point Average (GPA) for the semester and The Cumulative Grade Point Average (CGPA) of all enrolled subjects from first semester onwards.

(d) GPA is the ratio of sum of the products of the number of credits (C) of courses registered and the corresponding grades points (GP) scored in those courses, taken for all the courses and sum of the number of credits of all the courses

\[
GPA = \left( \frac{\text{Sum of (C \times GP)}}{\text{Sum of C}} \right)
\]

CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester. FA grades are to be excluded for calculating GPA and CGPA.

The conversion of CGPA into percentage marks is as given below

\[
\% \text{ Marks} = (CGPA - 0.5) \times 10
\]

12 Award of Class and Rank:

(i) A candidate who satisfies the course requirements for all semesters and who passes all the examinations prescribed for all the eight semesters (six semesters for lateral entry candidates) within a maximum period of 7 years (6 years for lateral entry candidates) reckoned from the commencement of the first semester to which the candidate was admitted shall be declared to have qualified for the award of degree.

(ii) A candidate who qualifies for the award of the degree passing in all subjects pertaining to semesters 3 to 8 in his/her first appearance within 6 consecutive semesters (3 academic years) and in addition secures a CGPA of 8.50 and above for the semesters 3 to 8 shall be declared to have passed the examination in **FIRST CLASS with DISTINCTION**.

(iii) A candidate who qualifies for the award of the degree by passing in all subjects relating to semesters 3 to 8 within a maximum period of eight semesters after his/her commencement of
study in the third semester and in addition secures CGPA not less than 6.5 shall be declared to have passed the examination in FIRST CLASS.

(iv) All other candidates who qualify for the award of degree shall be declared to have passed the examination in SECOND CLASS.

(v) For the Award of University ranks and Gold Medal for each branch of study, the CGPA secured from 1st to 8th semester alone should be considered and it is mandatory that the candidate should have passed all the subjects from 1st to 8th semester in the first attempt. Rank certificates would be issued to the first ten candidates in each branch of study.

13. **Provision for withdrawal:**

A candidate may, for valid reasons, and on the recommendation of the Head of the Institution be granted permission by the University to withdraw from writing the entire semester examination as one Unit. The withdrawal application shall be valid only if it is made earlier than the commencement of the last theory examination pertaining to that semester. Withdrawal shall be permitted only once during the entire course. Other conditions being satisfactory, candidates who withdraw are also eligible to be awarded DISTINCTION whereas they are not eligible to be awarded a rank.

14. **Discontinuation of Course:**

If a candidate wishes to temporarily discontinue the course for valid reasons, he/she shall apply through the Head of the Institution in advance and obtain a written order from the University permitting discontinuance. A candidate after temporary discontinuance may rejoin the course only at the commencement of the semester at which he/she discontinued, provided he/she pays the prescribed fees to the University. The total period of completion of the course reckoned from the commencement of the first semester to which the
candidate was admitted shall not in any case exceed 7 years, including of the period of discontinuance.

15. **Revision of Regulations and Curriculum:**

The University may from time to time revise, amend or change the regulations of curriculum and syllabus as and when found necessary.
<table>
<thead>
<tr>
<th>B.Tech courses in which admission is sought</th>
<th>Diploma courses eligible for admission</th>
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<tbody>
<tr>
<td>Civil Engineering</td>
<td>Civil Engineering</td>
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<td></td>
<td>Civil and Rural</td>
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<tr>
<td></td>
<td>Engineering Architectural</td>
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<tr>
<td></td>
<td>Assistantship Architecture</td>
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<td>Agricultural Engineering</td>
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<tr>
<td>Mechanical Engineering</td>
<td>Mechanical Engineering</td>
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<td>Automobile Engineering</td>
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<td>Agricultural Engineering</td>
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<tr>
<td></td>
<td>Mechanical and Rural Engineering</td>
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<tr>
<td></td>
<td>Refrigeration and Air-conditioning</td>
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<td></td>
<td>Agricultural Engineering Technology</td>
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<tr>
<td></td>
<td>Metallurgy</td>
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<td>Production Engineering</td>
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<tr>
<td></td>
<td>Machine Design &amp; Drafting</td>
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<tr>
<td></td>
<td>Machine tool maintenance and Repairs</td>
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<tr>
<td></td>
<td>Printing Technology /</td>
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<tr>
<td></td>
<td>Engineering Textile Engineering /</td>
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<tr>
<td></td>
<td>Technology Tool Engineering</td>
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<tr>
<td>Electrical and Electronics Engineering</td>
<td>Electrical Engineering</td>
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<td>Electronics &amp; Communication Engineering</td>
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<td>Engineering Ceramic Technology</td>
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<td>Plastic Engineering</td>
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<td>Paper &amp; Pulp Technology</td>
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# B.Tech - CURRICULUM
## Instrumentation and Control Engineering

### I Semester

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<tr>
<th>Code No.</th>
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<th>Marks</th>
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<td>T101</td>
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<td>T103</td>
<td>Chemistry</td>
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<td>T104</td>
<td>Basic Electrical and Electronics Engineering</td>
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<td>1</td>
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<tr>
<td>T105</td>
<td>Thermodynamics</td>
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<td>T106</td>
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<td>P105</td>
<td>Chemistry lab</td>
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*To be completed in I and II semesters, under Pass / Fail option only and not counted for CGPA calculation.*
### III semester

<table>
<thead>
<tr>
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<tr>
<td>IC T32</td>
<td>Electric circuit analysis</td>
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<td>IC T33</td>
<td>Electronic devices</td>
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<td>25 75 100</td>
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<td>IC T34</td>
<td>Switching theory and logical design</td>
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<td>C++ and Data Structures</td>
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<td>Fluid mechanics &amp; strength of materials</td>
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<table>
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<tr>
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**Total**

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### IV semester

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<td>MA T41</td>
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<td>IC T44</td>
<td>Sensors and transducers</td>
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<td>IC T45</td>
<td>Linear integrated Circuits</td>
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<td>IC T46</td>
<td>Electrical Technology</td>
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<tr>
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<tr>
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<td>Linear integrated Circuits and digital design lab</td>
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**Total**

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*Under Pass / Fail option only and not counted for CGPA calculation.*
### V semester

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### VI semester

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**Total**

|         |                                  | L  | T  | P  | IA | UE | TM |
|---------|                                  | 20 | 0  | 6  | 23 | 475| 425| 900 |

### VIII semester

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<th>Marks</th>
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**Total**

|         |                                  | L  | T  | P  | IA | UE | TM |
|---------|                                  | 20 | 0  | 9  | 27 | 375| 525| 900 |

Total Credits: 220
List of Electives

Sixth Semester
EI E61 Industrial Electronics
EI E62 Telemetry and Telecontrol
EI E63 Visual Programming for Instrumentation Engineers
EI E64 Object-Oriented Test and Measurement Software Development
EI E65 Biomedical Instrumentation

Seventh Semester
EI E71 Operating Systems
EI E72 Optimization Techniques
EI E73 Instrumentation and control in Petrochemical Industries
EI E74 Power Plant Instrumentation
EI E75 Instrumentation Buses and data networks
EI E76 Web Based Instrumentation
EI E77 Data Base Management Systems
EI E78 Fiber Optics and Laser Instrumentation

Eighth Semester
EI E81 Robotics and Automation
EI E82 Design of Process Control System Components
EI E83 Fuzzy Logic and Neural Networks
EI E84 Optimal Control
EI E85 Robust control
EI E86 Computer Networks
EI E87 VLSI Design
T 101 MATHEMATICS – I

Unit I - Calculus
Curvature, radius of curvature, evolutes and involutes. Beta and Gamma functions and their properties.

Unit II - Multiple Integrals And Applications
Multiple integrals – change of order of integration. Applications: Areas (double integration) and volumes by triple integration (Cartesian and polar) – mass and center of mass (constant and variable densities).

Unit III - Analytical Solid Geometry
Directional cosines and ratios – angle between two lines – the equation of plane - equations to a straight line and shortest distance between two skew lines.

Unit IV - Differential Equations
Exact equations, First order linear equations, Bernoulli’s equation, orthogonal trajectories, growth and decay, geometrical applications and electric circuits. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut’s type.

Unit V - Differential Equations (Higher order)
Linear differential equations of higher order – with constant coefficients, the operator D - Euler’s linear equation of higher order with variable coefficients - simultaneous linear differential equations – solution by variation of parameters method – simple applications to electric circuits.

Text Books

Reference Books
Unit I – Acoustics & NDT
ultrasonics - Ultrasonic Waves Productions (Piezoelectric & Magnetostriction method) – Detections (Acoustic Grating)
Acoustics - Factors affecting Acoustic of Buildings (Reverberation, Loudness, Focusing, Echo, Echelon Effect and Resonance) and their Remedies - Sabine’s formula for Reverberation Time
NDT applications - Pulse Echo Method - Liquid Penetrant Method

Unit II – Optics
Interference - Air Wedge – Michelson’s Interferometer – Wavelength Determination – Interference Filter – Antireflection Coatings
Diffraction - Diffraction Grating – Dispersive power of grating - Resolving Power of Grating & Prism

Unit III – Lasers & Fiber Optics
Fiber Optics - Principle and Propagation of light in optical fiber – Numerical aperture and acceptance angle – Types of optical fibers (material, refractive index, mode)

Unit IV – Wave mechanics

Unit V – Nuclear energy source

Text Books

Reference Books
Unit I - Water

Unit II – Polymers

Unit III - Electrochemical Cells

Unit IV - Corrosion And Its Control

Unit V -Phase Rule
Definition and derivation of phase rule. Application to one component system - water and sulphur systems. Thermal analysis, condensed phase rule. Two component alloy systems - Pb-Ag, Cu-Ni and Mg-Zn systems.

Text books
Reference Books
Part A - Electrical

Unit – I

Unit – II
Node and mesh methods of analysis of DC circuits and simple AC circuits. Introduction to three phase circuits. Introduction to three phase system - phase and line parameters – relations, power measurement – voltmeter and ammeter method, two and three wattmeter methods.

Unit – III
Principle of DC generator and motor, Transformer, synchronous generator, induction motor (single phase). Sources for electrical energy conversion-thermal and hydraulic plant (Block diagram approach only). Components of AC transmission and distributions systems – line diagram.

Part B – Electronics
Unit – IV
Half-wave rectifier and Full-wave rectifier- filters - Amplifiers-common emitter and common collector amplifiers- Hartley oscillator and RC phase shift oscillator. Transducers – Resistance temperature detector (RTD) – Linear variable differential transformer (LVDT) - Strain gauge – Piezo electric transducer.

Unit – V

Unit – VI
Model of communication system – Analog and digital – Wired and wireless channel. Block diagram of various communication systems – Microwave, satellite, optical fiber and cellular mobile system. Network model – LAN, MAN and WAN – Circuit and packet switching – Overview of ISDN.
Text Books

Reference Books
Unit I - Basic Concepts and Definitions
Energy conversion and efficiencies - System, property and state - Thermal equilibrium - Temperature - Zeroth law of Thermodynamics.

Unit II - First Law of Thermodynamics
The concept of work and adiabatic process - First law of thermodynamics - Conservation of Energy principle for closed and open systems - Calculation of work for different processes of expansion of gases

Unit III - Second Law of Thermodynamics
Equilibrium and the second law - Heat engines - Kelvin-Planck statement of second law of thermodynamics - Reversible and irreversible processes - Carnot principle - Clausius inequality- Entropy

Unit IV - Gas Power Cycles
Air standard cycles: The air standard Carnot cycle - Air standard Otto cycle, diesel cycle, dual cycle and Bryton cycles and their efficiencies

Unit V - Refrigeration Cycles and Systems
Reverse Carnot cycle - COP - Vapor compression refrigeration cycle and systems (only theory) - Gas refrigeration cycle - Absorption refrigeration system (only theory)- Liquification and solidification of gases

Text Books

Reference Books
T 106 COMPUTER PROGRAMMING

Unit – I

Unit – II
Problem solving techniques – Program – Program development cycle – Algorithm design – Flowchart - Pseudo code.
Introduction to C – C tokens – data types – Operators and expressions – I/O functions

Unit – III
Decision making statements – branching and looping – arrays – multidimensional arrays – Functions – Recursion – Passing array to functions
Storage classes – Strings – String library functions

Unit – IV
Structures – Arrays and Structures – nested structures – passing structures to functions – user defined data types– Union
Pointers – pointers and arrays – pointers and functions - pointers and strings - pointers and structures

Unit – V
Files – operations on a file – Random access to files – command line arguments
Introduction to preprocessor – Macro substitution directives – File inclusion directives – conditional compilation directives – Miscellaneous directives

Text Books

Reference Book
List of Exercises
OS Commands, Word Processor and Spreadsheets

1. Study of OS commands-Compilation and execution of simple C programs
2. Use of mail merge in word processor
3. Use of spreadsheet to create Charts (XY, Bar, Pie) and apply the formulae wherever necessary C Programming (Flowcharts and algorithms are essential for the programming exercises)
4. Greatest of three numbers using conditional operator and if statement
5. Read two numbers and swap those two numbers using temporary variable and without using temporary variable.
6. Solve quadratic equation for different sets of inputs.
7. Use of Switch….Case statements
8. Generation of prime and Fibonacci series
9. Evaluate the COSINE series using for, while and do while loops
10. Matrix operations
   a) Addition  b)Transpose  c) Multiplication
11. Evaluate the sin(x) series using functions and recursive functions
12. Read a string and find solution to remove the duplicates of a given string from the given sentence
13. Create an array of structures for a list of items with the following details

<table>
<thead>
<tr>
<th>Item - Code</th>
<th>Item_ Name</th>
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</thead>
<tbody>
<tr>
<td>102</td>
<td>Paste – Colgate</td>
</tr>
<tr>
<td>102</td>
<td>Paste – Pepsodent</td>
</tr>
<tr>
<td>102</td>
<td>Paste – Close-up</td>
</tr>
<tr>
<td>101</td>
<td>Soap – Cinthol</td>
</tr>
<tr>
<td>101</td>
<td>Soap – Lux</td>
</tr>
<tr>
<td>101</td>
<td>Soap – Hamam</td>
</tr>
<tr>
<td>101</td>
<td>Soap – Dove</td>
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Arrange the set of items in ascending order of its Item_Code and descending order of its Item_ name as given below

<table>
<thead>
<tr>
<th>Item-Code</th>
<th>Item_ Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Soap – Lux</td>
</tr>
<tr>
<td>101</td>
<td>Soap – Hamam</td>
</tr>
<tr>
<td>101</td>
<td>Soap – Dove</td>
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<td>Soap – Cinthol</td>
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<td>102</td>
<td>Paste – Pepsodent</td>
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<tr>
<td>102</td>
<td>Paste – Colgate</td>
</tr>
<tr>
<td>102</td>
<td>Paste – Close-up</td>
</tr>
</tbody>
</table>

14. Use of Structure to define a user defined data types, input the data and write the data into the file
15. Use of pointers and array of pointers
16. Functions with static data types
17. Write command line program to implement the following DOS commands using files
   • Del
• Copy
P 102  ENGINEERING GRAPHICS

Unit 0
Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning

Unit I
Conic sections, Involute, Spirals, Helix. Projection of Points, Lines and Planes

Unit II
Projection of Solids and Sections of Solids.

Unit III
Development of surfaces - Intersection of surfaces (cylinder-cylinder, cylinder-cone)

Unit IV
Isometric projections and Orthographic projections

Unit V
Computer Aided Drafting: Introduction to Computer Aided Drafting hardware - Overview of application software - 2D drafting commands (Auto CAD) for simple shapes - Dimensioning.

Text Books

Reference Books
Electrical Lab
1. Study of tools and accessories
2. Study of joints
3. Staircase wiring
4. Doctor’s room wiring
5. Godown wiring
6. Tube Light and Fan connection
7. Lamp controlled from three different places wiring

Electronics Lab
1. Rectifiers
   Construction of half wave and full wave rectifiers with and without filters –
   Calculation of ripple factors.

2. Frequency Response of RC Coupled Amplifiers
   Determination of frequency response of given RC coupled amplifier –
   Calculation of bandwidth.

3. Verification of Kirchoff’s Voltage and Current Laws
   Determine the voltage and current in given circuits using Kirchoff’s laws
   theoretically and verify the laws experimentally.

4. Study of Logic Gates
   a. Verification of Demorgan’s theorems
   b. Verification of truth tables of OR, AND, NOT, NAND, NOR, EX-OR, EX-NOR
      gates and Flipflops - JK, RS, T and D
   c. Implementation of digital functions using logic gates

5. Study of CRO
   a. Measurement of AC and DC voltages
   b. Frequency and phase measurements (using Lissajou’s figures)

6. Study of Transducers
   a. Displacement and load measurements with transducers
   b. Temperature measurement with thermocouple
Unit I - Algebra
Binomial, exponential and logarithmic series (without proof) – problems on summation, approximation and coefficients.

Unit II – Matrices
Inverse of matrix by row transformation – Eigen values and Eigen vectors - Cayley-Hamilton theorem (without proof) – Diagonalisation – rank of matrix – solution of a general system of m linear algebraic equations in n unknown (m ≤ n).

Unit III – Trigonometry
Expansions for sin^n θ, cos^n θ, tan^n θ, sin (nθ), cos(nθ), tan (nθ). Exponential, circular, hyperbolic, inverse hyperbolic and logarithmic functions of a complex variable – separation of real and imaginary parts.

Unit IV - Vector Analysis
Scalar fields and Vector fields – Gradient, Divergence and Curl – their properties and relations – Gauss and Stokes theorems (without proof), simple problems for their verification.

Unit V - Statistics
Moments, kurtosis and skewness based on moments only. Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions. Correlation and regression – rank correlation.

Text Books

Reference Book
Unit I - Crystal structure and Defects
Crystal Systems – Bravais Lattices – Coordination Number, Atomic Radius, Packing Factor for FCC & HCP structures – Miller Indices for a cubic crystal– Powder X Ray Diffraction Method - Lattice defects – Qualitative ideas of point, line, surface and volume defects

Unit II – Dielectric properties
Dielectric Polarization and Mechanism – Internal or local Field - Clausius-Mossotti relation – Dielectric loss - Temperature and frequency dependence of dielectric constant – Measurement of Dielectric constant and loss using Scherring bridge – Elementary ideas of Piezoelectrics, Ferroelectrics and Pyroelectric materials and its Applications

Unit III – Magnetic Properties

Unit IV – Semiconductors and superconductors

Unit V – Advanced Materials
Liquid Crystals – Types – Application as Display Devices – Metallic Glasses – Nanomaterials (one, Two & three Dimensional) – Physical Properties and Applications of Carbon Nano Tubes

Text books

Reference Books
7. T 109 ENVIRONMENTAL SCIENCE

Unit I - Environmental Segments And Natural Resources

Unit II - Ecosystem & Biodiversity

Unit III - Air Pollution
Air pollution-sources of air pollution. Sources, effects and control measures of oxides of nitrogen, oxides of sulphur, oxides of carbon, hydrocarbon, chlorofluoro carbons and particulates. Green house effect-causes and effects on global climate and consequences. Ozone depletion-causes, mechanism and effect on the environment. Smog-sulfurous and photochemical smog-effect on the environment. Acid rain-theory of acid rain and effects.

Unit IV - Water Pollution And Solid Waste Management
Sources, effects and control measures of water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and radioactive pollution. Solid waste management – causes, effect and control measures of urban and industrial wastes.

Unit V - Social Issues And The Environment
Human population and the environment-population growth, variation among nations, population explosion, role of information technology in environment and human health.

Text Books

Reference Books
2) Sodhi G. S., Fundamental concepts of environmental chemistry, Narosa publishing house, New Delhi
Part-A  Civil Engineering
Unit I - Buildings, Building Materials
Buildings-Definition-Classification according to NBC-plinth area, Floor area, carpet area, floor space index-construction materials-stone, brick, cement, cement-mortar, concrete, steel- their properties and uses.

Unit II - Buildings and their components
Buildings- Various Components and their functions. Soils and their classification Foundations-Functions and types of foundations, Masonry, Floors-functions and types of floors, Roofs and types of roofs.

Unit III - Basic Infrastructure

PART - B  Mechanical Engineering
Unit IV - Internal and external combustion systems
Working principles of IC engines – Classification – Diesel and petrol engines: two stroke and four stroke engines. Steam generators(Boilers) – Classification – Constructional features (of only low pressure boilers) – Boiler mountings and accessories.

Conventional Power Generation Systems
Hydraulic, steam and gas turbines power plants – Schemes and layouts – Selection criteria of above power plants.

Unit V - Non-Conventional Energy Systems (Description Only)
Solar thermal systems – Solar photovoltaic – Solar pond – wind, wave, tidal, geothermal and ocean thermal energy conversion systems.

Casting
Green and dry sand moulding processes for ferrous and non-ferrous metals – applications.

Unit VI - Metal Joining
Elements of arc and gas welding, brazing and soldering – Bolted joint types – Adhesive Bonding; classification of adhesives – applications. Sheet Metal
Processing Punching, blanking, shearing, bending, and deep drawing processes; descriptions and applications

Text Books

For Part –A

For Part –B

Reference Books
Unit I - Fundamental of Mechanics
Basic Concepts Force System and Equilibrium, Definition of Force, Moment and Couple, Principle of Transmissibility, Varignon’s theorem, Resultant of force system – Concurrent and non concurrent coplanar forces, Condition of static equilibrium for coplanar force system, stability of equilibrium, concept of free body diagrams, applications in solving the problems on static equilibrium of bodies.

Unit II - Plane Trusses
Degrees of freedom, Types of supports and reactions, Types of loads, Analysis of Trusses-method of joints, method of sections. Friction. Introduction, Static dry friction, simple contact friction problems, ladders, wedges, screws and belt friction.

Unit III - Properties of Surfaces
Properties of sections – area, centroids of lines, areas and volumes, moment of inertia first moment of inertia, second moment of inertia and product moment of inertia, polar moment of inertia, radius of gyration, mass moment of inertia.

Unit IV - Kinematics and Kinetics of Particles

Unit V - Kinematics and Kinetics of Rigid bodies
Plane motion, Absolute motion, Relative motion, translating axes and rotating axes, work and energy, impulse and momentum

Text Books

Reference Books
Unit I – Basic Communication Theory
Importance of Communication – stages of communication, modes of communication – barriers to communication – strategies for effective communication – Listening: Importance, types, barriers – Developing effective listening skills.

Unit II – Comprehension And Analysis
Comprehension of technical and non-technical material – Skimming, scanning, inferring-Note making and extension of vocabulary, predicting and responding to context- Intensive Reading and Reviewing

Unit III – Writing
Effective sentences, cohesive writing, clarity and conciseness in writing – Introduction to Technical Writing – Better paragraphs, Definitions, Practice in Summary Writing – Four modes of writing – Use of dictionaries, indices, library references – making bibliographical entries with regard to sources from books, journals, internet etc.

Unit IV – Business Writing / Correspondence

Unit V – Oral Communication

Reference Books
P 104 PHYSICS LABORATORY

List of experiments (Any 10 Experiments)
1. Thermal conductivity – Lee’s DISC
2. Thermal conductivity - Radial flow
3. Spectrometer – Prism or Hollow prism
4. Spectrometer – Transmission grating
5. Spectrometer - Ordinary & Extraordinary rays
6. Newton’s rings
7. Air – wedge
8. Half shade polarimeter – Determination of specific rotatory power
9. Jolly’s experiment – determination of α
10. Magnetism: i – h curve
11. Field along the axis of coil carrying current
12. Vibration magnetometer – calculation of magnetic moment & pole strength
13. Laser experiment: wavelength determination using transmission grating, reflection grating (vernier calipers) & particle size determination
14. Determination of optical absorption coefficient of materials using laser
15. Determination of numerical aperture of an optical fiber

P105 CHEMISTRY LABORATORY

List of experiments (Any 10 Experiments)
1. Determination of dissolved oxygen in water.
2. Determination of total hardness of water by EDTA method.
3. Determination of carbonate and bicarbonate in water.
4. Estimation of chloride content in water.
5. Estimation of magnesium by EDTA.
7. Estimation of ferrous by permanganometry.
8. Estimation of ferrous and ferric iron in a solution mixture by dichrometry.
10. Estimation of copper in copper sulphate solution.
11. Estimation of calcium by permanganometry.
12. Estimation of iron by colorimetry.

Demonstration Experiments (Any two of the following)
1. Determination of COD of water sample.
2. Determination of lead by conductometry.
3. Percentage composition of sugar solution by viscometry.
## List of Exercises

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Trade</th>
<th>List of Exercises</th>
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<tbody>
<tr>
<td>1.</td>
<td>Fitting</td>
<td>Study of tools and Machineries. Exercises on symmetric joints and joints with acute angle.</td>
</tr>
<tr>
<td>2.</td>
<td>Welding</td>
<td>Study of arc and gas welding equipment and tools – Edge preparation – Exercises on lap joint and V Butt joints – Demonstration of gas welding</td>
</tr>
<tr>
<td>4.</td>
<td>Carpentry</td>
<td>Study of tools and Machineries – Exercises on Lap joints and Mortise joints</td>
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### I Fitting
1. Study of tools and Machineries
2. Symmetric fitting
3. Acute angle fitting

### II Welding
1. Study of arc and gas welding equipment and tools
2. Simple lap welding (Arc)
3. Single V butt welding (Arc)

### III Sheet metal work
1. Study of tools and machineries
2. Funnel
3. Waste collection tray

### IV Carpentry
1. Study of tools and machineries
2. Half lap joint
3. Corner mortise joint.
NCC/NSS training is compulsory for all Undergraduate students

1. The activities will include Practical/field activities/Extension lectures.
2. The activities shall be carried out outside class hours.
3. For the above activities, the student participation shall be for a minimum period of 45 hours.
4. The activities will be monitored by the respective faculty in charge and the First Year Coordinator.
5. Pass/Fail will be determined on the basis of participation, attendance, performance and behavior. If a candidate fails, he/she has to repeat the course in the subsequent years.
6. Pass in this course is mandatory for the award of degree.
UNIT-I

UNIT – II
Function of a Complex Variable: Functions of a complex variable-continuity, Derivative and analytic function-Cauchy-Riemann equations-Necessary and sufficient conditions for analyticity-Harmonic and orthogonal properties of real and imaginary parts-Conformal mapping-Bilinear transformations (12 hours).

UNIT – III
COMPLEX INTEGRATION: Cauchy’s theorem-Cauchy’s integral formula-Taylor’s and Laurent series-Residue theorem-Contour integration round the unit circle and semicircular contour (12 Hours).

UNIT – IV
FOURIER SERIES: Dirichlet’s conditions-Expansion of periodic functions into Fourier series-Change of interval-Half-range Fourier Series. Complex form of Fourier series-Root mean square value-Parseval’s theorem on Fourier coefficients-Harmonic analysis (12 Hours).

UNIT – V
FOURIER TRANSFORM: Fourier integral (statement only), Fourier transform, Inverse Fourier Transform, Fourier sine and cosine transforms, definitions and properties. (12 hours)

TEXT BOOK:

REFERENCE BOOKS:
UNIT 1
Review of fundamentals of ac circuits, inductance and capacitance parameters, Concept of Reactance, Impedance, Susceptance and Admittance, Steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation- power factor, Real and Reactive powers, Complex and Polar forms of representation, Complex power.

UNIT II
NETWORK THEOREMS FOR DC AND AC CIRCUITS: Review of loop and nodal methods of analysis, star-to-delta or delta-to-star transformation, Source transformation
Superposition theorem, Thevenin’s theorem, Norton’s theorem, reciprocity theorem, compensation theorem, Maximum power transfer theorem, Millman’s theorem and Tellegen’s theorem.

UNIT – III
COUPLED CIRCUITS, RESONANCE AND THREE PHASE CIRCUITS:
Resonance – Series and parallel resonance circuits- Concept of band width and Q factor.
Coupled Circuits: Faraday’s laws of electromagnetic induction – Concept of self and mutual inductance – dot convention – coefficient of coupling- linear transformer- Ideal transformer
Three phase circuits: Phase sequence – Star and delta connection – Relation between line and phase voltages and currents in balanced systems – Analysis of balanced and Unbalanced 3 phase circuits – two watt meter method to measure power and power factor.

UNIT – IV
TRANSIENT ANALYSIS: Initial conditions in elements-Evaluating initial conditions in networks-Transient response of R-L, R-C, R-L-C circuits (Series combinations only) for impulse, step, pulse and sinusoidal excitations -Solution using differential equation approach and Laplace transform methods of solutions- Response of circuits for non-sinusoidal periodic inputs

UNIT – V
NETWORK FUNCTIONS AND PARAMETERS: Network functions: The concept of complex frequency-Transform impedance and transform circuits- driving point impedance and admittance-transfer function-poles and zeros.

Two port network parameters – Z, Y, ABCD, hybrid parameters and their relations- concept of transformed network – 2-port network parameters using transformed variables.

TEXT BOOKS:


REFERENCE BOOKS:

IC T33 ELECTRON DEVICES AND CIRCUITS
(Common to EIE and BME branches)

UNIT-I

UNIT-II
BIPOLAR JUNCTION AND FIELD EFFECT TRANSISTORS: Construction, principle of operation, V-I characteristics, symbol, equivalent circuit, parameter calculations, applications, and specifications of BJT, FET and MOSFETS. Enhancement and Depletion mode MOSFET, Salient features of different configuration of BJT and FET- VVR operation of FFT-Comparison of BJT, JFET and MOSFET. devices.

UNIT-III
RECTIFIERS, FILTERS AND REGULATORS: Half wave rectifier, ripple factor, full wave rectifier, Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L-section filter, \( \pi \)-section filter, Multiple L-section and Multiple \( \pi \)-section filter and comparison of various filter circuits in terms of ripple factors, clippers, clampers, voltage multipliers.
Simple circuit of a regulator using zener diode. Series and Shunt voltage regulators- Analysis and design- Protection circuits for voltage regulators.

UNIT IV
SPECIAL SEMICONDUCTOR DEVICES: Tunnel diode and characteristics- PIN diode- Varactor diode- Schottky diode- Gunn diode- Laser diode- photo conductive sensors- photo voltaic sensors- Light Emitting Diode (LED)- Liquid Crystal Display (LCD)- Charge coupled device (CCD)- Silicon Control Rectifier (SCR)- two transistor equivalent, DIAC, TRIAC, Applications of SCR, DIAC, TRIAC, Unijunction Transistor (UJT).

UNIT-V
BIASING AND STABILISATION: BJT biasing- DC equivalent model-Criteria for fixing operating point- Methods of Bias stabilization, fixed bias, emitter bias, voltage divider bias, DC bias with voltage feedback –Temperature compensation using diode biasing,thermistor and sensistor compensation-Thermal run away-Thermal stability. Biasing of JFET and MOSFET-uses of heat sink.
AMPLIFIERS: Small signal low frequency transistor amplifier circuits: h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-
parameters: voltage gain, current gain, Input impedance and Output impedance. Comparison of transistor configurations in terms of $A_I$, $R_i$, $A_v$, $R_o$.

TEXT BOOK

REFERENCE BOOKS
3. Nagrath, ““Electronic Devices and Circuits” PHI Learning, 2006
UNIT I

BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS: Review of logic gates—universal gates- NAND/NOR realizations- Boolean Algebra - Basic theorems and properties - switching functions-Simplification of Boolean expression-sum of products and product of sums, Karnaugh map-Quine McClusky’s method.

INTEGRATED CIRCUITS: Classification of ICs-Comparison of various logic families, standard TTL NAND Gate-Analysis& characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tristate outputs, IC interfacing- TTL driving CMOS & CMOS driving TTL.

UNIT II
COMBINATIONAL LOGIC DESIGN:
Design using conventional logic gates, half adder, full adder, half subtractor, full subtractor, magnitude comparator, Encoder, Decoder, Multiplexer, De-Multiplexer, MUX Realization of switching functions, Parity bit generator, Code converters, Hazards and hazard free realizations.
Study of pin configurations of TTL 74XX and CMOS 40XX series for the above combinational circuits, decoders & drives for LED & LCD display.

UNIT III
SEQUENTIAL CIRCUITS: Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples) Basic flip-flops-truth table and excitation table, synchronous and asynchronous counter design-up-down counter, BCD counter- Design of modulo-N Ring & Shift registers-timing sequence-tracing problems-Hazard and hazard free asynchronous counters.

UNIT IV

UNIT V
ALGORITHMIC STATE MACHINES: Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.
PROGRAMMABLE LOGIC DEVICES, THRESHOLD LOGIC: Basic PLD’s-ROM, PROM, PLA, PLD Realization of Switching functions using PLD’s. Capabilities and limitations of Threshold gate, Synthesis of Threshold functions, Multigate Synthesis.

TEXTBOOKS:
2. Anand Kumar, Digital Electronics, PHI, 2008

REFERENCE BOOKS:
2. Fletcher, An Engineering Approach To Digital Design –PHI.
IC T35 C++ AND DATA STRUCTURES  
( Common to EIE and BME branches)

UNIT – I  
INTRODUCTION TO DATA STRUCTURES – Abstract data types – Arrays – Static, Dynamic and Generic arrays. Strings – Fixed and variable size – static and dynamic strings.

UNIT – II  

UNIT – III  

UNIT – IV  
OBJECTS AND CLASSES – specifying classes – using – C++ objects and data types – constructors and destructors – object as function arguments – structures and classes.

UNIT – V  

TEXT BOOKS:

REFERENCES:
IC T36 FLUID MECHANICS AND STRENGTH OF MATERIALS  
( Common to EIE and BME branches)

Unit I  
DEFORMATION OF SOLIDS AND BENDING OF BEAMS: Concept of stress and strain – Normal and shear stresses – Simple and compound Stresses - Elasticity and elastic moduli – Poisson’s ratio – Concept of Shear Force and Bending Moment – Bending moment and shear force diagrams for simply supported, cantilever and over hanging beams.

UNIT II  
SHAFTS AND SPRINGS: Torsion – Shear stresses in circular solid and hollow shafts - Torque and power – Helical and leaf springs – Load, deflection, stress and stiffness relationships.

Unit III  

Unit IV  

Unit V  

TEXT BOOKS:  

REFERENCE S:  
IC P31 ELECTRON DEVICES AND CIRCUITS LAB
(Common to EIE and BME branches)

Any ten experiments
1. PN Junction diode and Zener diode
2. Rectifier with and without filters (Full wave & Half wave)
3. FET characteristics
4. Measurement of h parameters of transistor in CB, CE, CC configurations
5. CE Amplifier and CC amplifiers
7. FET amplifier (Common Source)
8. Wien Bridge and RC Phase Shift Oscillators
10. SCR, DIAC and TRIAC characteristics
11. Clippers and clampsers
12. RC wave shaping circuits

IC P32 FLUID MECHANICS AND STRENGTH OF MATERIALS LAB
(Common to EIE and BME branches)

List of Experiments:

Part – A: Fluid Mechanics Laboratory
1. Determination of Coefficient of discharge of Venturimeter, Orifice meter, Mouthpiece and Orifice.
2. Determination of Losses through pipes and pipe specials.
3. Determination of metacentric height of floating bodies.
4. Determination of force due to impact of jet on Vanes
5. Characteristic study on turbines
6. Characteristic study on pumps.

Part – B: Strength of Materials Laboratory
1. Tension test and Young’s modulus of steel.
2. Hardness test : Rockwell, Brinell and Vicker’s.
3. Torsion test : Rods and Flats.
4. Impact test : Charphy and Izod on metals.
5. Ductility test : Sheet metals (Al,GI and MS)
IC P33 C++ AND DATA STRUCTURES LAB
( Common to EIE and BME branches)

1. Programming using keywords of C++: public, Private, Protected.
2. Programming using keywords of C++: Inline, new and delete.
3. Programming examples for the following: function over loading.
4. Programming examples for the following: Operator over loading.
5. Programming using information hiding.
9. Programming to illustrate (i) String (ii) linked list.
10. Programming to illustrate (i) Stack (ii) Queues (iii) Trees.
UNIT – I
PARTIAL DIFFERENTIAL EQUATIONS: Formation by elimination of arbitrary constants and arbitrary functions – general, singular, particular and complete integrals – Lagrange’s linear first order equation – higher order differential equations with constant coefficients.

UNIT – II

UNIT – III
FOURIER SERIES SOLUTION: One dimensional heat flow equation – Fourier series solutions for two dimensional heat flow equations under steady state conditions – (Cartesian and polar forms).

UNIT – IV
APPLIED STATISTICS: Curve fitting method of least squares – fitting of straight lines, second degree parabolas and more general curves. Test of significance – large samples test for ratio of variances – chi – square test for goodness of fit and independence of attributes.

UNIT – V
SMALL SAMPLES: test for single mean, difference of means and correlations of coefficients, test for ratio of variances – chi – square test for goodness of fit and independence of attributes.

TEST BOOKS:

REFERENCES:
IC T42 ELECTRONIC CIRCUITS
( Common to EIE and BME branches)

UNIT I
Differential amplifiers – Common mode and differential mode analysis - DC and AC analysis.

UNIT II
FEEDBACK AMPLIFIERS AND OSCILLATORS: Concept of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on Amplifier characteristics, feedback topologies, practical feedback circuits- the oscillator-conditions for oscillations-RC phase shift oscillator –Wien bridge oscillator, Colpitt’s oscillator, Hartley oscillator, clap oscillator, frequency and amplitude stability in oscillators, crystal oscillator.

UNIT III
POWER AMPLIFIERS: Class A power amplifier, maximum value of efficiency of Class A amplifier, transformer coupled amplifier, transformer coupled audio amplifier, push pull amplifier, complimentary symmetry circuits (transformer less class B power amplifier), phase inverters, class D operation, class S operation,

UNIT IV
TUNED AMPLIFIERS: Single tuned capacitive coupled amplifier, tapped single tuned capacitance coupled amplifier, single tuned transformer coupled or inductively coupled amplifier, CE double tuned amplifier, application of tuned amplifiers. stagger Tuning, stability considerations, tuned class B and class C Amplifiers, wideband amplifiers, tuned amplifiers.

UNIT V
PULSE CIRCUITS
RC wave shaping circuits-Integrator and differentiator-switching diodes and transistors-storage time-Astable, monostable and bistable multivibrators, Schmitt trigger, voltage/current sawtooth sweeps-fixed amplitude and constant current generators-UJT saw tooth generator-Miller and bootstrap time bases-Multivibrator using negative resistance devices (UJT and tunnel diodes)

TEXT BOOKS:

REFERENCES:
IC T43 ELECTRICAL AND ELECTRONIC MEASUREMENTS
( Common to EIE and BME branches)

UNIT I
MEASUREMENT OF VOLTAGE, CURRENT, POWER AND ENERGY
Galvanometers – Ballistic, D’Arsonval galvanometer – Theory, calibration, application – Principle, construction, operation and comparison of moving coil, moving iron meters, dynamometer, induction type & thermal type meter, rectifier type – Extension of range and calibration of voltmeter and ammeter– Errors and compensation

UNIT II
POTENTIOMETERS & INSTRUMENT TRANSFORMERS
C.T and V.T construction, theory, operation, phasor diagram, characteristics, testing, error elimination – Applications.

UNIT III
RESISTANCE AND IMPEDANCE MEASUREMENT

UNIT IV
SIGNAL GENERATORS AND ANALYZERS

UNIT V
CATHODE RAY OSCILLOSCOPE, RECORDER AND DISPLAYS
General purpose oscilloscope – Screens for CRT graticules – Vertical & horizontal deflection systems – Delay line – Multiple trace – Dual beam & dual trace –
Display devices: LED – LCD – Annunciators, Numerics, Alphanumerics

TEXT BOOKS

REFERENCE BOOKS
UNIT – I

UNIT - II

UNIT – III

UNIT – IV

UNIT – V
Text Books:

References:
2. C.D. Johnson, “Process control Instrumentation Technology”, PHI, 7thedition,
IC T45 LINEAR INTEGRATED CIRCUITS
(Common to EIE and BME branches)

UNIT I
INTEGRATED CIRCUITS: Classification, chip size and circuit complexity, Fundamentals of Monolithic IC technology, basic planar processes, Fabrication of a typical circuit, Active and passive components of ICs, fabrication of FET, Thin and thick film technology.

UNIT II
OP-AMP APPLICATIONS: Basic application of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, Precision rectifiers, log and antilog amplifiers, sample & hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators, Schmitt trigger, Multivibrator, Triangular wave generator.

UNIT III
ACTIVE FILTERS, OSCILLATORS AND REGULATORS: Introduction-Low pass and High pass filters- Design of first and second order Butterworth lowpass and high pass filters Band pass, Band reject and all pass filters- Oscillator types and principle of operation – RC, Wien bridge oscillators triangular, saw-tooth, square wave and VCO- Introduction to voltage regulators, features of 723, Three Terminal IC regulators- DC to DC Converter- Switching Regulators-UPS-SMPS.

UNIT IV

UNIT V
D-A AND A-D CONVERTERS: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC, dual slope ADC and Sigma delta ADC, DAC and ADC specifications. DAC 0800 and ADC 0804 pin diagram and applications

TEXT BOOK:

REFERENCES:
UNIT-I
MAGNETIC CIRCUIT: Magnetomotive force, magnetic field strength-permeability of free space, relative permeability-reluctance-comparison of electric and magnetic circuits-composite magnetic circuit-magnetic leakage and fringing Kirchhoff’s Laws for the magnetic circuits-magnetization curve-hysteresis loop-current-ring theory of magnetism- hysteresis loop-minimum volume of a permanent magnet-load line of a permanent magnet-barium ferrite magnets-magnetic field of a long solenoid-magnetic energy in a non-magnetic medium-magnetic pull. Inductance of a coil and factors determining inductance of a coil. Magnetic relays and contactors. Earth leakage circuit breakers.

UNIT-II
DC MACHINES: Construction details of machine-operation of DC generators-EMF equation-characteristics of different types of generators-commutation-armature reaction- operation of DC motors-torque equation- characteristics of different types of DC motors. Starters-braking and speed control of DC motors. Applications of DC motors and generators, DC Servomotor

UNIT-III

UNIT-IV

UNIT-V
INDUCTION MACHINES: Types- constructional features- equivalent circuit-slip-torque characteristics-starters- braking and speed control methods-principle of operation and types of single phase induction motors. Application of three and single phase induction motors, AC servomotor

TEXT BOOK

REFERENCE BOOK
IC P41 LINEAR INTEGRATED CIRCUITS AND DIGITAL DESIGN LAB  
(Common to EIE and BME)

Minimum ten Experiments to be conducted: (five from each part A & B)

Part A (IC Application Lab):
1. OP AMP Applications – Adder, Subtractor, Integrator and Differentiator Circuits using IC 741.
2. Active Filter Applications – LPF, HPF (first order)
3. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
4. Function Generator using OP AMPs.
5. IC 555 Timer – Monostable and Astable Operation Circuit.
7. Voltage Regulator using IC 723.

Part B
1. D Flip-Flop 7474 and shift registers 7495
2. Decade counter 7490
3. 3-8 Decoder 74138
4. 4 bit Comparator 7485
5. 8 x 1 Multiplexer 74151 and 2x4 Demultiplexer 74155
6. RAM (16x4) 74189 (Read and Write operations)
7. Decoder drives for LED

IC P42 SENSORS AND TRANSDUCERS LAB  
(Common to EIE)

1. Characteristic of Temperature transducers (LDR, thermistor and thermocouple).
3. Measurement of strain, Load and Level using strain gauges
4. Measurement of torque and Pressure using strain gauges
6. Characteristics of Optical Transducers (LDR, Phototransistor, Photovoltaic and photoconductive cells)
8. Ramp response characteristic of filled in system thermometer.
10. Characteristics of P/I and I/P converters.
11. Measurement of Pressure and Temperature using ICs (LM 335, and AD 590)
12. Measurement of Position using synchro Transmitter and receiver
IC P43 ELECTRICAL MACHINES LAB
(Common to EIE)

1. Power measurement using Two wattmeter method for the following:
   a) Load with UPF
   b) Load with Lagging PF
   c) Load with Leading PF
2. OCC of Shunt generator.
4. Swinburn’s Test.
5. Load test on single phase Induction motor.
7. Load test on single phase Alternator.
8. V-Curves for synchronous motor.
9.Load test on three phase transformer.
10. Load test on shunt motor.
11. Variation of starting torque with rotor resistance of a slip ring induction motor.

IC P44 PHYSICAL EDUCATION

Physical Education is compulsory for all the Undergraduate students
1. The activities will include games and sports / extension lectures.
2. Two Hrs. / Week will be allocated for physical education in the third and fourth semesters. The student participation shall be for a minimum period of 45 hours in both the semesters put together.
3. These activities will be monitored by the Director of Physical Education.
4. Pass /Fail will be determined on the basis of participation, attendance, and performance. If a candidate Fails, he/she has to repeat the course in the subsequent years
5. Pass in this course is mandatory for the award of degree.
UNIT – I
SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATION AND EIGEN VALUE PROBLEM: Solution of algebraic and transcendental equation by the method of bisection, the method of false position, Newton-Raphson method and Graeffe’s Root squaring method. Eigen value problem by power method and Jacobi method.

UNIT – II

UNIT – III

UNIT – IV

UNIT – V

Text Book:

References:
UNIT-I
INTRODUCTION: Concepts of control systems- Open loop and closed loop control systems and their differences- Different examples of control systems- classification of control systems.

MATHEMATICAL MODELS OF PHYSICAL SYSTEMS: Differential equations- transfer function and block diagram representation of physical systems- translational and rotational mechanical systems, electrical systems-analogous systems- Block diagram reduction using algebra- Representation by signal flow graph-reduction using Mason’s gain formula.

UNIT-II

UNIT-III
CONCEPTS OF STABILITY: The concept of stability, Routh stability criterion- qualitative stability and conditional stability. The root locus concept- construction of root loci effects of adding poles and zeros to G(s)H(s) on the root loci-root contour.

UNIT-IV
FREQUENCY RESPONSE ANALYSIS: Frequency response specifications- Bode diagrams- Determination of Frequency domain specifications and transfer function from the Bode diagram- Phase margin and Gain margin- Stability Analysis from Bode plots. Polar plots, Nyquist plots and applications of Nyquist criterion to find the stability- Effects of adding poles and zeros to G(s)H(s) on the shape of the Nyquist diagrams, Constant M and N circles- Nichols Chart-Frequency Domain specifications from Nichols Chart.

UNIT-V
STATE-VARIABLE ANALYSIS: Introduction of state, state variables and state model, derivation of state models from block diagrams, Relationship between state equations and transfer functions- Characteristic equation, eigenvalues, eigenvectors, canonical forms Diagonalization- solving the time invariant state equations- State Transition Matrix. Controllability and observability.

TEXT BOOK:
REFERENCES:
UNIT – I


UNIT – II


UNIT – III


UNIT – IV

MISCELLINEOUS MEASUREMENTS-I: Accelerometers - LVDT, piezo-electric, strain gauge and variable reluctance type accelerometers – mechanical type vibration instruments – seismic instrument as an accelerometer and vibrometer – calibration of vibration pick ups – units of density, specific gravity and viscosity used in industries – Baume scale API scale – pressure head type densitometer – float type densitometer – ultrasonic densitometer Bridge type gas densitometer.

UNIT – V

terms - different methods of moisture measurement – moisture measurement in
granular materials, solid penetrable materials like wood, web type material.

TEXT BOOKS:
1. Ernest O.Doebelin, “Measurement systems Application and Design”,
   1998.
2. R.K.Jain, “Mechanical and Industrial Measurements”, Khanna Publishers,
   New Delhi, 1999.

REFERENCES:
   Publishing Ltd., New Delhi, 1999.
2. A.K.Sawhney, “A course in Electrical and Electronic Measurement and
3. P.Holman, “Experimental Methods for Engineers”, International Student
UNIT-I

INTRODUCTION TO 8085: Generic-8-bit microprocessor and its architecture-8085 functional block diagram-Architecture-functions of different sections-Memory mapping-Memory interfacing-Instruction format-addressing modes-instruction set of 8085 CPU-instruction cycle-timing diagram-different machine cycles-fetch and execute operations-estimation of execution time.

UNIT-II

PROGRAMMING 8085: data transfer instructions-arithmetic operations-logic and branch operations-writing assembly language programmes-looping, count indexing-16 bit arithmetic instructions-arithmetic operations related to memory-logical operations, rotate compare, counter and time delays-debugging techniques. Stack- subroutine- call and return instructions-parameter passing techniques-nested subroutine. Parallel input-output and interfacing applications-parallel peripheral and memory mapped I/O

UNIT-III

INTERFACING DEVICES: 8255 programmable peripheral interface-8253 programmable interval timer-8085 interrupts-Restart as software instructions-8259 programmable interrupt controller-direct memory access(DMA) and 8257 DMA controller-8155 and 8255 multipurpose programmable devices-8279 programmable keyboard display interface-serial I/O and data communication-8251 USART-Interfacing data converters ADC and DAC.

UNIT-IV

INTRODUCTION TO 8086: Architecture of 8086 Microprocessor- Special functions of General purpose registers- 8086 flag register and function of 8086 flags-Addressing modes of 8086- Instruction set of 8086-, Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation- Pin diagram of 8086-Minimum mode and maximum mode of operation- Timing diagram- Memory interfacing to 8086 (Static RAM & EPROM).

UNIT-V

APPLICATIONS OF MICROPROCESSORS: Typical application of microprocessors: stepper motor control, temperature control, thermocouple linearization, frequency measurement., phase angle and power factor measurement, Measurement of voltage, current, resistance and power, Measurement of strain, deflection and water level.measurement, Microprocessor based traffic control.
TEXT BOOKS

REFERENCE BOOKS
UNIT I:


UNIT II

CURRENT TRENDS IN DIGITAL INSTRUMENTATION: Introduction to special function add on cards – Resistance card – Input and output cards – Digital equipment construction with modular design; interfacing to microprocessor, micro controllers and computers - Computer aided software engineering tools (CASE) – Use of CASE tools in design and development of automated measuring systems – Interfacing IEEE cards – design of GPIB Systems - Intelligent and programmable instruments using computers-Data networks-CAN Bus, SMART/HART protocols

UNIT III

VIRTUAL INSTRUMENTATION: Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI. VI programming techniques: VIS and sub-VIS, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

UNIT IV

DATA ACQUISITION & VI CHASSIS REQUIREMENTS: Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements. Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI.

UNIT V

VI TOOLSETS, DISTRIBUTED I/O MODULES: Application of Virtual Instrumentation: Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.
TEXTBOOKS:

REFERENCES:
IC T56 ELECTRIC DRIVES AND CONTROL

UNIT I
Electric drives and its control: speed torque characteristics of D.C. motors (shunt, series and compound type), induction motor and synchronous motor under normal operating and braking conditions, Speed control of electric motors, special forms of electric drive. Motor power rating selection and load diagrams, Load equalization.

UNIT II
Automatic Electric drive control: Automatic electric drive control with rotating amplifiers, magnetic amplifier and electronic devices.
Control of electric motor by thyristor: Starting and speed control and braking of D.C. motors, induction motor and synchronous motor by S.C.R.
Application of electric drive in steel, cement and paper mills, Selection of motor for given services.
Electric Traction: System of electric traction and their comparison, systems used in India.

UNIT III
Mechanics of train movement: Speed time and distance time curves, tractive efforts for acceleration and propulsion, effective weight, train resistance, adhesive weight and coefficient driving axles, specific energy output and consumption factors effecting energy consumptions.

UNIT IV

UNIT V
Feeding and distribution stem for tramways and railways: Track boosters, Distribution system for single phase A.C. electrification, Current collectors, Substation equipments and arrangements.

TEXTBOOK: 1. Fundamentals of Electrical Drives by G.K. Dubey
IC P51 SIMULATION LAB

2. Time responses of various systems, compensation, Stability analysis using MATLAB.
3. Root locus plots using MATLAB.
5. Relative stability analysis using Bode plot.
6. Time domain Analysis using Simulink blocks.
7. Analysis of Transistor biasing circuits (Fixed, Emitter and Collector base bias).
8. Analysis of Transistor Amplifier circuits.
10. Design and Analysis of Feedback Amplifiers and Oscillators.
11. Analysis of FET biasing and Amplifier circuits.

IC P52 DESIGN PROJECT LAB

5. Design, Testing and calibration of DAC and ADC.

IC P53 MICROPROCESSORS AND APPLICATIONS LAB

1. Programming 8085 microprocessor kit
2. Programming 8086 microprocessor kit
3. Interfacing programmable interrupt controller
4. Interfacing of switches and display devices
5. Interfacing of D/A and A/D converters
6. Interface of key board and display using programmable controllers
7. Interface of programmable timer
8. Stepper motor control using microprocessor
9. Interfacing of 8251 and 8257
10. Study of MASM and DEBUG utilities
UNIT -I:

**ART OF COMMUNICATION:** Verbal and Non-verbal Communication – Barriers to Communication – Importance of Body Language – Effective Listening – Feedback

UNIT - II:

**INTRODUCTION TO SOFT SKILLS:** Attitude – Self-Confidence – Leadership Qualities – Emotional Quotient – Effective Time Management Skills – Surviving Stress – Overcoming Failure – Professional Ethics – Interpersonal Skills

UNIT – III:

**WRITING:** Importance of Writing – Written Vs Spoken Language – Formal and Informal Styles of writing – Resources for improving writing – Grammar and Usage – Vocabulary Building – SWOT analysis

UNIT – IV:

**SPEAKING PRACTICE:** Dialogue – Telephone Etiquette – Public Speaking – Debate – Informal Discussions – Presentations

UNIT – V:

**APTITUDE:** Verbal and Numerical aptitude

REFERENCES:

IC T61 PROCESS CONTROL
(Common to EIE)

UNIT – I


UNIT – II

PROCESS CONTROL ELEMENTS: Signal conversion - I/P, P/I Converters, Pneumatic and Electric actuators, Valve Positioner-Control Valve – Characteristics of Control Valves-Types of control valves- control valve sizing- cavitation and flashing. Dynamics of batch and Continuous process.

UNIT – III


CONTROLLER TUNING: Zeigler and Nichols open and Closed loop methods, Performance indices –Based on evaluation criteria – ISE, IAE, ITAE.

UNIT – IV

VARIOUS CONTROL SYSTEMS: Feed Forward Control ,Cascade control , Ratio control, Over ride control, Split range control , Selective control, Adaptive control, Inferential control.

UNIT V


TEXT BOOKS:

REFERENCES:
IC T62 INDUSTRIAL INSTRUMENTATION – II

UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V
INDUSTRIAL SAFETY SPECIFICATIONS: EMC: Introduction, Interference coupling mechanism, basics of circuit layout and grounding, concepts of Interfaces,

TEXT BOOKS:

REFERENCES:
IC T63 COMMUNICATION ENGINEERING
(Common to EEE and EIE)

UNIT-I

UNIT-II

UNIT- III

UNIT- IV
FIBER OPTICAL COMMUNICATION SYSTEMS: Need for fiber optics, introduction to optical fiber, principle of light transmission through a fiber, fiber characteristics and classification, various fiber losses- Light sources and photo detectors- Block diagram of a fiber optic system- Power budget analysis for a optical link- Recent applications of fiber optics.

UNIT - V
CELLULAR MOBILE COMMUNICATION: Cellular concept, basic cellular concept and its operation, uniqueness of mobile radio environment- Performance metrics in cellular system-Elements of cellular mobile radio-Handoff- Frequency management and channel assignment- Introduction to various cellular standards like AMPS, GSM, GPRS, IS-95A, IS-95B, CDMA-2000 and WCDMA.

TEXT BOOK:

REFERENCE BOOKS:
IC T64 SYSTEM DESIGN USING MICROCONTROLLERS
(Common to EIE)

UNIT I

UNIT II

UNIT III
PIC MICROCONTROLLER AND INTERFACING: Introduction, CPU architecture, registers, instruction sets addressing modes Loop timing, timers, Interrupts, Interrupt timing, I/o Expansion, I 2C Bus Operation Serial EEPROM, Analog to digital converter, UART-Baud Rate-Data Handling-Initialization, Special Features - serial Programming-Parallel Slave Port.

UNIT IV

UNIT V

TEXT BOOK:

REFERENCES:
3. Grehan Moore, and Cyliax, " Real time Programming: A guide to 32 Bit Embedded
IC T65 ADVANCED CONTROL SYSTEMS

UNIT I
NON-LINEAR SYSTEM – DESCRIPTION & STABILITY:
  Linear vs non-linear – Examples – Incidental and Intentional –
  Mathematical description – Equilibrium and linearization – Stability –
  Lyapunov function – Construction of Lyapunov function.

UNIT II
PHASE PLANE AND DESCRIBING FUNCTION ANALYSIS
  Construction of phase trajectory – Isocline method – Direct or numerical
  integration – Describing function definition – Computation of amplitude
  and frequency of oscillation.

UNIT III
Z-TRANSFORM AND DIGITAL CONTROL SYSTEM
  Z transfer function – Block diagram – Signal flow graph – Discrete root
  locus – Bode plot.

UNIT IV
STATE-SPACE DESIGN OF DIGITAL CONTROL SYSTEM
  State equation – Solutions – Realization – Controllability – Observability –
  Stability – Jury’s test.

UNIT V
MULTI INPUT MULTI OUTPUT (MIMO) SYSTEM
  Models of MIMO system – Matrix representation – Transfer function
  representation – Poles and Zeros – Decoupling – Introduction to
  multivariable Nyquist plot and singular values analysis – Model predictive
  control.

TEXT BOOKS

REFERENCE BOOKS
2. Raymond T. Stefani & Co., ‘Design of Feed back Control systems’, Oxford University,
  2002.
IC P61 PROCESS CONTROL LAB  
(Common to EIE)

1. Modeling of single capacity level process from experimental Reactive curve.  
   Obtain PID Tuning parameters from the model.  
2. Modeling of Two capacity level process.  
4. Modeling of Thermal process from reaction curve and obtain tuning parameters 
   from the model.  
5. Modeling of Thermal process.  
6. Closed loop control of flow process.  
7. Closed loop control of level process.  
9. Closed loop control of Pressure process.  
10. Inherent and Installed characteristic study of linear, equal percentage and quick 
    opening valves.

IC P62 SYSTEM DESIGN USING MICROCONTROLLERS LAB

1. Programming 8051  
2. Parallel Port Interfacing Using MCS51  
3. Design of Real Time Clock using MCS 51 using segment Displays.  
4. Design of PC interface Hardware with MCS51  
5. Interfacing LCD Display using MCS51  
7. PIC Microcontroller Design for DC Motor using PWM  
8. Interrupts Programming using PIC and MCS51 (optional)  
9. Implementation of Multiprocessor communication. (optional)

IC P63 MODERN ELECTRONIC INSTRUMENTS LAB

1. Graphical Programming using LabVIEW  
2. SCPI - Instrument interfacing using GPIB communication  
3. RS232 communication for Instrument Interfacing.  
4. Design of Programmable Digital Voltmeter Hardware  
5. Design of Programmable Digital Function Generator Hardware  
6. Design of Distributed Measurement using Ethernet by LabVIEW  
7. Design of Digital Filters using LabVIEW  
8. Design of Virtual Voltmeter and Function Generator  
10. Design of Programmable Motion Drives.
IC P64 GENERAL PROFICIENCY – II

UNIT – I :
COMPOSITION ANALYSIS: Technical and Non-Technical Passages (GRE Based) – Differences in American and British English – Analyzing Contemporary issues – Expanding Terminology

UNIT – II :
WRITING: Job Application Letter Writing – Resume Writing

UNIT – III :
ORAL SKILLS: Group Discussion – Introduction and Practice – Team Work – Negotiation Skills – Organizing and Attending Meetings – Facing Interviews

UNIT – IV :
ADAPTING TO CORPORATE LIFE: Corporate Etiquette – Grooming and Dressing

UNIT – V :
APTITUDE: Verbal and numerical aptitude

REFERENCES

IC T71 COMPUTER CONTROL OF PROCESS  
(Common to EIE)

UNIT – I

ANALYSIS OF SAMPLED DATA CONTROL SYSTEM: Continuous and discrete systems sample data system- Z transform –inverse Z transform- selection of sampling period – mathematical representation of sampler- transfer function of zero order hold and first order hold device-Pulse transfer function – open loop and closed response of linear sample data control system for step input – stability analysis: Jury’s test and bilinear transformation-State space representation of sample data systems

UNIT – II


UNIT – III


UNIT – IV

Robust Control, Intelligent Controllers, Optimal Control

UNIT – V


MODEL PREDICTIVE CONTROL: Introduction- optimization problems- dynamic matrix control-DMC for first order process – quadratic DMC.

TEXT BOOK:

REFERENCES:
1. B.W.Bequette, “Process control” Prentice Hall Inc. 2006(unit IV)
IC T72  ANALYTICAL INSTRUMENTATION
(Common to EIE)

UNIT I

UNIT II
Molecular spectra – electronic, vibrational and rotational energies and spectra characteristic bands of radicals, OH, CH, CO, etc., - IR absorption - spectroscopy – single and double beam spectrophotometers - instrumentation techniques for analyzing solid, liquid and gaseous samples – sample handling techniques.

UNIT III
Microwave spectroscopy – NMR, ESR and EPR spectroscopy – basic principles – instrumentation techniques and applications - principles of ion optics – ion sources – single focusing and double focusing mass spectrometers – principles and application

UNIT IV

UNIT V

TEXT BOOKS

REFERENCE BOOKS
UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
Safety codes and standards – general safety considerations in power plants, pressure vessels and pressurized pipe lines – operation and inspection of extinguishers – preventing the spread of fire – emergency exit facilities.

TEXT BOOKS:

REFERENCES:
IC P71 COMPUTER CONTROL OF PROCESS LAB
(Common to EIE)

1. Programming a PLC to demonstrate control of a device using one push button.
Generating square wave etc.
2. Programming a PLC to demonstrate an operation of Batch process.
3. Configuring and Implementation of programmable PID controllers.
4. Control of a process using dead beat algorithm using simulation.
5. Control of a process using Dhalings algorithm using simulation.
6. PC based control of flow process.
7. PC based control of level process.
8. PC based control of presence process.
9. PC based control of Thermal process.
10. Online Identification of process parameters from experimental data by least square estimate method.

IC P72 SEMINAR

Each one of the students will be assigned a Seminar Topic in the current and frontier areas. The student has to conduct a detailed study/survey on the assigned topic and prepare a report. The student will make an oral presentation followed by a brief question and answer session. The Seminar (presentation and report) will be evaluated by an internal assessment committee for a total of 100 marks.

IC P73 INDUSTRIAL VISITS /TRAINING

During the course of study from 3rd to 7th semester each student is expected to undertake a minimum of four industrial visits or undertake a minimum of two weeks of industry/field training. The students are expected to submit a report, which shall be evaluated by an internal assessment committee at the end of seventh semester for 100 marks.

IC PW7 PROJECT WORK (PHASE-I)

The objective of the project is to enable the students to work in groups of not more than four members in each group on a project involving analytical, experimental, design or combination of these in the area of Instrumentation and control Engineering. Each project shall have a guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. The evaluation is based on continuous internal assessment by an internal assessment committee for 100 marks.
IC T81 - ENGINEERING ECONOMICS

UNIT I

UNIT II

UNIT III

UNIT IV
Replacement and Maintenance Analysis: Types of Maintenance, Types of Replacement Problem, Determination of Economic Life of an Asset, Replacement of an Asset with a New Asset – Capital Recovery with Return and Concept of Challenger and Defender, Simple Probabilistic Model for items which fail Completely.

UNIT V
TEXT BOOKS:

REFERENCE BOOKS:
IC T82 - PLC AND DISTRIBUTED CONTROL SYSTEM

UNIT I
PLC Fundamentals – Discrete state vs continuous state control-Evolution of modern day
PLCs building blocks of PLCs-Communication in PLCs.

UNIT II
PLC Applications-Programming methods- Relay & logic ladder diagrams-Boolean logic-
High level languages-Graphical representation- programming examples - Comparative study of industrial PLCs.

UNIT III
Elements of DCS –Evolution of DCS - Building blocks- Detailed descriptions and functions of field control units-Operator stations and data highways-Redundancy concepts.

UNIT IV
Case studies in DCS-Comparative study of industrial DCS-Reliability calculations - intrinsically safe instrumentation –Case studies

UNIT V
Communications in DCS - Basics of Computer networks - Special requirements of network used for control - Communication protocols-link access mechanism-Manufactures automation protocols - Field bus and Smart transmitters.

TEXT BOOKS:

REFERENCE BOOKS
IC T83  POWER PLANT INSTRUMENTATION

Piping and instrumentation diagram of a thermal power plant, basic process on a boiler,
Fuel measurement - review of pressure and temperature measurement steam and water
flow measurement – instrument applications in power stations: review of indicating and
recording instrument applications in power stations: review of indicating and recording
instruments, water level gauge for boiler drums, closed circuit television instrument, gas
analysis meters, smoke instruments, dust monitor—measurement of impurities in feed
water and steam generator coolant controls and instruments—instrument maintenance
aspects.
UNIT II
Boiler control objectives—combustion of fuels (gaseous liquid, and solid), excess air,
combustion chemistry and products of combustion, requirement for excess combustion,
air-circulation of efficiency of boiler: input/output method—stream temperature control
systems super heaters and desuperheaters.
UNIT III
Feed water supply and boiler water circulation system—drum level control
systems—boiler
draft systems—measurement and control of furnace draft—measurement and control of
combustion—draft and air flow control related functions.
UNIT IV
Flue gas analysis trimming of combustion control systems—combustion control for
liquid
and gaseous fuel boilers coal or solid fuel stokes—combustion control for stoker-fired
boilers—pulverised coal—fired boilers. Turbine monitoring and control: speed, vibration,
shell temperature monitoring.
UNIT V
Nuclear power plant instrumentation: piping and instrumentation diagram of different
types of nuclear power plants—radiation detection instruments—process sensors for nuclear
power plants—spectrum analyzers—nuclear reactor control systems and allied instrumentation.
Text Books:
IC P81 INDUSTRIAL AUTOMATION LAB

(Any five experiments has to be done from each part)

Part - A
1. Calibration of Pressure gauge using Dead weight Tester.
2. Calibration of manometers
3. Calibration of Control valves
4. Calibration of I to P and P to I converters
5. Calibration of Pressure Switch.

Part - B
PLC and Distributed Control System

1. Study of basic programming of PLC
2. Analog operation in PLC
3. Arithmetic operation, Timer, Counter operation using PLC
4. Annunciator design using PLC
5. Application using PLC PC based programming (Level control, Temperature control, Speed Control)
6. Study and Demonstration of DCS
7. Developing control logic using DCS
8. Application of DCS (Level control, Pressure control)
9. Application of DCS (Boiler Control, Distillation column control)
10. Virtual DCS
IC P82 PROFESSIONAL ETHICS PRACTICE

The course should cover the following topics by way of Seminars, Expert Lectures and Assignments:

1. Engineering Ethics – Moral issues, Ethical theories and their uses
2. Engineering as Experimentation – Code of Ethics
3. Engineer’s responsibility for safety
4. Responsibilities and rights
5. Global issues of engineering ethics

REFERENCE BOOK


IC P83 COMPREHENSIVE VIVA-VOCE

The student will be tested for his understanding of basic principles of the core Instrumentation and control Engineering subjects. The internal assessment for a total of 50 marks will be made by an internal assessment committee. The committee will conduct two written examinations of objective or short questions type from the all the core subjects. The external university examination, which carries a total of 50 marks, will be a Viva Voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.

IC PW8 PROJECT WORK (PHASE II)

Project work phase II will be an extension of the project work started in the seventh semester. On completion of the work, a project report should be prepared and submitted to the department. The project work and the report will be evaluated by an internal assessment committee for 50 marks. The external university examination, which carries a total of 50 marks, will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.
ELECTIVES – 6TH SEMESTER

IC E61 INDUSTRIAL ELECTRONICS

UNIT I.


UNIT II

APPLICATIONS OF SCRS-I: Static circuit breaker, Protection of SCR, Inverters, Classification, Single Phase inverters, Converters, single phase Half wave and Full wave, Chopper circuits, Principle, methods and Configurations, Diac and Triac, Triacs, Triggering modes, Firing Circuits, Commutation

UNIT-III

APPLICATIONS OF SCRS-II Voltage compensator – solid state DC voltage regulation – DC shunt motor – armature control and field control of motor speed – electronic control of DC motor – speed regulator action – full wave motor speed regulation by one SCR

UNIT-IV

INDUSTRIAL TIMERS: Industrial timers -Classification, types, Electronic Timers, Classification, RC and Digital timers, Time base Generators, Electric Welding, Classification, types and methods of Resistance and ARC wielding

UNIT –V


TEXTBOOKS

REFERENCES
2. Industrial electronics and control, S.K. Bhattacharya and S.chatterjee, Tata Mc
Graw Hill, 1995
IC E62 TELEMETRY AND TELECONTROL

UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V

REFERENCES:
IC E63  VISUAL PROGRAMMING FOR INSTRUMENTATION ENGINEERS

UNIT I  WINDOWS PROGRAMMING
Windows environment – a simple windows program – windows and messages – creating the window – displaying the window – message loop – the window procedure – message processing – text output – painting and repainting – introduction to GDI – device context – basic drawing – child window controls

UNIT II  VISUAL C++ PROGRAMMING – INTRODUCTION

UNIT III THE DOCUMENT AND VIEW ARCHITECTURE

UNIT IV  ACTIVEX AND OBJECT LINKING AND EMBEDDING (OLE)
ActiveX controls Vs. Ordinary Windows Controls – Installing ActiveX controls – Calendar Control – ActiveX control container programming – create ActiveX control at runtime – Component Object Model (COM) – containment and aggregation Vs. inheritance – OLE drag and drop – OLE embedded component and containers – sample applications

UNIT V ADVANCED CONCEPTS

TEXT BOOKS

REFERENCE
IC E64  OBJECT-ORIENTED TEST AND MEASUREMENT SOFTWARE DEVELOPMENT

UNIT I


UNIT II


UNIT III


UNIT IV


UNIT V

CASE STUDY: Creating OO Data Types - Error Handling - Advanced Instrument Classes – object oriented Test and Measurement software Applicable to Programmable Instruments - Case study.

TEXT BOOKS

REFERENCES
IC E65 BIOMEDICAL INSTRUMENTATION

UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V

TEXT BOOKS:
2. R. Anandanatarajan, “Biomedical Instrumentation”, PHI Learning, 2009

REFERENCES:
ELECTIVES – 7TH SEMESTER
IC E71 OPERATING SYSTEMS

UNIT I
COMPUTER SYSTEM AND OPERATING SYSTEM OVERVIEW: Overview of computer operating systems operating systems functions protection and security distributed systems special purpose systems operating systems structures and systems calls operating systems generation
PROCESS MANAGEMENT – Process concepts threads, scheduling-criteria algorithms, their evaluation, Thread scheduling, case studies UNIX, Linux, Windows

UNIT II
CONCURRENCY : Process synchronization, the critical-section problem, Peterson’s Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors, Synchronization examples, atomic transactions. Case studies UNIX, Linux, Windows
MEMORY MANAGEMENT : Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, page-Replacement, algorithms, case studies UNIX, Linux, Windows

UNIT III :
PRINCIPLES OF DEADLOCK – system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock, I/O systems, Hardware, application interface, kernel I/O subsystem, Transforming I/O requests Hardware operation, STREAMS, performance.

UNIT IV :
FILE SYSTEM INTERFACE- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.
FILE SYSTEM IMPLEMENTATION- File system structure, file system implementation, directory implementation, directory implementation, allocation methods, free-space management, efficiency and performance, case studies. UNIX, Linux, Windows
MASS-STORAGE STRUCTURE overview of Mass-storage structure, Disk structure, disk attachment disk scheduling, swap-space management, RAID structure, stable-storage implementation, Tertiary storage structure.

UNIT V:
SECURITY- The Security problem, program threats, system and network threats cryptography as a security tool, user authentication, implementing security defenses, firewalling to protect systems and networks, computer –security classifications, case studies UNIX, Linux, Windows

TEXT BOOKS :

REFERENCES :
2. Crowley, Operating System A Design Approach, TMH.
IC E72 OPTIMIZATION TECHNIQUES

UNIT I

MATHEMATICAL PRELIMINARIES: Vector Spaces, Vector Space Operations, Data Fitting, Eigenvalues and Eigenvectors Convergence in $\mathbb{R}^n$, Calculus on $\mathbb{R}$ and $\mathbb{R}^n$, Calculus for a Function of One Variable Calculus for a Function of Several Variables, Convex Analysis, Convex sets, Convex Functions

UNIT II

ONE-DIMENSIONAL OPTIMIZATION: Function Comparison Methods, Polynomial Interpolation Methods \( \backslash \) Iterative Methods, Function Comparison Methods, Two Point Equal Interval Search Method of Bisection, Fibonacci Method, Golden Section Search, Polynomial Interpolation, Quadratic Interpolation, Cubic Interpolation; Iterative Methods, Newton’s Method, Secant Method, Case studies

UNIT III

UNCONSTRAINED GRADIENT BASED OPTIMIZATION METHODS
Gradient and Conjugate Gradient Type Algorithms, Method of Steepest Descent Conjugate Gradient Method (Method of Fletcher and Reeves), Newton Type Methods Newton’s Method, Marquardt’s Method, Quasi-Newton Algorithms, Case studies

UNIT IV

LINEAR PROGRAMMING
Simplex Method, Movement from One Extreme Point to another Algorithm, Revised Simplex Method, Finding Initial Solution, Two Phase Simplex Method, Duality Theory, Dual Simplex Method, Case studies

UNIT V

CONSTRAINED OPTIMIZATION METHODS AND EVOLUTIONARY ALGORITHMS

EVOLUTIONARY ALGORITHMS: Box Complex Method, Box Complex Method, Genetic Algorithm, Case studies

TEXT BOOK
Mohan C Joshi, Kannan M Moudgalya “Optimization: Theory and practice” Narosa publishing House
REFERENCE BOOK

IC E73 INSTRUMENTATION AND CONTROL IN PETROCHEMICAL INDUSTRIES

UNIT – I

UNIT – II
Unit operations in petroleum industry – Thermal cracking – Catalytic cracking – Catalytic reforming – Polymerization – Alkylation – Isomerization – production of ethylene acetylene and propylene from petroleum.

UNIT – III

UNIT – IV
Measurements in refineries and petrochemical industries – selection and maintenance of measuring instruments – special measurement problems.

UNIT – V
Process control in refineries and petrochemical industries – Control of distillation column – control of Catalytic crackers and pyrolysis unit – Automatic control of polyethylene production – Control of Vinyl chloride and PVC production.

REFERENCES:
IC E74 DIGITAL SIGNAL PROCESSING

UNIT – I
DISCRETE-TIME SIGNALS AND LINEAR SYSTEMS
Classification of signals: elementary continuous-time signals, continuous-time periodic signals, representation of discrete-time signals, elementary discrete-time signals, classification of discrete-time signals, sampling and aliasing. Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; impulse response and convolution sum, step response, FIR and IIR systems, stable and unstable systems, correlation, time response of discrete-time systems, sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation, reconstruction of analog signal, analog to digital conversion.

UNIT- II
DTFT AND Z-TRANSFORM

UNIT- III

UNIT IV
DESIGN OF DIGITAL FILTERS
FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics, frequency sampling method. IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

UNIT- IV
FINITE WORD LENGTH EFFECTS:
Number representation, quantization, rounding truncation. Input quantization error, Product quantization error, Coefficient quantization error, Overflow limit cycle oscillations, Zero input limit cycle oscillations.
DIGITAL SIGNAL PROCESSORS: Overview and selection of DSPs, Architecture of TMS320C50, addressing modes, simple assembly language programmes

TEXT BOOKS


REFERENCE BOOKS

IC E75 INSTRUMENTATION BUSES AND DATA NETWORKS

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V

REFERENCES:
Computer Busses – William Buchanan – CRC press
IC E76 WEB BASED INSTRUMENTATION

UNIT - I
BASIC INTERNET CONCEPTS

History of Internet – RFCs, FYIs and STDs – Security – Protocols – Internet addressing – DNS and directory services. Applications of Internet in the field of Internet and Control – Distributed Measurements.

UNIT - II
INTERNET APPLICATION

Electronics Mail, Newsgroups, UUCP, FTP, Telnet, Finger. Data Acquisition using internet – online monitoring and control.

UNIT – III
WORLD WIDE WEB

Overview – Hypertext Mark-up language – Uniform resources locators – HTTP protocol – Common gateway interface – Multipurpose internet mail extensions – Web browsers such as Netscape, Internet Explorer.

UNIT – IV
JAVA PROGRAMMING LANGUAGE


UNIT – V
MISCELLANEOUS TOPICS

Intranets – Internet commerce – Internet and VRML – Active X. Case study : Internet based measurement, Telemonitoring and Tele control in Biomedical instrumentation Applications.

TEXT BOOKS


REFERENCE BOOKS

IC E77 DATABASE MANAGEMENT SYSTEMS

UNIT I

UNIT II
RELATIONAL MODEL: SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design – Functional dependences and Normalization for Relational Databases (up to BCNF).

UNIT III

UNIT IV

UNIT V

TEXT BOOKS

REFERENCES
IC E78  FIBRE OPTICS AND LASER INSTRUMENTATION

UNIT - I
OPTICAL FIBRES AND THEIR PROPERTIES

UNIT - II
INDUSTRIAL APPLICATION OF OPTICAL FIBRES

UNIT - III
LASER FUNDAMENTALS

UNIT - IV
INDUSTRIAL APPLICATION OF LASERS
Laser for measurement of distance, length, velocity, acceleration, current, voltage and atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

UNIT – V
HOLOGRAM AND MEDICAL APPLICATIONS
TEXT BOOKS

REFERENCE BOOKS
UNIT – I

UNIT – II
ROBOT CONTROL: Control of robot manipulators- state equations-constant solutions-linear feedback systems-single axis PID control- PD gravity control- computed torque control- variable structure control- Impedance control.

UNIT – III
END EFFECTORS: End effectors and tools- types – Mechanical grippers – Vacuum cups – Magnetic grippers – Robot end effectors interface, work space analysis work envelope-workspace fixtures-pick and place operation- continous path motion-interpolated motion-straight line motion.

UNIT – IV
ROBOT MOTION ANALYSIS: Robot motion analysis and control: Manipulator kinematics –forward and inverse kinematics- arm equation-link coordinates- Homogeneous transformations and rotations and Robot dynamics.

UNIT – V

TEXT BOOKS:

REFERENCE:
1. K.S.Fu,R.C.Gonzalez, CSG. Lee, Robotics,control sensing vision and Intelligence, Tata Mcgraw-Hill, 2008
IC E82 DESIGN OF PROCESS CONTROL SYSTEM COMPONENTS

UNIT – I
Orifice meter – design of orifice for given flow condition – design of rotameter – design of RTD measuring circuit – design of cold junction compensation circuit for thermocouple using RTD – Transmitters – Zero and span adjustment in D/P transmitters and temperature transmitters.

UNIT – II
Bourdon gauges – factors affecting sensitivity – design of Bourdon tube – Design of Air purge system for level measurement. Electronic P+I+D controllers – design – adjustment of setpoint, bias and controller settings.

UNIT – III
Control valves – design of actuators and positioners – types for valve bodies – valve characteristics – materials for body, and trim – sizing of control valves – selection of body, materials and characteristics of control valves for typical applications.

UNIT – IV

UNIT - V
Design of logic circuits for alarm and annunciator circuits, interlocks – design of microprocessor based P+I+D controller.

TEXT BOOKS:

REFERENCES:
IC E83 FUZZY LOGIC AND NEURAL NETWORKS

UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V

TEXT BOOKS:

REFERENCES:
IC E84 OPTIMAL CONTROL

UNIT - I
INTRODUCTION

UNIT - II
DYNAMIC PROGRAMMING

UNIT - III
CALCULUS OF VARIATIONS
Fundamentals concepts – Functional of a single function – Functional involving several independent functions – Piecewise smooth extremals – Constrained extrema.

UNIT - IV
VARIATIONAL APPROACH TO OPTIMAL CONTROL
Necessary conditions for optimal control – Linear regulator problems – Pontryagin’s minimum principle and state inequality constraints.

UNIT - V
APPLICATIONS OF PONTRYAGIN’S MINIMUM PRINCIPLE

TEXT BOOKS

REFERENCE BOOKS
IC E85 ROBUST CONTROL

1. INTRODUCTION TO ROBUST CONTROL

2. SYSTEM UNCERTAINTY

3. ROBUST STABILITY AND PERFORMANCE
   Robust stability analysis – Kharitonov’s theorem, edge theorem, mapping theorem, small gain theorem. Robust performance analysis – Based on control sensitivity, input and output sensitivity minimization.

4. $H_2$ AND $H_\infty$ OPTIMAL CONTROL

5. CASE STUDY
   Modelling and design of robust controller for crane – Automatic steering of bus – Flight control – Comparison of conventional and robust control for the case studies.

TEXT BOOKS

REFERENCE BOOKS
UNIT I  DATA COMMUNICATIONS

UNIT II  DATA LINK LAYER

UNIT III NETWORK LAYER

UNIT IV TRANSPORT LAYER

UNIT V  APPLICATION LAYER

TEXT BOOKS

REFERENCES
IC E87  VLSI DESIGN

Unit - I

Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS technologies- Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design-Gate realization using CMOS-Introduction to Reconfigurable Hardware – HDL basics.

Unit – II

VHDL basics - VHDL levels of abstraction - Abstraction and timing - The VHDL design flow - VHDL design entities - Entity declarations - Architectures - Using libraries and packages - Concurrent signal assignments - Signal assignments with delays.

Unit - III

Component declarations - Component instantiation - Named port mapping - Positional port mapping - Direct instantiation - Configuration specifications - Entity binding
Port modes - VHDL processes - Processes sensitivity lists - Objects in VHDL - Constants, variables and signals - VHDL types - Scalar types - Arrays – Records - Custom types and subtypes

Unit - IV

Concurrent statements - Sequential statements - Conditional & selective signal assignments - The generate statement - Signal and variable assignments - For loops - Subprograms – Functions – Procedures - Differences between functions and procedures - Subprogram declarations – Packages - Package declaration - Package body.

Unit – V

VHDL synthesis - Modeling hardware in VHDL - VHDL models for multiplexers, Encoders, Decoders, Parity Generators – combinational circuit implementation - compilation and simulation of VHDL code, modeling a sequential machine, Test bench development.

TEXT BOOK :
VHDL Primer by J. Bhasker, Prentice Hall. 2006

REFERENCES: