

PONDICHERRY UNIVERSITY
BACHELOR OF TECHNOLOGY PROGRAMMES
(EIGHT SEMESTERS)

REGULATIONS

Approved by 17th Board of Studies (Engineering) meeting
(Operated from the Academic Year 2003-2004)

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 there to with minimum of 40% marks (a mere pass for SC/ST candidates) in aggregate of subjects – Mathematics, Physics and Chemistry.

OR

An Examination of any University or Authority recognised by the Executive Council of the Pondicherry University as equivalent thereto.

- (B)** Lateral Entry for Diploma passed candidates for admission to third semester of the eight semester B.Tech programme should be required to have passed three year diploma or four year sandwich diploma course in engineering/technology with a minimum of 60% marks in aggregate in the subjects covered in 3rd to 6th semester (a mere pass for SC/ST candidates). A list of diploma programmes approved for admission for each of the degree programme 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	- Mechatronics

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 practicals as given in the scheme of examination 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 semesters in all subjects as well as university examinations conducted by Pondicherry University at the end of the semester (November / December or April / May).

(a) 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) Practicals 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.

(iv) In addition, the candidate shall satisfy the following conditions.

(a) To be permitted to register for courses in 5th semester, the candidate should have earned a minimum of 30 credits for the I & II semesters put together.

(b) To be permitted to register for the courses in 7th semester, the candidate should have completed all credit requirements for the I and II semester and 30 credits for the 3rd and 4th semesters put together.

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.

10. Passing Minimum and Classification of Successful Candidates :

(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 examination.
- (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 upto 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.

(iii) AWARD OF LETTER GRADES

The assessments 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:

Range of Total Marks	Letter Grade	Grade Points
90 to 100	S	10
80 to 89	A	9
70 to 79	B	8
60 to 69	C	7
55 to 59	D	6
50 to 54	E	5
0 to 49	F	0
Incomplete	FA	

F Denotes failure in the course.

Curriculum & Syllabi (B.Tech. EIE)

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 of courses registered and the corresponding grades points scored in those courses, taken for all the courses and sum of the number of credits of all the courses

$$\text{GPA} = \frac{\text{Sum of [c x GP]}}{\text{Sum of C}}$$

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

- (iv) A candidate who satisfies the course requirements for all semesters and who passes all the examinations prescribed for all the eight semesters within a **MAXIMUM PERIOD OF 7 YEARS** 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.
- (v) 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**.
- (vi) For the Award of University ranks and Gold Medal for each branch of study, the CGPA secured from 3rd to 8th semester alone should be considered. Rank certificates would be issued to the first ten candidates in each branch of study
- (vii) 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 8 semesters after his/her commencement of study in the third semester and

in addition secures CGPA not less than 6.5 shall declared to have passed the examination in **FIRST CLASS**.

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

11. Provision for withdrawal :

A candidate may, for valid reasons, and on the recommendations 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.

12. 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.

13. 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.

ANNEXURE – A

B.Tech courses in which admission is sought	Diploma courses eligible for admission
Civil Engineering	Civil Engineering Civil and Rural Engineering Architectural Assistantship Architecture Civil Engineering (Sandwich)
Mechanical Engineering	Mechanical Engineering Automobile Engineering Agricultural Engineering Mechanical and Rural Engineering Refrigeration and Air-conditioning Agricultural Engineering & Farm – Equipment – Technology Metallurgy Production Engineering Machine Design & Drafting Mechanical Engineering (Sandwich) Machine tool maintenance and Repairs (Sandwich) Printing Technology / Engineering Textile Engineering / Technology Tool Engineering
Electrical and Electronics Engineering	Electrical Engineering Electrical and Electronics Engineering Electronics and Instrumentation Instrumentation Technology
Electronics & Communication Engineering	Electronics and Communication Engg., Electronics Engineering Electrical Engineering Electrical and Electronics Engineering Medical Electronics
Computer Science & Engineering	Computer Science & Engineering Computer Technology
Electronic and Instrumentation Engineering, Instrumentation and Control Engineering	Instrumentation and Control Instrumentation Engineering Electronics and Instrumentation Electronics Engineering Applied Electronics Medical Electronics Electrical & Electronics Electronics and Communication Engineering
Chemical Engineering	Chemical Engineering Chemical Technology Petrochemical Technology Petroleum Engineering Ceramic Technology Plastic Engineering Paper & Pulp Technology (Sandwich) Polymer Technology (Sandwich)
Information Technology	Computer Science and Engineering Computer Technology Electrical and Electronics Engineering Electronics & Communication Engineering Electronics and Instrumentation Engineering Instrumentation Engineering

PONDICHERY UNIVERSITY
B.Tech - CURRICULUM

I B.TECH – ELECTRONICS & INSTRUMENTATION ENGINEERING**I Semester**

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
UCC 0231	Technical English	3	-	-	3	25	75	100
UCC 1202	Mathematics – I	3	1	-	4	25	75	100
UCC 1213	Physics	3	-	-	3	25	75	100
UCC 1224	Chemistry	3	-	-	3	25	75	100
UCC 0125	Basic Engineering.	4	-	-	4	25	75	100
UCC 0016	Engineering Mechanics	2	1	-	3	25	75	100
	Practicals							
UCC 0217	Physics Lab	0	0	3	1	50	50	100
UCC 0228	Chemistry Lab	0	0	3	1	50	50	100
UCC 0029	Work Shop Practice	0	0	3	1	50	50	100
	Total	18	2	9	23	300	600	900

II Semester

Code No.	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	UE	TM
	Theory							
UCC 0041	Computer Programming	3	-	-	3	25	75	100
UCC 2202	Mathematics – II	3	1	-	4	25	75	100
UCC 2213	Material Science	3	-	-	3	25	75	100
UCC 2224	Environmental Science	3	-	-	3	25	75	100
UCC 0135	Elements of Electrical and Electronics Engineering	3	1	-	4	25	75	100
UCC 0026	Thermodynamics	2	1	-	3	25	75	100
	Practicals							
UCC 0047	Computer Lab	0	0	3	1	50	50	100
UCC 0028	Engineering Graphics	2	0	3	2	50	50	100
UCC 0059	Basic Electrical and Electronics lab	0	0	3	1	50	50	100
	Total	19	3	9	24	300	600	900

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CURRICULUM AND SYLLABUS

Curriculum & Syllabi (B.Tech. EIE)

III Semester:

Sl. No.	Code	Name of the Subject	Periods Credit Marks							
			L	T	P	C	IA	UE	T	DE
Theory										
1.	UEI 3201	Mathematics – III	3	1	0	4	25	75	100	3
2.	UEI 3072	Circuit Theory	3	1	0	4	25	75	100	3
3.	UEI 3073	Electronics Circuits – I	3	0	0	3	25	75	100	3
4.	UEI 3044	C++ and Data Structures	3	0	0	3	25	75	100	3
5.	UEI 3015	Strength of Materials	3	0	0	3	25	75	100	3
6.	UEI 3076	Electrical Instruments and Measurements	3	0	0	3	25	75	100	3
Practicals										
7.	UEI 3237	General Proficiency – I	-	-	-	1	50	--	50	--
8.	UEI 3078	Electronics Lab -I	0	0	3	2	50	50	100	3
9.	UEI 3019	Strength of Materials Lab.	0	0	3	2	50	50	100	3
10.	UEI 30410	C++ and Data Structures Lab	1	0	3	2	50	50	100	3
			19	2	9	27				

IV Semester:

Sl. No.	Code	Name of the Subject	Periods Credit Marks							
			L	T	P	C	IA	UE	T	DE
Theory										
1.	UEI 4201	Mathematics – IV	3	1	0	4	25	75	100	3
2.	UEI 4072	Electronics Circuits – II	3	0	0	3	25	75	100	3
3.	UEI 4053	Electrical Technology	3	0	0	3	25	75	100	3
4.	UEI 4074	Digital Electronics	3	0	0	3	25	75	100	3
5.	UEI 4015	Fluid Mechanics and Hydraulic Machinery	3	0	0	3	25	75	100	3
6.	UEI 4076	Transducers and Measurements Systems	3	0	0	3	25	75	100	3
Practicals										
7.	UEI 4237	General Proficiency – II	-	-	-	1	50	--	50	--
8.	UEI 4058	Electrical Machines Lab.	0	0	3	2	50	50	100	3
9.	UEI 4079	Electronics Lab – II	0	0	3	2	50	50	100	3
10.	UEI 40110	Fluid Flow and Hydraulic Machinery Lab.	0	0	3	2	50	50	100	3
			18	1	9	26				

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V Semester:

Sl. No.	Code	Name of the Subject	Periods Credit Marks							
			L	T	P	C	IA	UE	T	DE
Theory										
1.	UEI 5201	Numerical Techniques	3	1	0	4	25	75	100	3
2.	UEI 5072	Control Systems	3	1	0	4	25	75	100	3
3.	UEI 5073	Analog and Digital Instrumentation.	3	0	0	3	25	75	100	3
4.	UEI 5074	Industrial Instrumentation - I	3	0	0	3	25	75	100	3
5.	UID 5005	Elective – I *	3	0	0	3	25	75	100	3
Practicals										
6.	UEI 5236	General Proficiency – III	-	-	-	1	50	--	50	--
7.	UEI 5077	Simulation Lab	1	0	3	2	50	50	100	3
8.	UEI 5078	Electronic Measurement and Instrumentation Lab	0	0	3	2	50	50	100	3
9.	UEI 5079	Transducers and Measurements Lab	0	0	3	2	50	50	100	3
			16	2	9	24				

VI Semester:

Sl. No.	Code	Name of the Subject	Periods Credit Marks							
			L	T	P	C	IA	UE	T	DE
Theory										
1.	UEI 6071	Process Control	3	0	0	3	25	75	100	3
2.	UEI 6072	Microprocessors and Micro Controllers	3	1	0	4	25	75	100	3
3.	UEI 6073	Industrial Instrumentation - II	3	0	0	3	25	75	100	3
4.	UEI 6034	Communication Engineering	3	0	0	3	25	75	100	3
5.	UID 6005	Elective – II *	3	0	0	3	25	75	100	3
Practicals										
6.	UEI 6236	General Proficiency – IV	-	-	-	1	50	--	50	-
7.	UEI 6077	Process Control Lab	0	0	3	2	50	50	100	3
8.	UEI 6078	Microprocessors and Micro Controllers Lab	0	0	3	2	50	50	100	3
9.	UEI 6079	Design Project Lab	1	0	3	2	50	50	100	3
			16	1	9	23				

* Students should take course from the inter disciplinary elective list.

Curriculum & Syllabi (B.Tech. EIE)

VII Semester:

Sl. No.	Code	Name of the Subject	Periods Credit Marks							
			L	T	P	C	IA	UE	T	DE
Theory										
1.	UEI 7071	Computer Control of Processes	3	0	0	3	25	75	100	3
2.	UEI 7212	Optical Instrumentation	3	0	0	3	25	75	100	3
3.	UEI 7023	Industrial Safety and Energy Management	3	0	0	3	25	75	100	3
4.	UEI 7074	Elective - I	3	0	0	3	25	75	100	3
5.	UEI 7075	Elective – II	3	0	0	3	25	75	100	3
Practicals										
6.	UEI 7076	Computer Control of Processes Lab.	0	0	3	2	50	50	100	3
7.	UEI 7077	System Design Using Microprocessor Lab	0	0	3	2	50	50	100	3
8.	UEI 7078	Project Work	0	0	3	2	50	--	50	-
9.	UEI 7079	Seminar	-	-	-	1	50	--	50	-
10.	UEI 70710	Industrial Visit/Training	-	-	-	1	50	--	50	-
			15	0	9	23				

VIII Semester:

Sl. No.	Code	Name of the Subject	Periods Credit Marks							
			L	T	P	C	IA	UE	T	DE
Theory										
1.	UEI 8231	Management Techniques	3	0	0	3	25	75	100	3
2.	UEI 8072	Data Acquisition and Communication	3	0	0	3	25	75	100	3
3.	UEI 8073	Elective – III	3	0	0	3	25	75	100	3
4.	UEI 8074	Elective – IV	3	0	0	3	25	75	100	3
Practicals										
5.	UEI 8075	Servicing Lab.	0	0	3	2	50	50	100	3
6.	UEI 8076	Project Work	0	0	6	4	50	100	150	-
7.	UEI 8077	Comprehensive Viva – Voce	0	0	0	2	50	50	100	-
			12	0	9	20				

LIST OF ELECTIVE SUBJECTS

VII Semester Elective:

1. UEI E701 Power Electronics
2. UEI E702 VLSI Systems
3. UEI E703 Telemetry and Tele control
4. UEI E704 Power Plant Instrumentation
5. UEI E705 Microprocessor Based System Design.
6. UEI E706 Instrumentation in Petrochemical Industries
7. UEI E707 Digital Signal Processing

VIII Semester Elective:

1. UEI E801 Adaptive Control Theory
2. UEI E802 Environmental Monitoring Instrumentation
3. UEI E803 Robotics and Automation
4. UEI E804 Process Control System Components
5. UEI E805 Neural and Fuzzy Logic Control
6. UEI E806 Artificial Intelligence and Expert Systems
7. UEI E807 PLC and Distributed Control Systems
8. UEI E808 Biomedical Instrumentation

LIST OF INTERDEPARTMENTAL ELECTIVES (UID 5005 & UID 6005)

Code	Subject Title	Department offering the Subject
011	Experimental Stress Analysis	Civil Engineering
012	Computer Aided Planning and Drafting	
021	Mechatronics	Mechanical Engineering
022	Total Quality Management	
031	Communication Engineering	Electronics and Communication Engineering
032	Computer Networks	
041	Relational Database Management Systems	Computer Science and Engineering
042	Visual Programming	
051	Introduction to Soft Computing	Electrical and Electronics Engineering
052	Industrial Electronics	
061	Elements of Biotechnology	Chemical Engineering
062	Industrial Pollution Abatement	
071	Industrial Control Systems	Electronics and Instrumentation Engineering
072	Transducers and Instrumentation	
081	IT for Engineers	Information Technology
082	Bio Informatics	
201	Finite Element Methods	Mathematics
202	Computational Fluid Dynamics	
211	Introduction to Nano Technology	Physics
212	Novel and Intelligent Materials	
221	Instrumental Methods of Analysis	Chemistry
222	Ceramic Technology	

UCC 0041 COMPUTER PROGRAMMING

UNIT – I

Introduction to basic concepts of Hardware/Software – System Software – Application Software – Low level and High level Languages – CAD/CAM – Graphics – AutoCAD – LAN-MAN-WAN – Internet and Intranet.

UNIT – II

Fundamentals of C Programming:– Sample 'C' Program. Introduction to Data types: – Identifier, keyword, data type, ASCII, variables, constants. Input/output:– Printf, Scanf, format string - escape sequences. Operators and constructs: – Relational, logical, conditional operators, expression, statements, if, else if, shorthand operators.

UNIT III

Loops - Functions –Recursion – String handling – Programming examples -Type conversion.

UNIT IV

Storage class specifiers – User defined data types – Enumerated data types, typedef – Structures – Union.

UNIT V

C Preprocessor – Pointers – File handling - problems using these concepts

Text Books:

1. Subburaj. R, Programming in C, Vikas Publishing House Pvt Ltd., First Edition, 2000.
2. Balagurusamy. E, Programming in ANSI C, Tata McGraw Hill, Second Edition, 2002.

UCC 1202 MATHEMATICS - I

UNIT-I

APPLICATION OF DIFFERENTIATION: Sub tangent and subnormal – Curvature, evolutes and involutes.

INTEGRAL CALCULUS: Properties of definite integrals – Reduction formulae for $x^n e^{ax}$, $\sin^n(x)$, $\cos^n(x)$, $\tan^n(x)$, $\sin^m(x) \cos^n(x)$, $x^n \sin(ax)$, and $x^n \cos(ax)$.

UNIT –II

MULTIPLE INTEGRALS AND APPLICATIONS: Multiple integrals – change of order of integration. Applications: Areas and volumes (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 Book:

Dr.M.K.Venkataraman, Engineering Mathematics (First Year), Second Edition, The National Publishing Company, Madras, July 2001.

Reference Book:

P. Kandasamy, K. Thilagavathy and K. Gunavathy, Engineering Mathematics, Volume-I, Second Edition, S. Chand and Company Ltd., New Delhi 1996.

UCC 1213 PHYSICS – I

Unit I – Optics

Interference: Newton's rings – Michelson's interferometer – wavelength determination – interference filter – antireflection coatings. *Diffraction:* diffraction grating – resolving power of grating & prism. *Polarization:* Fresnel's theory of double refraction – quarter and half wave plates – Optical Rotation.

Unit II – Acoustics

Ultrasonics: ultrasonic waves productions and detections – piezoelectric – magnetostriction – NDT applications. *Acoustics of auditoria:* – Sabine's formula – Reverberation time.

Unit III – Wave mechanics

Matter waves – de Broglie wavelength – uncertainty principle – Schroedinger wave equation – time dependent – time independent – application to particle in a box – barrier penetration – tunneling effect – tunnel diode.

Unit IV – Nuclear energy source

Binding energy – mass defect – packing fraction – mass and binding energy – disintegration in fission – fission and fusion – nuclear reactor – PHWR – FBTR – materials used in nuclear reactors.

Unit V – Lasers

Principles of Laser – Einstein's Coefficients – Threshold Conditions – Optical resonators – *Solid State laser:* NdYAG – *Gas Laser:* CO₂ laser – Dye laser, *Semiconductor Laser:* GaAs Laser – *Laser in NTD:* Holographic Interferrometry, Single and Double exposure

Text Books:

1. **Engineering Physics R K Gaur and S L Gupta, Dhantath Rai and Sons (1996)**
2. Optics – 2nd Edition Ajay Ghatak TMH (1995)

Reference Books:

1. Introduction to Modern Physics – Richtwmeyer, Kennard and cooper TMH (1998).
2. Laser and Application – Thiagarajan and Ghatak
3. Corept of Modern Physics Beiser – Mc graw Hill (1998).

UCC 1224 CHEMISTRY

UNIT I WATER

Hardness of water – units and calcium carbonate equivalent.
Determination of hardness of water – O – Hehner's method.
Disadvantages of hardwater – boiler scale and sludge, caustic embrittlement, priming & foaming and boiler corrosion.
Water softening method – lime-soda process, zeolite process and Ion exchange process

UNITII HIGH POLYMERS

Monomers – functionality, degree of polymerization -Tacticity -
Addition & Condensation Polymerization – Molecular weight distribution.
Polymerization techniques - Thermoplastics and Thermosets -
Preparation, properties and uses of Polyester, Teflon, nylon 6,6, PVC, Bakelite.
Polymer composites - Fibre reinforced plastics.

UNIT-III ELECTROCHEMICAL CELLS

Galvanic cells, Single electrode potential, Standard electrode potential. Elctromotive series. EMF of a cell and its measurement.
Nernst equation. Electrolyte Concentration cell. Reference electrodes - Hydrogen, Calomel & Glass electrodes.
Batteries - Primary and secondary cells, laclanche cell, lead acid storage cell & Ni-Cd battery.
10 hrs

UNIT-IV CORROSION AND ITS CONTROL

Chemical and Electrochemical corrosion. Types of corrosion-Galvanic, pitting, concentration cell corrosion. Passivity. Corrosion control Methods - Cathodic protection and corrosion inhibitors.
Protective coatings: Types of protective coatings-Metallic coating, - cladding, electroplating and anodizing.

UNIT-V PHASE RULE

Phase rule-definition and explanation of terms in phase rule.
Water, lead -silver alloy system, copper – nickel alloy system and iron-carbon alloy system

TEXT BOOKS

1. P C Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai and Sons, New Delhi, 2000
2. S S Data, "A Textbook of Engineering Chemistry" S Chand & Co., Ltd., New Delhi.

REFERENCES :

J C Kuriacose and Raja Ram J, "Chemistry in Engineering and Technology Vol.-I & II, Tata McGraw-Hill Co-Ltd., New Delhi.

**UCC 0135 – ELEMENTS OF ELECTRICAL AND
ELECTRONICS ENGINEERING**

ELECTRICAL:

PART – A

UNIT – I

Active and passive elements - review of Kirchoff's laws – star/delta conversion – equivalent resistance – Node and mesh methods of analysis of DC circuits.

UNIT – II

Concepts of AC circuits – rms value, average value, form and peak factors – real and reactive power – power factor – Node and mesh analysis of AC circuits.

UNIT – III

Introduction to three phase balanced circuits – two watt meter method of power measurement – Principle of DC generator, DC motor, Transformer and single phase motor.

ELECTRONICS:

PART - B

UNIT – I

Solid state devices - characteristic of diode, BJT, FET,UJT and SCR – RC coupled amplifier- Principle of Hartley oscillator and RC phase – shift oscillator – Introduction to IC.

Transducers – Linear variable differential transformer (LVDT, Strain gauge, Tachogenerator, Resistance Temperature Detector (RTD), Thermocouple, Thermistor, Piezoelectric transducer.

UNIT – II

Boolean algebra – reduction of Boolean expressions – De-Morgan's theorem logic gates – Implementation of Boolean expressions – flip - flops RS, JK, T and D – combinational logic - Half adder, Full adder and subtractors – Principle of counters and registers

UNIT – III

Model of a communication system – Types of electrical communication channel- wire and wireless channel – wire, Coaxial cable and optical fiber – Microwave radio link and satellite link. Advantage of Digital Communication – Overview of ISDN.

TEXT BOOKS:

1. R. Muthusubramanian, S Salivahanan, and K A Muraleedharan, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, New Delhi, 2000.

Reference Books:

1. D.P. Kothari and I.J. Nagrath, "Theory and Problems of Basic Electrical Engineering" Prentice Hall of India Ltd. New Delhi.
2. Allen Mottershead , "Electronic Devices and Circuits: An Introduction", Prentice Hall of India Ltd. New Delhi.
3. George Kennedy and Bernard Davis, "Electronic Communication Systems", Tata McGraw-Hill Ltd. New Delhi. Year 2001.

UCC 0026 THERMODYNAMICS

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 - Gas refrigeration cycle - Absorption refrigeration system - Liquifaction and solidification of gases

Text Books :

1. **Nag,P.K., "Engineering Thermodynamics", 2nd edition, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi,1995**
2. Wark, K., "Thermodynamics", 4th edition ,Mc Graw Hill, N.Y.,1985

Reference Books :

1. Arora, C.P., "Thermodynamics" , Tata Mc Graw Hill Publishing Co. Ltd., New Delhi,1998.
2. Burghardt, M.D., "Engineering Thermodynamics with Applications", 4th edition, Harper & Row, N.Y., 1986.
3. Huang, F.F., "Engineering Thermodynamics" 2nd edition , Macmillan Publishing Co. Ltd., N.Y.,1989.
4. Van Wylen, G.J and R.E Sonntag., "Fundamental of Classical Thermodynamics", 4th edition, John Wiley & Sons , 1994.
5. Cengel, Y.A. and Boles, M.A., 1989, "Thermodynamics - An Engineering Approach", Mc-Graw Hill.

UCC 0047 COMPUTER PROGRAMMING LAB (0 0 3 2)

There are three cycles of experiments. Write C programs to solve the problems wherever required.

CYCLE I - BASIC CONCEPTS

1. Study of Turbo C IDE – Compilation and execution using simple C Programs – Simple OS Interface/ commands.
2. Solve quadratic equation for various possible inputs.
3. Generation of all prime numbers in a given range. (Using iteration construct).
4. Sort given array of numbers and names.
5. Matrix operations (addition, subtraction, transpose)

CYCLE II - STRUCTURES AND FILES

6. Create an array of structures for student information with the following details:
 - Name -
 - DOB -
 - Age
 - Marks - percentage or CGPA
 - Roll No. -
 - Gender -
 - i. Compute the overall pass percentage of the class.
 - ii. List of the students roll numbers who failed in the current semester.
 - iii. Compute the average
 - 1v. Given a name, print the marks and other details.
7. Using files implement the above problem and print the mark sheet of each student after storing structure information in an input file. Also read the input file and create two output files containing male student information and female student information separately.
8. Develop the following functions to perform matrix multiplication:
 - i. Read any given general matrix
 - ii. Print a given matrix
 - iii. Identify the compatibility
 - iv. Multiplication of two matrices
9. Recursive program to
 - i. Find Factorial of a number
 - ii. Generate Fibonacci Series.

CYCLE III - APPLICATIONS

10. Using AutoCAD,
- Draw a National flag/house/car/layout of a street using basic objects.
 - Create a village layout and manipulate it with different edit commands.
11. Using MS WORD,
- Prepare a practical experiment report for any one of Physics experiments. (report should include diagrams, tables, formulae, using mathematical symbols.)
 - Prepare a letter containing the facilities available in a department addressed to N companies (using mail merge).
12. The placement data from the year 1996 to 2001 of Pondicherry Engineering College is given in the following table.

Year	Number of Students placed
1996	168
1997	179
1998	272
1999	245
2000	292
2001	192

- Using extrapolation method, find the expected number of students to be placed in the year 2005.
13. To identify the position of a pendulum at a given time instant after formulating equation for simple pendulum.
14. Accept a chemical equation and check whether it is balanced or not.
15. To Count the number of words and sentences in a given paragraph.

UCC 0231 – TECHNICAL ENGLISH

UNIT – I - BASIC COMMUNICATION THEORY

Communication as sharing; context of communication; the speaker/writer and the listener/reader; medium of communication; barriers to communication; accuracy, brevity, clarity and appropriateness in communication.

UNIT – II READING

Comprehension of technical and non-technical material, skimming, scanning, Inferring, Guessing, the meaning of words from contexts, Note making and extension of vocabulary, predicting and responding to context.

Include Intensive Reading.

UNIT – III WRITING

Effective sentences, Cohesive writing, Clarity and Conciseness in writing, Introduction to technical writing, Better paragraphs, Definition, Description, Practice in summary writing.

Include I. Four modes of writing – Description, Narration, Exposition and Argument.

II. Use of dictionaries, Library references, Use of indices. Making bibliographical entries with regard to sources from books, journals, internet, etc. Developing reference skills relating to note taking, collating information and organizing it.

UNIT IV WRITTEN COMMUNICATION

Report writing – informal and formal reports, Memoranda, Notice, Instruction.

Include: Business Letters, Resumes, Job Applications.

UNIT V - SPEAKING

Features of effective speech, practice in speaking fluently, Dialogue practice, Simple social exchanges, short extempore.

Include : Basics in Phonetics, Group Discussions and Presentations.

Importance of Listening Skills.

Text Books :

1. Boove, Courtland R, et al. Business Communication Today. Delhi: Pearson Education, 2002.
2. Lakshminarayanan, K.R. English for Technical Communication, Chennai: Scitech Publication, 2001.

Reference Books:

1. Davis, Llyod and Susan McKay, Structures and Strategies. Hyderabad; Universities

- Press, 1999.
2. Jones, Daniel, Everyman's English Pronunciation Dictionary, New Delhi; Universal Book Stall, 2001.

UCC 0028 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:

1. K.R. Gopalakrishna, A Text Book of Engineering Drawing, Vol. I & II
2. K.V. Natarajan, A Text Book of Engineering Drawing.
3. BIS, Engineering Drawing practice for Schools & College.

REFERENCES:

1. N.D. Bhatt, Engineering Drawing.
2. K. Venugopal, Engineering Drawing.
3. Warren. T. Luzadder, Fundamentals of Engineering Drawing.
4. David I cook and Robert N Mc Dougal, Engineering Graphics and Design with

5. computer applications, Holt – Sounders Int. Edn. 1985.
James D Bethune and et al., Modern Drafting, Prentice Hall Int., 1989.

UCC 0059 - BASIC ELECTRICAL AND ELECTRONICS LAB

List of Experiments

Electrical:

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:

1. Study of Analog and digital instruments
2. Study of CRO
3. Calibration of Voltmeter and Ammeter
4. Calibration of Energy meter and Wattmeter
5. Verification of Kirchoff's laws
6. Characteristics study of transducers (LVDT, Straingauge, thermocouple)
7. Digital Logic Gates

UCC 2202 MATHEMATICS - II

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 ($m \leq n$).

Unit III

TRIGONOMETRY: Expansions for $\sin(n\theta)$, $\cos(n\theta)$, $\tan(n\theta)$, $\sin^n(\theta)$, $\cos^n(\theta)$. Exponential, circular, hyperbolic, inverse hyperbolic and logarithmic functions of a complex variable – separation of real and imaginary parts. (Sec.6.1 to 6.3, 6.5 in Chapter6 and Chapter 7 in the Text Book given below)

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 Book:

Dr.M.K.Venkataraman, Engineering Mathematics (First Year), Second Edition, The National Publishing Company, Madras, July 2001.

Reference Book:

P. Kandasamy, K. Thilagavathy and K. Gunavathy, Engineering Mathematics, Volume-I, Second Edition, S. Chand and Company Ltd., New Delhi, 1996.

UCC 2213 Material Science

Unit I - Crystal structure and x – ray diffraction

Miller indices – Bravais lattices – unit cell – reciprocal lattice vector – Atomic packing fraction – Debye–Scherrer X– ray Diffraction method – co-ordination number – radius of atom and size of cell.

Unit II – Defects

Point defects – Qualitative ideas of point, line and volume defects - Lattice vibration – Specific heat of solids – Einstein’s-Debye’s Theory – Thermal conductivity in metals

Unit III – Dielectric properties

Dielectric Polarization and Mechanism – Clausius-Mossotti relation – Dielectric constant measurements – Temperature and frequency dependence of dielectric constant – Dielectric loss – Measurement of Dielectric constant and loss using Scherring bridge – Elementary ideas of Piezoelectrics, ferroelectrics and pyroelectric materials and its applications

Unit IV – Magnetic Properties

Classification of Magnetic Materials – Quantum Theory of Ferro and Anti-ferromagnetism – hysteresis curves and parameters – Curie temperature – domain theory – magnetic anisotropy – soft and hard magnetic materials – magnetic bubble – memory devices - Magnetic circuits

Unit V – Semiconductors and superconductors

Compound semiconductors – Hall effect – origin of energy band and energy gap – Kronig penny model – Basic concepts superconductivity – transition temperature – Meissner effect – Type I and II superconductors – high temperature superconducting materials – 123 superconductor.

Text books

1. Materials Science – M Arumugam, Anuratha Printers, 1994.
2. Solid State Physics – S.O Pillai – Wiley Easton, 1994.

Reference

- 1 Solid State Physics – C Kittel 7th Edition – Wiley Eastern Ltd., 1987
- 2 Science of Engg. Materials – C M Srivastava – Wiley Eastern Ltd., 1987
- 3 Elementary Physics – M Ali Omar – Addison Sesley Publishing Co.India,1990.

UCC 2224 ENVIRONMENTAL SCIENCE

Unit I

Environmental segments – brief outline. Pollution – Definition – classification. Pollutants – classification of pollutants.

Air pollution–I - Reactions in atmosphere – Sources of air pollution – Gaseous pollutants – oxides of nitrogen, oxides of sulfur, oxides of carbon, hydrocarbons and particulates.

Unit II

Air pollution II – Greenhouse effect – Sources - Effect on Global climate-consequences. Chlorofluro carbons- (CFC). Ozone depletion – Cause -Mechanism-Effects on environment. Smog-Sulfurous or London Smog – Photochemical Smog or Los Angles Smog –Effects on environment.

Acid rain – Theory of acid rain – Effects.

Unit III

Water pollution – Types of water pollution–Sources-Classification of water pollutants cause and effect of :- (i) Inorganic pollutants and toxic metals, (ii) Organic pollutants, (iii) Radioactive pollutants and (iv) Pesticides.

Unit IV

Pollution monitoring and control methods - Air pollution - Analysis of CO_x, NO_x, SO_x, H₂S, Hydrocarbons, particulate matter.

Water pollution. Monitoring pH, Dissolved oxygen –Winkler's method - BOD, COD, TOC.

Unit V

Noise pollution – Sound levels – Sources of Noise – Effects of Noise – Noise Limits – Some control measures

Basic concept of Environmental impact assessment – Types of impact – Quantifying specific impact – Elementary aspects of impact identification and evaluation.

TEXT BOOKS:

1. Anil Kumar De, "Environmental Chemistry", 3rd Edition, New Age International (P) Ltd., Publishers, New Delhi (1996)
2. B K Sharma, "Environmental Chemistry" GOEL Publishing House, Meerut, (2000).

REFERENCE BOOKS:

1. Gilbert M. Masters, "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., New Delhi, (1994).
2. S A Abbasi, "Environmental Pollution and its control", Cogent International, Pondicherry, (1998). (For Unit V)..
3. A textbook in Environmental Science, V Subramanian, Narosa Publishing House, New Delhi.

UCC0125 Basic Engineering

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- classification and methods of improving bearing capacity of soils.

Foundations-Functions and classification.

Masonry-Types of stone and brick masonry.

Flooring-functions and types-cement, concrete, mosaic, granolithic-marble, timber and granite flooring.

Roofs-Flat roofs - steel trusses - roof covering.

Unit III

Utilities and Services:

Surveying-classification, general principles of surveying – Basic terms and definitions in chain, compass, leveling surveying and uses of surveying – definition, characteristics and uses of contours.

Roads-types, Water bound macadam road, cement concrete road, bituminous road.

Bridges-types, T-beam, steel, arch, culvert and causeway.

Dams-Purpose, selection of site, types of dams - gravity and earthen dams..

Water supply-sources-surface and ground water quality and quantity requirements.

Rainwater harvesting.

Text Book:

- 1.Purushothama Raj.P., Basic civil engineering,3rd Edn., Dhanam Publications, Chennai, 2001.
2. Natarajan, K V, Basic Civil Engineering, 11th Edition, Dhanalakshmi Publications, Chennai, 2001.

Reference Books:

1. Rajpat, R K, Engineering Materials, S Chand & Co. Ltd., New Delhi, 2002
2. Punmia, B.C. etal, Surveying , Vol-I, Laxmi Publishers, New Delhi, 2002
3. Arora, S P and Bevidra, S P., Building Construction, Dhanpat rai & Sons, New Delhi, 2002.

UCC 0125 BASIC ENGINEERING

**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:

1. Lindberg, R.A.Process and Materials of Manufacture, PHI.
2. Nagpal, Power Plant Engineering, Khanna Publishers, Delhi.

REFERENCES:

1. E1.Wakil, M.M.Power Plant Technology, Mc Graw Hill Book Co.
2. Campbell, J.S.Principles of Manufacturing Materials and processes, TMH.
3. Hajra Choudhry, et. A1, Workshop Technology, Media Promoters Publishers Pvt. Ltd., Bombay.
4. Chapman, A.J.Production Technolgoy.

UCC 0016 ENGINEERING MECHANICS

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, definition of rigid body and degrees of freedom, 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, introduction to virtual work principle

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

Rectilinear motion, curvilinear motion, Relative motion, equations of motion, D'Alembert's principle, work, power, energy and efficiency – Conservative forces and principle of conservation of energy, Impulse – momentum, Impact – Direct central impact and oblique central impact.

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

1. Rajesekaran.,S and Sankara Subramanian., G., Engineering Mechanics, Vikas Publishing House Private Ltd., 2002
2. Natesan, S C., Engineering Mechanics, Umesh Publications, New Delhi, 2002

Reference Books

1. Meriam, J.L., "Statics", John Wiley, 2002
2. Meriam, J.L., "Dynamics", John Wiley, 2002
3. Natarajan, K V., Engineering Mechanics, Dhanalakshmi Publishers, Chennai, 2003.

PHYSICS LABORATORY: UCC 0217

(ANY 10 EXPERIMENTS)

- 1 THERMAL CONDUCTIVITY – LEE’S DISC
- 2 THERMAL CONDUCTIVITY RADIAL FLOW
- 3 SPECTROMETER – PRISM AND HOLLOW PRISM
- 4 SPECTROMETER – GRATING
- 5 SPECTROMETER - ORDINARY & EXTRAORDINARY RAYS
- 6 NEWTON’S RINGS
- 7 AIR – WEDGE
- 8 POLARIMETER
- 9 I – H CURVE
- 10 FIELD ALONG THE AXIS OF COIL CARRYING CURRENT
- 11 MELDE’S STRING
- 12 KUNDT’S TUBE
- 13 LASER EXPERIMENT: Wavelength Determination Using Grating and Vernier Calipers.
- 14 JOLLY’S EXPERIMENT FOR α
- 15 VIBRATION MAGNETOMETER – CALCULATION OF MAGNETIC MOMENT AND POLE STRENGTH

UCC 0029 WORKSHOP PRACTICE

Sl.No.	Trade	List of Exercises
1.	Fitting	Study of tools and Machineries. Exercises on symmetric joints and joints with acute angle.
2.	Welding	Study of arc and gas welding equipment and tools – Edge preparation – Exercises on lap joint and V Butt joints – Demonstration of gas welding
3	Sheet metal work	Study of tools and Machineries – exercises on simple products like Office tray and waste collection tray.
4.	Carpentry	Study of tools and Machineries – Exercises on Lap joints and Mortise joints

LIST OF EXERCISES

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.

UCC 0228 CHEMISTRY PRACTICALS

(Any 10 Experiments)

1. Determination of total hardness of water by EDTA method.
2. Determination of alkali by Flame photometer.
3. Estimation of iron by colorimetry.
4. Molecular weight determination of a polymer by viscometry.
5. Percentage composition of sugar solution by viscometry.
6. Determination of dissolved oxygen content in water.
7. Estimation of mixture of alkali ($\text{HCO}_3 + \text{CO}_3$)
8. Determination of Pb in polluted water by conductometry.
9. Estimation of Fe^{2+} by Potentiometry.
10. Determination of COD of a waste water sample.
11. Determination of chloride content in water.
12. Determination of copper in brass.
13. Determination of available chlorine in bleaching powder.

UEI 3201 MATHEMATICS III

UNIT – I

Laplace Transform: Definitions – Laplace transform of unit – impulse and step functions – Laplace transform of periodic functions – exponential shift formula – initial and final value theorems – Laplace transform of derivatives and integrals – convolutions theorems – inverse Laplace transform – methods of determining inverse, Laplace transform – solutions of linear differential equations using Laplace transforms.

UNIT – II

Functions of a Complex Variable: Functions of a complex variable – continuity, derivatives and Analytic Function – Cauchy – Riemann equations – Sufficient Conditions for analyticity – harmonic and orthogonal properties of the real and imaginary parts – Conformal Mapping – Bilinear transformations.

UNIT – III

Complex Integration: Cauchy’s theorem – Cauchy’s integral formula – Taylor’s and Laurent series – residue theorem – Contour integration round the units circle and semi – circular contour.

UNIT – IV

Fourier series: Dirichlet’s conditions – expansion of periodic functions into Fourier series – change of interval – half – range Fourier series.

UNIT – V

Complex form of Fourier series: Root mean square value – Parseval’s theorem on Fourier coefficients – Harmonic analysis. Fourier transform: Definition and properties – Fourier integral theorem – statement – Fourier sine transform and cosine transforms – Inverse Fourier transform.

Text Books:

1. Venkataraman.M.K, “Engineering Mathematics”, National Publishing Co., Madras, 1986.
2. Gupta, S.C., and Kapoor, V.K., “Fundamentals of Mathematics Statistics”, Sultan Chand and Sons, 1975.

References:

1. Erwin Kreyszig, “Advance Engineering Mathematics”, Wiley Eastern Ltd.,
2. Grewal, D.C., “Higher Engineering Mathematics”, Khanna Publishers, Delhi,.
3. Naryanan, S., Manicavachagam Pillai, T.K., and Ramaniah, C., “Advance Mathematics for Engineering Students”, Chennai 1985.

UEI 3072 CIRCUIT THEORY

UNIT – I

Graph Theory: Basic concepts of graph theory – Tree, branch, Chord, Incidence and reduced incidence matrices – Application to networks – link currents and tie set, Tree, branch Voltage and cut set – concept of duality and dual networks.

UNIT – II

Network Theorems: – Review of Kirchoff’s laws – star to delta and delta to star transformation – mesh and node analysis.

Thevenin’s, Norton’s, Superposition, Compensation, Millman’s, Tellegen’s, Reciprocity and Maximum power transfer theorems and their applications to D.C. and A.C. Circuits.

UNIT – III

Resonance Circuits: – series, parallel, series - parallel resonance circuits – Q – factor, Bandwidth of a resonant circuit.

Coupled Circuits: – Dot convention for coupled circuits – coefficient of coupling – analysis of coupled circuits – single and double tuned circuits – Band width and frequency response.

UNIT – IV

Transient Analysis: Initial conditions in elements-Evaluating initial conditions in networks – Transient response of RL, RC and RLC Circuits to DC excitation – Natural and forced oscillations – Application of Laplace transform for transient solution – Response of circuits for Non sinusoidal periodic inputs.

UNIT – V

Network Functions: The concept of complex frequency – Transform impedance and transform circuits – driving point impedance and admittance function – Transfer function– poles and zeros of two port networks – open circuit impedance parameters – short circuit admittance parameters – Transmission and inverse transmission parameters – Hybrid and inverse hybrid parameters.

Text Books:

1. Joseph A. Edminister, “Electric Circuits”, Schaum’s outline series.
2. M.L. Soni and J.C. Gupta, “Electrical Circuit analysis”, Dhanpat Rai and Sons.

References:

1. M.E. Van Valkenburg, “Network analysis”, prentice hall of India
2. Sudhakar and Shyammohan, “Circuits and Networks”, Tata – McGraw – Hill,.
3. W.H. Hoyt and J.E. Kemmerly, “Engineering Circuit analysis”, McGraw Hill,.

UEI 3073 ELECTRONIC CIRCUITS – I

UNIT – I

Junction Diodes: Energy – band diagram – PN Junction – Junction diode – Volt – ampere characteristics – Ratings – Transition and diffusion capacitances – Varactor diode- Avalanche and Zener, break down – Zener diode – Tunnel diode – PIN diode – Clipper and camper circuits using diodes – Photo diodes – Photovoltaic – LED and LCD – Voltage multiplier circuit.

UNIT – II

Bipolar Junction Transistor: Principle of transistor action – Current components – Cutoff, active and saturation regions – Input and output characteristics – CE, CB and CC configurations – Small signal and large signal beta – Transistor breakdown biasing – Bias stabilization – Bias compensation – Thermal runaway problem – Thermal resistance and capacitance concepts – Use of heat sink.

UNIT – III

FET and other Devices: Constructional features and characteristics of JFET and MOSFET – Depletion and enhancement modes – VVR operation of FET – Biasing of FET circuits – Construction and characteristics of UJT – Fabrication and characteristics of four layer devices such as SCR, Triac and Diac.

UNIT – IV

Biasing and Stabilization: BJT Biasing – Operating point – fixed bias circuit – Emitter stabilized bias – voltage divider bias – DC bias with voltage feedback – bias stabilization – Q point variation – stability factor analysis – Temperature compensation using diode biasing – thermistor and sensistor compensation – thermal runaway and thermal stability.

Small Signal Low Frequency Analysis: Two port device and the hybrid model – BJT hybrid model – Determination of h parameters from characteristics – Analysis of transistor amplifiers using h – parameters – CE, CC, CB configurations – simplified hybrid model of CE, CC, CB configurations.

UNIT – V

Frequency Response of Amplifiers: Low frequency response of BJT, FET amplifiers – Miller effect capacitance – High frequency response of BJT, FET amplifiers – Multistage amplifiers effects of cascading on gain and BW – Darlington pair cascade amplifier – Differential amplifier.

Text Book:

1. Millman and Halkias, “Integrated Electronics”, McGraw Hill.

References:

1. Donald L. Schilling, Charles Belove, “Electronic Circuits”, 3rd edition, McGraw Hill.
2. Allen Mottershed, “Electronic Devices and Circuits: An Introduction”, Prentice Hall of India Ltd. New Delhi.

UEI 3044 C++ AND DATA STRUCTURES

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

Linked lists – Dynamic storage management – singly and doubly linked list – Stack – Application of stack – Fixed, variable and Generic stack – queues – queue based on Dynamic linked list – Trees – Binary Trees – Graphs – Warshall’s Algorithms – Shortest paths.

UNIT – III

Objects Oriented Programming – objects and classes – methods, messages, encapsulation, abstraction, inheritance, polymorphism, dynamic building. Traditional approach Versus object orientation; benefits of object orientation – flexibility in software development – reusability – extensibility – maintainability.

UNIT – IV

Objects and Classes – specifying classes – using – C++ objects and data types – constructors and destructors – object as function arguments – structures and classes. Array fundamentals – array as class member data – array of objects. Structures – simple structure – accessing structure member – structure within structure – structure and classes – Function overloading – Inline function – Virtual function and polymorphism.

UNIT – V

Operator Overloading – overloading unary operator – overloading binary operator – data conversion. Inheritance – derived class and base class – derived class constructors – public and private inheritance – level of inheritance. C++ graphics – text – mode graphics functions – graphics – mode graphics functions – colors – rectangles and lines – polygons and inheritance – text in graphics mode – Addresses and pointers, Simple file operations: streams – string I/O – character I/O.

Text Books:

1. N.S. Kutti and P.Y. Padhye ,“Data Structures in C++” ,Prentice Hall of India Pvt., Ltd., New Delhi 2001.
2. Liberty & Keogh, “C++: An introduction to programming”, Prentice Hall of India Pvt., Ltd., New Delhi 2002.

References:

1. Bjarne Stroustrup, “ The C++ Programming Language”, Addison Wesley by publication, New york 1994.
2. Jean – Paul Tremblay and Paul G.Sorenson, “An Introduction to Data Structures with Applications”, Tata McGraw Hill 1998.
3. E. Balagurusamy, “Object oriented Programming with C++”, Tata McGraw Hill, New Delhi, 1996.

UEI 3015 STRENGTH OF MATERIALS

UNIT – I

Concept of mechanics of deformable bodies – Behavior of mild steel under tension – stress and strain – elastic constants and their relationships – equivalent modulus – factor of safety – Principal planes and principal stresses (two dimensional) – Mohr’s circle representation.

UNIT – II

Bending moment and shear force diagrams for cantilever, simply supported and over hanging beams – Bending of beams: theory of simple bending – neutral axis – stress distribution across a section due to bending moment and shear force – thin cylindrical shells.

UNIT – III

Deflection of beams: Equation of deflection curve – slope and deflection by double integration method – Moment area method – conjugate beam method.

UNIT – IV

Torsion: Torsion of solid and hollow circular shafts – combined bending and torsion – springs: Leaf springs – closed and open coiled helical springs.

UNIT – V

Columns: Theory of columns – combined bending and direct stresses – concept of structural stability – long columns: Euler’s theory of buckling load – Rankine – Gardon formula – Jhonson’s formula – column with initial curvature.

Text Books:

1. Rajput, R.K, “Strength of Materials”, S. Chand and Company Ltd., New Delhi, 2002.
2. Bhavikatti, S.S, “Strength of Materials”, Vikas Publishing House (P) Ltd., 2002.

UEI 3076 ELECTRICAL INSTRUMENTS AND MEASUREMENTS

UNIT – I

Units, standards and Calibration – D’Arsonval galvanometer, Principle, operation and constructional details of moving coil, Moving iron, dynamometer type, rectifier type, thermal type instruments, Induction type Ferraris type, shaded pole type. Sources of errors and their compensations, extension of ranges using shunt, series multiplier, Current Transformer and Potential Transformers. Construction operation principles of CT and PT.

UNIT – II

Power measurement – DC power – using Voltmeter and Ammeter. AC power electro dynamic wattmeter, thermal type wattmeter compensated wattmeter, single and 3-phase power measurements. Energy meter – compensation and adjustment in Energymeters, Testing of Energy meters, Calibration of wattmeters and Energy meters. Power factor meter-single phase and three phase meter. Maximum demand meter, Trivector meter.

UNIT – III

Resistance measurement – Low, medium and high values – using Ammeter and Voltmeters – Series and shunt type ohmmeter – Wheatstone bridge, Kelvin double bridge, Megger, Loss of charge method and Direct deflection – AC bridges – Maxwell’s bridge, Wien bridge, Anderson bridge, Hay’s bridge, Schering bridge – detectors in bridge measurements – Vibrational Galvanometer. Sources of errors in bridge measurements and elimination methods. Localization of faults in cable-loop tests-Murray, Varley and Fall of potential tests.

UNIT – IV

DC potentiometer – students type, Leeds and Northrop potentiometer, Vernier potentiometer, Larsen potentiometer, Brooks deflection potentiometer. A.C. Potentiometers – Drysdale potentiometer, Gall Tinsley potentiometer – Applications of AC and DC potentiometers.

UNIT – V

Magnetic measurements – Ballistic Galvanometer, Grassot flux meter – flux meter – testing of ring specimen – Determination of B.H. curve by method of reversal and step by step method – testing of bar specimen – Hopkinson’s permeameter – Iron loss measurement by Lloyd Fisher square. AC test on magnetic materials.

Text Book:

1. A.K.Sawhney, “A Course in Electrical and Electronic measurements and Instruments”, Dhanpat Rai and Sons, 2000.

References:

1. E. W. Golding and F.E. Widdis, “Measurements and Measuring Instruments”, Sir Isaac Pitman and Sons(P) Ltd., 1995.
2. J.B. Gupta – S.K., “A Course in Electrical Measurements”, Kataria & sons and Sons, 1998.
3. Halftrack & Cooper “Modern Electronic Instrumentation and Measurement Techniques”, PHI 1997.

UEI 3237 GENERAL PROFICIENCY - I

UNIT 1

BASICS OF COMMUNICATION : Essential Communication Skills; Elements of Communication; Basic Models of Communication; Frames of Reference; Purposive Communication; Channels of Communication; Developing Good Communication Style.

UNIT II

LANGUAGE DEVELOPMENT THROUGH READING : TOEFL based Reading Comprehension; Current Affairs; Vocabulary Building; Idioms and Phrases; Basic Phonetics.

UNIT III

SPEAKING PRACTICE : Dialogue/Conversation; Types of Conversations; Listening Skills; Telephone Etiquette; Public Speaking; Debate.

UNIT IV

QUANTITATIVE ANALYSIS : Aptitude Tests

REFERENCE BOOKS :

1. Bovee, Courtland L and John V Thill. *Business Communication Today*. Pearson Education, 2003.
 2. Rymniak, Marilyn J and Janet A Shanks. *TOEFL CBT Exam*. Simon and Schuster, 2002.
 3. Lewis, Norman. *Word Power Made Easy*. Bloomsbury, 2003.
 4. Nicholls, Anne. *Mastering Public Speaking*. Jaico Publishing House, 2003.
 5. Jones, Daniel. *Cambridge English Pronouncing Dictionary*. CUP, 2003.
- Aggarwal, R.S. *Quantitative Aptitude*. S. Chand & Co., 2004.

UEI 3078 ELECTRONICS LAB – I

1. Characteristics of p-n junction, point contact and Zener diodes.
2. Characteristics of Common Base Configuration.
3. Characteristics of Common Emitter Configuration.
4. Characteristics of FET.
5. Characteristics of SCR and UJT.
6. Biasing Circuits.
7. RC coupled amplifier.
8. Emitter follower.
9. FET Amplifier.
10. Multistage amplifier.

UEI 3019 STRENGTH OF MATERIALS LAB

Test on metals (Ferrous and Non Ferrous)

- 1 & 2. Tension test: To find yield stress, ultimate stress, percentage elongation and reduction in area of cross section, young's modulus and Barba's constant.
3. Torsion test.
4. Double shear test.
5. Hardness test: Vickers, Brinell and Rockwell.
6. Impact test: Charpy and Izod.
7. Bend test (180 degree and 90 degree).
8. Ductility test.
9. Static bend test on Timber.
10. Compression, Tension, Shear tests of Timber.
11. Tension test on Plastic.
12. Spring test.

UEI 30410 C++ AND DATA STRUCTURES LAB

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.
6. Programming using polymorphism.
7. Programming using inheritance.
8. Programming using object interface.
9. Programming to illustrate (i) String (ii) linked list.
10. Programming to illustrate (i) Stack (ii) Queues (iii) Trees.

UEI 4201 MATHEMATICS – IV

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

Solution of partial differential equation by the method of separation of variables – boundary value problems – Fourier series solutions – transverse vibration of an elastic string.

UNIT – III

Fourier series solution for 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:

1. Venkataraman M.K., “Engineering Mathematics”, National Publishing Co., Madras.
2. S.C. Gupta and V.K. Kapoor, “Fundamentals of mathematical statistics”, Sultan Chand and sons, 1975.

References:

1. Erwin kreyszig, “Advance Engineering Mathematics”, Wiley Eastern Ltd., 1985.
2. Grewal, D.C., “Higher Engineering Mathematics”, Khanna Publishing Delhi 1985.
3. Narayanan.S., Manicavachagam Pillai, t.K., and Ramanaiah.C, “Advanced Mathematics for Engineering Students”, Madras, 1985. C. Viswanathan Pvt., Ltd., Madras.

UEI 4072 ELECTRONIC CIRCUITS – II

UNIT – I

Feedback concept – Barkhausen criterion – Gain with feed – back – General characteristics of negative feedback amplifiers – Four basic types of feedback and their effect on gain – Input and output impedances – Multistage feedback amplifiers – Frequency response and stability. Sinusoidal oscillators: Conditions for oscillations – Analysis of Hartley, Colpitts and Tuned Oscillators – R.C. Oscillators – Phase Shift and Wien bridge types and analysis of these circuits – Crystal oscillators and frequency stability.

UNIT – II

Class A large – Signal amplifiers – Second harmonic distortion Higher order harmonic generation – The transformer coupled audio power amplifiers – Efficiency push pull amplifiers – Class AB, Class B and Transformer – less types – Expressions for power output, efficiency and figure of merit. Class C power amplifiers, efficiency.

UNIT – III

Half wave and full wave rectifiers – Bridge rectifiers, filters, Inductor and capacitor filters, L section and section filters – Regulation – regulated power supplies. Shunt and series voltage regulation. Analysis and design – Protection circuits for voltage regulators, DC voltage regulators.

UNIT – IV

RC wave shaping circuits – clipping and clamping circuits – Switching diodes and transistors – Storage time – Astable, Monostable and Bistable multivibrators, Schmitt trigger – Voltage / Current sawtooth sweeps – Fixed amplitude sweep and constant current sweep generators - UJT sawtooth generator – Miller and Bootstrap time bases – Multivibrators using negative resistance Devices (UJT and Tunnel diodes).

UNIT – V

The differential amplifier – small signal analysis – CMRR – Differential – Amplifier with constant current source – OPAMP – electrical characteristics of OPAMP – Specification of OPAMP linear and Non linear operations using OPAMP 555 Times – Application of 555 timer as Astable and Monostable Multivibrator.

Text Book:

1. Millman and Halkias, “Integrated Electronics”, McGraw Hill, 2002.

References:

1. Millman and Taub, “Pulse, Digital and switching Waveforms”, McGraw Hill 2002.
2. Coughlin and Dirscol, “Operational amplifiers and Linear Integrated circuits”, Prentice Hall of India Pvt., Ltd., 2002.

UEI 4053 ELECTRICAL TECHNOLOGY

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 – Kirchoff’s Laws for the magnetic circuit – magnetization curve – hysteresis loop – current – ring theory of magnetism – hysteresis loss – 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 – breaking and speed control of DC motors. Applications of DC motors and generators.

UNIT – III

Transformers: Principle – types, general constructional features of single phase and three phase transformers – phasor diagram and equivalent circuit – regulation and efficiency – open circuit and short circuit tests – autotransformers. Applications of three phase, single phase and auto transformers.

UNIT – IV

Synchronous Machines: Principle – types and general constructional features – synchronous generators – characteristics – emf equation – armature reaction – regulation – phasor diagram of synchronous motor – V curve – starting methods. Application of synchronous generators and motors.

UNIT – V

Induction machines: Types – constructional features – equivalent circuit – slip – torque characteristics – starters – breaking and speed control methods – principle of operation and types of single phase induction motors. Application of three phase and single phase induction motors.

Text Books:

1. Edward Hughes, “Electrical Technology”, ELBS/Longman.
2. B.L. Theraja and Theraja. “A Text book of Electrical Technology – Vol. II, AC and DC Machines”, S.Chand & Co., Ltd.

References:

1. I.J. Nagrath and D.P. Kothari, “Electric machines”, TMH New Delhi.
2. Fitzgerald, Kingsley and Umans, “Electric machinery”, McGraw Hill.

UEI 4074 DIGITAL ELECTRONICS

UNIT – I

Codes: BCD – ASCII-EBCDIC weighted and self – complimenting codes – Excess – Gray code – Error detecting codes – Hamming code – parity Generation and detection.

Boolean algebra: De-morgan laws – simplification of Boolean expression – sum of products and product of sum forms, karnaugh Map – Quine McClusky’s tabular method.

UNIT – II

Combinational Logic Design: Logic gates – Implementation of combinational logic functions – Half adder, full adder – Half subtraction – full subtract or – parallel adder – binary adder – Magnitude comparator – encoder and decoders – multiplexers – code converters – parity generator/checker.

UNIT – III

Sequential Circuits: Flip – flops (all types) – Truth table and excitation table, synchronous and Asynchronous Counter design – Up-down counter, BCD Counter – Modulus counters – shift registers – timing sequence – racing problems – Hazards – Hazard free Asynchronous circuits.

UNIT – IV

Design of Sequential Circuits: Basic models of sequential machines – concept of state – state diagram – Design with state equations – simple circuit implementations Characteristics of Digital IC’s – TTL, ECL, MOS and CMOS digital IC families – Characteristics – Performance comparison of all logic families – Interfacing TTL and CMOS IC’s.

UNIT – V

System Design Using Digital Integrated Circuits: Designs of combinational and sequential circuits with standard IC’s – Design of digital voltmeter – Display drivers Basic concepts of Programmable logic – PROM, EPROM, RAM, PAL, PLA, FPGA – implementation of digital functions.

Text Book:

1. Morris Mano, “Digital Design”, Prentice Hall of India.

References:

1. Floyd, “Digital Fundamentals”, Universal Book Stall, New Delhi.
2. Albert Paul Malvino and Donald P Leach, “Digital principles and Applications”, McGraw Hill.
3. Herbert Taub and Donald Schilling, “Digital Integrated Circuits”, McGraw Hill.

UEI 4015 FLUID MECHANICS AND HYDRAULIC MACHINERY

UNIT – I

Physical properties of fluids, mass density, specific weight, specific volume, specific gravity viscosity – Newton’s law of viscosity, compressibility, surface tension and capillarity – pressure and its measurement: absolute and gauge, atmospheric pressures, simple manometers.

UNIT – II

Dynamics of fluid flow – equation of motion. Bernoullis equation – practical application – venture meter, orifice meter and pitot tube – Flow through pipes – loss of energy due to friction – minor energy losses – hydraulic gradient and total energy line – flow through pipes – pipes in series – pipes in parallel – power transmission through pipes.

UNIT – III

Turbines: General layout of a hydro-electric power plant – definitions of heads and efficiencies of a turbine – classification of turbines – pelton wheel – velocity triangles – work done efficiency – radial flow – reaction turbines – Francis turbine – velocity triangles – work done efficiency – draft tube theory – governing of turbines: Specific speed and its significance – unit quantities.

UNIT – IV

Centrifugal pumps – main parts, work done, definitions of heads and efficiencies – minimum starting speed – multistage pumps specific speed – priming – cavitation – Reciprocating pumps – main parts – working principle – slip indicator diagrams – effects of acceleration and friction on indicator diagram – maximum speed of a reciprocating pump – Air vessels.

UNIT – V

Hydraulic devices – hydraulic press. Hydraulic accumulator and hydraulic intensifier – Hydro power development – Types, layout and components of typical plant – Load factor, utilization factor and capacity factor – small, mini and micro power plants.

Text Books:

1. Modi and Seth, “Fluid Mechanics, Hydraulic and hydraulic Machines”, Standard Publishing House, New Delhi, 2002.
2. Rajput, R.K. “Fluid Mechanics and Hydraulic Machines”, S. Chand & Company, New Delhi, 2002.

UEI 4076 TRANSDUCERS AND MEASUREMENT SYSTEMS

UNIT – I

Generalized scheme of a measurement system – basic methods of measurements-Errors in measurements –types of errors-Statistical analysis of measurement data-mean, standard deviation – probability of errors – Gaussian distribution – probable error, limiting errors. Reliability of measurement systems – failure rate – reliability improvement, Availability, redundancy, choice of components and materials. Different types of noises in measurements and its Suppression methods.

UNIT – II

Static characteristics of instruments – accuracy, precision, sensitivity, linearity, resolution, hysteresis, threshold, input impedance, loading effect – generalized mathematical model of measurement systems – dynamic characteristics – Modelling of Transducers – operational transfer function – zero, first and second order instruments – impulse, step, ramp and frequency response of the above instruments. Techniques for dynamic compensation.

UNIT – III

Resistance potentiometer – loading effect – strain gauges – gauge factor – types of strain gauges – rosettes – semiconductor strain gauges – installation of strain gages – strain measuring circuits – resistance thermometers, materials, construction, characteristics – Thermo wells – Thermistors and photo resistors (LDR) – hot wire anemometer – constant current and constant temperature operation – humidity sensors. Signal conditioning circuits for RTD, thermocouple, thermistor and strain gage. Linearization techniques for thermistors.

UNIT – IV

Induction potentiometers – variable reluctance transducers – Inductive proximity pick up and Capacitive proximity pickup – LVDT construction – signal conditioning circuit – applications – RVDT, Magnetostrictive transducer. Capacitive transducers – variable area type – variable air gap type – variable permittivity type – signal conditioning circuit – Blumlein bridge – Capacitor microphone – frequency response. Piezoelectric transducers – piezoelectric crystals – charge amplifier.

UNIT – V

Accelerometer and Vibrometer – Eddy current transducers. Hall effect transducers – accelerometer – Photo electric detector, different types and characteristics – Optical sensors, IC sensor for temperature and pressure – Introduction to fiber optic sensors – Optical fiber types – Temperature, pressure, flow and level measurement using fiber optic sensors. Intelligent and smart Transducers.

Text Books:

1. E.O. Doebelin, “Measurement systems Applications and design”, McGraw – Hill. 1998.
2. John B. Bentley, “Principles of Measurement systems”, Longman Publishers, 1983.

References:

1. J.W. Dally,W.F. Riley and K.G. Mc Connell, “Instrumentation for Engineering measurements”, John Wiley & sons Inc., 1993.
2. C.D. Johnson, “Process control Instrumentation Technology”, PHI, 7th edition,
3. S.Renganathan, “Transducers Engineering”, Allied Publishers, 1999.
4. R.K.Jain, “Mechanical measurements”, Kanna Publishers, 2002.

UEI 4237 GENERAL PROFICIENCY - II

UNIT I

IMPORTANCE OF COMMUNICATION : Introduction; Verbal and Non-verbal Codes of Communication; Barriers to Communication; Self-Assessment; SWOT Analysis; Identifying Strengths and Weaknesses.

UNIT II

PERSONALITY DEVELOPMENT : Body Language; Non-verbal Skills; Leadership Qualities; Emotional Quotient; Effective Time Management; Surviving Stress; Overcoming Failure; Professional Ethics

UNIT III

VERBAL COMMUNICATION : Social Exchanges; Planned Speech; Extempore; Basics of Attending & Organizing Meetings; Informal Discussions

UNIT IV

QUANTITATIVE ANALYSIS : Aptitude Tests

REFERENCE BOOKS

1. Mohan, Krishna and Meera Banerji. *Developing Communication Skills*. Macmillan, 2002.
2. Leigh, Andrew and Michael Maynard. *The Perfect Leader*. Random House Business Books, 1999.
3. Minchinton, Jerry. *Maximizing Self-confidence*. Jaico Publishing House, 2003.
Thorpe, Edgar. *Course in Mental Ability and Quantitative Aptitude*. Tata McGraw-Hill, 2003.

UEI 4058 ELECTRICAL MACHINES LABORATORY

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.
3. Predetermination of Transformer parameters.
4. Swinburn's Test.
5. Load test on single phase Induction motor.
6. Blocked rotor test.
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.

UEI 4079 ELECTRONICS LAB - II

1. Feedback amplifiers.
2. Hartley and Colpitts oscillator.
3. RC – phase shift and Wien bridge oscillator.
4. Power amplifiers.
5. Rectifiers (3 types).
6. Regulators (Shunt, Series, IC).
7. a) Clipping and clamping circuits.
b) UJT relaxation oscillator.
8. Astable and Monostable multivibrators using discrete components.
9. Astable and Monostable multivibrators using 555 Timer.
10. Applications of OP AMP.
11. Function generator using OPAMP.

UEI 40110 FLUID FLOW AND HYDRAULIC MACHINERY LAB

Fluid Flow Lab:

1. Determination of co-efficient of discharge of orifices and mouth pieces.
2. Determination of coefficient of discharge of the venturimeter and orifice meter.
3. Determination of friction factor for a pipe.
4. Determination of minor losses due to pipe implements.
5. Determination of Metacentric heights for ship models.
6. Determination of force due to Impact of jet on vanes.

Hydraulic Machinery Lab:

1. Performance characteristics of Centrifugal Pump.
2. Performance characteristics of Reciprocating Pump.
3. Performance characteristics of Submersible Pump.
4. Performance characteristics of Gear Pump.
5. Performance characteristics of Pelton Wheel.
6. Performance characteristics of Francis Turbine.

UEI 5201 NUMERICAL TECHNIQUES

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

Solution of Systems of Equations and Matrix Inversion: Solution of linear algebraic equation: Gauss and Gauss-Jordan elimination methods-Methods of triangularization and Crout's reduction. Iterative methods: Gauss-Jacobi, Gauss-Seidel and Relaxation methods. Matrix inversion by Gauss-Jordan elimination and Crout's methods.

UNIT – III

Interpolation: Finite Differences, Relation between operators – Interpolation by Newton's forward and backward difference formulae for equal intervals. Newton's divided difference method and Lagrange's method for unequal intervals. Numerical differentiation in one variable. Numerical Integration by Trapezoidal and Simpson's rules with respect to one and two variables.

UNIT – IV

Solution of Ordinary Differential Equation: Single step methods: Taylor series method, Picard's method of successive approximation, Euler and Improved Euler methods, Runge-Kutta method of fourth order only. Multistep methods: Milne and Adams-Bashforth methods.

UNIT – V

Solution of Partial Differential Equations: Solution of Laplace and Poisson equations: Leibmann's iterative method. Diffusion equation: Bender-Schmitt method and Crank-Nicholson implicit difference method. Wave equation: Explicit difference method.

Text Book:

1. P.Kandasamy, K. Gunavathy and K.Thilagavathy, "Numerical Methods", S. Chand & Company Ltd., New Delhi, 2000.

References:

1. P.Kandasamy, "Numerical methods in Science and Engineering", National Publishing Company, Madras.
2. B.S. Grewal, "Numerical methods in Engineering & Science", Khanna Publishers, New Delhi. (Fifth edition 1999).

UEI 5072 CONTROL SYSTEMS

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 and reduction using algebra-Representation by signal flow graph- reduction using Mason’s gain formula.

Control System Components: DC Servo motor-AC Servo motor- Synchro Transmitter and Receiver- Stepper motor.

UNIT – II

Time Response Analysis: Standard test signals- impulse ,step and ramp response analysis of first order and second order systems-Characteristics Equation of Feedback control systems, Transient Response of second order systems – Time domain specifications – Steady State response – Steady State errors and error constants – Effects of proportional derivative, proportional integral systems, performance indices.

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 Charts – Frequency Domain specifications from Nichols Charts.

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, eigen values, eigen vectors ,- canonical forms Diagonalization – solving the time invariant state equations – State Transition Matrix. Controllability and observability

Text Books:

1. J.Nagrath & M.Gopal, “Control System Engineering” Wiley Eastern , 2001.
2. Katsuhiko.Ogata, “Modern Control Engineering”, Pearson Education - Asia, Fourth Edition, 2002.

References:

1. Benjamin .C.Kuo, “Automatic Control Systems”, Prentice hall of India, 1995.
2. Katsuhiko.Ogata, “Solving control Engineering problems with MATLAB”, Prentice Hall,1994.
3. R.Anandanatarajan ,P.Ramesh Babu, “Control systems”, Scitech Publications ,India, 2004.
4. Richard C.Dorf, Robert H.Bishop, “Modern Control Systems” Addison - Wesley, 1999.

UEI 5073 ANALOG AND DIGITAL INSTRUMENTS

UNIT – I

Electronic analog meters: DC and AC Voltmeters – true R.M.S Voltmeters – differential Voltmeters – ac Current Measurements Multimeters – Component measuring instruments – Q-meter – Vector Impedance Meter – Wave Analyzer – Harmonic distortion analyzer – spectrum analyzer.

UNIT – II

Digital Instruments: Digital methods of measuring frequency, Phase difference, time period. DVM Dual slope, Ramp type Digital Multimeters and Q-meters – Digital measurement of non electrical variables like displacement, speed and temperature. Digital storage Oscilloscope.

UNIT – III

Display devices and Recording Instruments: LED's, LCD's annunciators, numerics, alphanumeric, graphics – X-t and X-y recorders – UV recorders – Magnetic tape recorders – direct, F.M. digital. Interference and Screening Components impurities and their effect on signals – Electromagnetic Interference – Multiple Earth and Earth loops.

UNIT – IV

Oscillators: RC Phase shift oscillator – Wien Bridge oscillator – pulse and square wave Generators – Function Generators – Cathode Ray Oscilloscope – Vertical, Horizontal amplifiers – time base – Synchronization – free run auto – single sweep – Multitrace display – alternate chop sweep trigger sources – delayed sweep – delay lines – probes – high frequency considerations sampling oscilloscope.

UNIT – V

Introduction to Automated Measurement Systems: IEEE 488 bus – Intelligent Instruments – Microprocessor based – DVM – and Multimeters with self Diagnostic features – design of GPIB Systems. Network Protocols – OSI Model – BISYNC – HDLC – SDLC – LAN Topologies – Ethernet.

Text Books:

1. W. D. Cooper and A.D. Helfrick, "Electronic Instrumentation and Measurement Techniques", 3rd Edition, PHI, 1991.
2. A.K. Sawhney, "A Course in Electrical and Electronic Measurements and Instruments", Dhanpat Rai and Sons, 1991.

Reference:

1. B.M. Oliver and J.M. Cage, Electronic Measurements and Instruments McGraw Hill, 1977.

UEI 5074 INDUSTRIAL INSTRUMENTATION – I

UNIT – I

Measurement of straightness, flatness, roundness and roughness. Electric balance – different types of load cells – magnets – elastics load cell-strain gauge load cell- different methods of torque measurement, using strain gauge, relative regular twist-speed measurement – reevaluation counter-capacitive tacho-drag up type tacho D.C and A.C tacho generators – stroboscopic methods.

UNIT – II

Mechanical type flowmeters: Theory of fixed restriction variable head type flow meters-orifice plate – venturi tube – flow nozzle – dall tube – installation of head flow meters- piping arrangement for different fluids – pilot tube. Positive displacement flow meters – constructional details and theory of operation of mutating disc, reciprocation piston, oval gear and helix type flow meters-inferential meter turbine flow meter – rotameter – theory and installation – angular momentum mass flow meter – coriolis mass flow meters – thermal mass flow meter – volume flow meter plus density measurement – calibration of flow meters – dynamic weighing method.

UNIT – III

Electrical type flow meter: Principle and constructional details of electromagnetic flow meter – different types of excitation – schemes used – different types of ultrasonic flow metera-laser Doppler anemometer systems – vortex shedding flow meter – target flow meter – solid flow rate measurement – guidelines for selection of flow meter.

UNIT – IV

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

Viscosity terms – say bolt viscometer – rotameter type viscometer – industrial consistency meters – humidity terms – dry and wet bulb psychrometers – hot wire electrode type hygrometer – dew cell – electrolysis type hygrometer – commercial type dew point meter – moisture 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”, International Students Edition, IV Edition, McGraw Hill Book Company, 1998.
2. R.K.Jain, “Mechanical and Industrial Measurements”, Khanna Publishers, New Delhi, 1999.

References:

1. D.Patranabis, “Principles of Industrial Instrumentation”, Tata McGraw Hill Publishing Ltd., New Delhi, 1999.
2. A.K.Sawhney, “A course in Electrical and Electronic Measurement and Instrumentation”, Dhanpat Rai and Sons, New Delhi, 1999.
3. P.Holman, “Experimental Methods for Engineers”, International Student Edition, McGraw Hill Book Company, 1971.

UEI 5236 GENERAL PROFICIENCY - III

UNIT I

COMPOSITION ANALYSIS : Technical and Non-technical Passages (GRE Based); Differences in American and British English; Analyzing Contemporary Issues; Expanding Terminology

UNIT II

DEXTERITY IN WRITING : Importance of Writing; Written vs. Spoken Language; Formal and Informal Styles of Writing; Resources for Improving Writing; Grammar and Usage; Letter-writing; Application Essays; Project Proposals

UNIT III

PRESENTATION SKILLS : Collecting and Organizing Materials; Audience; Content; Rehearsing; Delivering Matter; Questions; Controlling Anxiety; Seminar Presentations (Subject Oriented/ General Topics); Language lab Practice

UNIT IV

QUANTITATIVE ANALYSIS : Aptitude Tests; Puzzles; Psychometric Tests

REFERENCE BOOKS

1. Bhatnagar, R.P and Rajul Bhargava. *English for Competitive Examinations*. Macmillan, 1999.
2. Thorpe, Edgar and Showick Thorpe. *Objective English*. Pearson Education, 2004.
3. Staff of Kaplan. *GRE Exam 2004*. Simon and Schuster, 2003.
4. Leigh, Andrew and Michael Maynard. *The Perfect Presentation*. Random House Business Books, 1999.
5. Thorpe, Edgar. *Test of Reasoning*. Tata McGraw-Hill, 2003.

UEI 5077 SIMULATION LAB

1. Matrix Manipulation, Numerical solution of differential equations using MATLAB software.
2. Time responses of various systems, compensation, Stability analysis using MATLAB.
3. Root locus plots using MATLAB.
4. Relative stability analysis using Nyquist plot.
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.
9. Design of filters and resonance circuits.
10. Design and Analysis of Feedback Amplifiers and Oscillators.
11. Analysis of FET biasing and Amplifier circuits.
12. Analysis of cascade amplifiers.

UEI 5078 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION LAB

1. Calibration of ammeter and Voltmeter using Compton's Potentiometer.
2. Calibration of a 1 phase Energy meter for various power factors.
3. Calibration of series and shunt Type Ohmmeter.
4. Design of DVM and Digital Phase Meter.
5. Measurement of Inductance using Anderson's and Hay's Bridge.
6. Transfer Characteristics of LVDT.
7. Calibration of FET input Electronic DC Voltmeter and Rectifier type Voltmeter.
8. Design of a frequency meter.
9. Instrumentation Amplifier.
10. Study of spectrum Analyzer.

UEI 5079 TRANSDUCER AND MEASUREMENTS LABORATORY

1. Characteristic of Temperature transducers (LDR, thermistor and thermocouple).
2. Measurement of Displacement using capacitive transducer, LVDT, inductive transducer and potentiometric transducer.
3. Measurement of strain, Load and Level using strain gauges
4. Measurement of torque and Pressure using strain gauges
5. Measurement of Voltage, current and power using Hall Effect transducer.
6. Characteristics of Optical Transducers (LDR, Phototransistor, Photovoltaic and photoconductive cells)
7. Measurement of speed using Magnetic and photo electric pickup transducers.
8. Ramp response characteristic of filled in system thermometer.
9. Online Modeling of RTD and thermocouple using Data loggers.
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.
13. Study of Virtual Instruments using LabView.
14. Study of smart transducers.

UEI 6071 PROCESS CONTROL

UNIT – I

Concept of unit operations of Chemical Engineering. Description Types. Methods of operation, operating variables and their interaction with each other – unit operations: (i) Heat exchangers (ii) Evaporators (iii) Distillation (iv) Leaching and extraction (v) Membranes separation. (vi) Gas absorption (vii) Humidification and dehumidification (viii) Drying (ix) Crystallisation and (x) adsorption. Incentives for process Control – design aspects of a Process Control System. (Note: Only qualitative treatment)

UNIT – II

Process variables degrees of freedom characteristics of liquid system, gas system, thermal system – mathematical model of liquid process, gas process, flow process, thermal process. Mixing process – batch process and continuous process – self – regulation – inverse response. I/P and P/I converters – pneumatic and electric actuators – valve positioner – control valve – characteristics of control valves – valve body – globe, butterfly, diaphragm, ball valves – control valve sizing – cavitation, flashing in control valves. Response of pneumatic transmission lines and valves.

UNIT – III

Basic control actions – characteristics of On-Off. Proportional. Single speed floating integral and derivative control modes – composite control modes – P+I. P+D and P+I+D control modes – response of controller for different types of test inputs – integral windup – auto manual transfer – selection of control mode for different processes – typical control schemes for level flow, pressure and temperature.

UNIT – IV

Non-Linear Systems: Common non-linear elements and their models-time and frequency response characteristics unique to non-linear systems – analysis of simple second – order systems by phase – plane method using isocline method – singular points – limit cycle behavior. State – variable Analysis: Concepts of state. State variable and state-model-solution of state equations. Optimal Control: Performance indices – parameter optimization.

UNIT – V

Distillation column – control of top and bottom product compositions – reflux ratio – control of chemical reactor – control of heat exchanger. Steam boiler – drum level control and combustion control. Piping and Instrumentation Diagram of control loops.

Text Books:

1. C.Stephanopoulos, “Chemical process control”, Prentice Hall of India. 1998.
2. D.R. Coughanowr, “Process System Analysis and Control”, Second Edition, McGraw Hill. 1991.

References:

1. D.P. Eckman, “Automatic Process Control”, Wiley Eastern Ltd., 1972.
2. D.R. Coughanowr, “Process System Analysis and Control”, Second Edition, McGraw Hill 1991.
3. K. Ogata, “Modern Control Engineering”, Prentice Hall of India, 1982.

UEI 6072 MICROPROCESSORS AND MICROCONTROLLERS

UNIT – I

8085 Architecture and Programming: General 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 diagrams – different machine cycles – fetch and execute operations – estimation of execution time. Stack and subroutine-Assembly language programming.

UNIT – II

Data Transfer and Interfacing: Data transfer schemes – programs I/O & interrupt structure of 8085 – interrupt Drive I/O– DMA serial I/O – input/output ports – latches and buffers peripheral interface ICs, 8255, 8251, 8279, 8259 – interfacing of A/D and D/A converters – display devices – applications.

UNIT – III

80X86 Processors: 8086 Architecture, Pin Configuration, 8086 Minimum and Maximum mode configurations, Addressing modes, Basic Instructions, 8086 Interrupts, Assembly level programming. Introduction to 80186, 80286, 80386, 80486 and Pentium processors.

UNIT – IV

Microcontrollers: Intel 8031/8051 Architecture, Special Function Registers (SFR), I/O pins, ports and circuits, Instruction set, Addressing Modes, Assembly Language Programming, Timer and Counter Programming, Serial Communication, Connection to RS 232, Interrupts Programming, External Memory interfacing , Introduction to 16 bit Microcontroller

UNIT – V

Microprocessor based systems design: Interfacing to alphanumeric displays, interfacing to liquid crystal display (LCD 16 x 2 line), high power Devices and Optical motor shaft encoders, stepper motor interfacing, Analog interfacing and industrial control, Microcomputer based smart scale, industrial process control system, Robotics and Embedded control, Digital Filters.

Text books:

1. Ramesh S. Gaonkar, “Microprocessor Architecture Programming and Applications with 8085”. Fourth edition, Penram International Publishing 2000.
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi, “The 8051 Microcontroller, and Embedded Systems”, Pearson Education 2002.
3. Douglas V.Hall, “Microprocessor and Interfacing, Programming and Hardware”, Tata McGraw Hill, Second Edition. 1999.

References:

1. Kenneth J.Ayala, “The 8051 Microcontroller Architecture Programming and Applications”, Penram International Publishing (India). 1996.
2. Kenneth J.Ayala, “The 8086 Microprocessor, Programming and Interfacing the PC”, Penram International Publishing. 1995.

UEI 6073 INDUSTRIAL INSTRUMENTATION – II

UNIT – I

Gauge glass technique coupled with photo electric readout system – float type level indication – different schemes – level switches level measurement using displacer and torque tube – bubbler system. Boiler drum level measurement – differential pressure method – hydra step systems – electrical types of level gauges using resistance, capacitance, nuclear radiation and ultrasonic sensors.

UNIT – II

Units of pressure – Types of pressure-Non-Electric type pressure measurement – manometers – different types – elastic type pressure gauges – Motion and force balance designs. Bourdon type bellows – diaphragms – Electrical methods – elastic elements with LVDT and strain gauges – capacitive type pressure gauge – piezo resistive pressure sensor – resonator pressure sensor – measurement of vacuum – McLeod gauge – Knudsen gauge – thermal conductivity gauges – Ionization gauge cold cathode and hot cathode types – Electrical pressure transmitter – testing and calibration of pressure gauges – dead weight tester.

UNIT – III

Definitions and standards – primary and secondary fixed points – Temperature scale – calibration of thermometers – different types of filled in system thermometer – sources of errors in filled in systems and their compensation – Bimetallic thermometers – Electrical methods of temperature measurement – signal conditioning of industrial RTDs and their characteristics – 3 lead and 4 lead RTDs – Improved bridge circuits.

UNIT – IV

Thermocouples – law of thermocouple – fabrication of industrial thermocouples – signal conditioning of thermocouple output – thermal block references functions – commercial circuits for cold junction compensation – response of thermocouple – Linearization of thermocouple and Thermistors – colour coding Testing and calibration and Installation procedures. Special techniques for measuring high temperature using thermocouples – Radiation methods of temperature measurement – radiation fundamentals – total radiation and selective radiation pyrometers – optical pyrometer – two colour radiation pyrometer.

UNIT – V

EMC: Introduction, Interference coupling mechanism, basics of circuit layout and grounding, concepts of Interfaces, filtering and shielding. Safety: Introduction, electrical hazards, hazardous areas and classification, Non hazardous areas, enclosures – NEMA types, fuses and circuit breakers, protection methods: purging, explosion proofing and Intrinsic safety. Specification of instruments, preparation of project documentation, process flow sheet, Instrument index sheet, Instrument specification sheet, panel drawing and specifications.

Text Books:

1. Ernest O.Doebelin, “Measurement systems Application and Design”, International Student Edition, IV Edition, McGraw Hill Book Company, 1998.
2. R.K.Jain, “Mechanical and Industrial Measurements”, Khanna Publishers, New Delhi, 1999.

References:

1. D.Patranabis, “Principles of Industrial Instrumentation”, Tata McGraw Hill Publishing Ltd., New Delhi, 1999.
2. Andrew W.G, “Applied Instrumentation in Process Industries – A survey”, Vol. 1 & Vol.2, Gulf Publishing Company, Houston, 1992.

UEI 6034 COMMUNICATION ENGINEERING

UNIT – I

Modulation – need for modulation – amplitude modulation – frequency spectrum – Power relation – different types of modulators – SSB and VSB generation. AM transmitters – Block diagram – functions of each block – high level transmitters.

UNIT – II

Angle modulation – principle of frequency and phase – modulation – Relation between FM and PM waves – Bandwidth of FM – Narrow band wide band FM – Generation of FM wave – Direct and Indirect methods – FM transmitters – Block diagram – functions of each block.

UNIT – III

Detection and Receivers – Detection – Diode detectors – Synchronous detection – FM detectors – slope detectors – Phase discriminators – Ratio detectors.

Receiver – different types – superheterodyne receivers – Block diagram – Choice of IF and Oscillator frequencies – Tracking – alignment – AVC, AFC – Receiver characteristics.

UNIT – IV

Pulse modulation systems – Sampling theorem – Pulse amplitude modulation – Channel bandwidth for PAM – detection of PAM signals – Pulse width modulation – generation of PWM and PPM – conversion of PWM to PPM – detection of PWM and PPM – Pulse code modulation – quantization – PCM systems – Encoder – decoder – Time division multiplexing – Frequency division multiplexing.

UNIT – V

Broadband communication system (Block Diagram Approach) – Telegraph system – Teleprinter and Facsimile system – Telephone system – crossbar and electronic exchanges – Television system – microwave communication and optical communication systems – Principle of satellite communication – computer communication – Electronic Mail.

Text Books:

1. G. Kennedy, “Electronic Communication Systems”, McGraw Hill, 1984.
2. Wayne Tomasi, “Electronic Communications Systems – Fundamentals Through advanced”, 4th Edition, Pearson Education, 2001.

References:

1. Taub and Schilling, “Principles of Communication Systems”, McGraw Hill, 1989.
2. Bruce Carlson, “Communication Systems”, McGraw Hill, 1985.

UEI 6236 GENERAL PROFICIENCY - IV

UNIT 1

RESUMES : Introduction to Resumes; Types of Resumes; Organization of Resume Formats; Presenting Information and Content

UNIT II

GROUP DISCUSSIONS/ ACTIVITIES : Introduction; Defining Group Discussions; Types of Group Discussions; Preparation; Participation; Group Dynamics; Intra/Inter Dept. Group Discussions; Team-work; Negotiation Skills; Introduction to Organizational Behaviour; Language lab Practice

UNIT III

INTERVIEWS :Introduction; Honing Verbal and Non-verbal Skills; Rehearsing; Listening Skills; Taking the Interview; Facing Questions; Mock Interviews

UNIT IV

QUANTITATIVE ANALYSIS :Aptitude Tests; Psychometric Tests; Puzzles

REFERENCE BOOKS:

1. Prasad, H.M. *How to Prepare for Group Discussion and Interview*. Tata McGraw-Hill, 2001.
2. Kenendy, Gavin. *The Perfect Negotiation*. Random House Business Books, 1999.
3. Career Press Editors. *101 Great Resumes*. Jaico Publishing House, 2003.
4. Robins, Stephen. *Organizational Behaviour*. Prentice-Hall, 2003
5. Aggarwal, R.S. *A Modern Approach to Verbal & Non-verbal Reasoning*. S. Chand & Co., 2004.

UEI 6077 PROCESS CONTROL LAB

1. Modeling of single capacity level process from experimental Reactive curve. Obtain PID Turing parameters from the model.
2. Modeling of Two capacity level process.
3. Modeling of two capacity interacting level process by semi log method.
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.
8. Closed loop control of Thermal Process.
9. Closed loop control of Pressure process.
10. Inherent and Installed characteristic study of linear, equal percentage and quick opening valves.

UEI 6078 MICROPROCESSORS AND MICROCONTRLLERS LAB

1. Programming 8085 microprocessor kit
2. Programming 8086 microcontroller 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

UEI 6079 DESIGN PROJECT LAB

1. Design, testing and calibration of 3½ Digit Digital Voltmeter using ICL 7107.
2. Design, testing and calibration of Monolithic function Generator using XR 2206.
3. Design, testing and calibration of Regulator Power supplies.
4. Design, testing and calibration of Batch counter using TTL ICs.
5. Design, testing and calibration of DAC and ADC
6. Design, testing and calibration of Electronic P, PI, PID and ON/OFF controllers.
7. Design, testing and calibration of Cold Junction compensation of a Thermocouple.
8. Design, testing and calibration of Programmable Timers.
9. Design, testing and calibration of pH meter using single glass electrode.
10. Design, testing and calibration of Digital Thermometer.
11. Design, testing and simulation of Higher order systems using OPamp.
12. Design of Micro computer based Speed control of HPD motors.

UEI 7071 COMPUTER CONTROL OF PROCESSES

UNIT – I

Sampled – data control systems: Z transform – Z transfer function (Pulse transfer function) – The inverse Z transform – response of linear discrete system for step input – stability analysis: Jury’s test and bilinear transformation. Advanced Controllers – Multi – function Controllers Programmable Controller – Different Control functions. Operation. Tuning and engineering panels – interface for Computer Communication and multidropping. Program Controllers.

UNIT – II

Digital Control Algorithms – Deadbeat Algorithm – Dahlin’s method – ringing – Kalman’s approach – discrete equivalent to an analog Controller – design for load changes. PID Algorithms – tuning techniques. Selection of sampling time. Dead – time Compensation – Smith Predictor Algorithm.

UNIT – III

System Modelling and Identification – mathematical model for processes – first order. Second order processes without and with pure delay higher order systems – process modeling from step test data – pulse testing for process identification – time – domain identification – linear least square algorithm.

UNIT – IV

Programmable Logic Controllers (PLCs): Basic components and configuration- discrete. Analog and digital types of I/O modules: typical input and output field devices and modules of each type – I/O signal types and typical signal conditioning circuits – common electrical devices and symbols – intelligent I/O modules like control – loop module – Communication I/O modules. Network Communication module – distributed I/O – AS – interface. Memory types used in PLCs – memory map – assigning I/O address and internal address – scan sequence.

UNIT –V

Programming Languages: Ladder diagram Boolean – function blocks – programming devices: hand – held programmer – industrial programming terminal – personal computer based programmer – development of programmes for typical applications – editing and testing by simulation – of programmes. Basic design aspects of I/O systems – electrical. Mechanical and environmental specifications. Installation and maintenance of PLCs. Interlocks and alarms: Interlock design principles, fail – safe design – alarms and their types.

Text Books:

1. C.L. Smith, “Digital Computer Process Control”, Intext Educational Publishers, 1972.
2. P.B. Deshpande and R.H. Ash, “Elements of Computer Process Control”, Instrument Society of America. 1981.
3. T.A. Hughes, “Programmable Controllers”, ISA. 1989.

References:

1. “Process Control Systems and Instruments: Catalogue and General Specifications”, Yokogawa Electric Corporation, Japan.
2. T.J. Maloney, “Industrial Solid State Electronics”, Second Edition. Prentice Hall. 1986.

UEI 7212 OPTICAL INSTRUMENTATION

UNIT –I

Optical fibers : Fundamental guidance principle – numerical aperture – different types of fibres – production of optical fibres – materials characteristics of optical fibres – optical sources and detectors – coupling and splicing techniques.

UNIT-II

Optical Communication: Acousto-optic modulators – modulators and detectors – spectrum analyzer – magneto-optic modulators – Electro-optic modulators – Travelling wave modulators – single optical fiber system.

UNIT –III

Instrumentation: Quantum detectors – LED, photodiode – PIN, APD sensors, pressure, temperature, displacement, acceleration, torque sensors – flow meters – strain field sensors.

UNIT-IV

Lasers: Rate equation – three and four level systems – modes– resonator configurations– mode locking – types of lasers – nonlinear susceptibility – second harmonic generation.

UNIT-V

Applications: Fiber endoscope – laparoscope operation – Laser measurement – pollutants heating, melting, scribing, welding and laser materials processing – holographic – holographic NDT.

Textbooks:

Unit I: Keiser, “Optical fiber Communications”, McGraw Hill, 1983.

Unit II: Pallab Bhattacharya, “Semiconductor Optoelectronic Devices”, 2nd Edition, Prentice Hall, 1996.

Unit III: a) Donald C O’Shea et. al., “Introduction to Lasers and applications”, Pearson Education, 1977.

b) Silvano Donati, “Electro-Optical Instrumentation: Sensing and Measurements with lasers”, Prentice Hall, 2004.

Unit IV: William T. Silvast, “Laser fundamentals”, Cambridge University Press, 1996.

Unit V: Cameron J.R., Skafranick J.G, “Medical Physics”, John Wiley, 1978.

References:

1. Ajoy Ghatak and Thyagarajan, “Lasers”, Macmillan.
2. Joseph T Verdegyan, “Laser Electronics”, PHI,1993.
3. Amith Yariv, “Opto-electronics”.
4. Amith Yariv, “Quantum Electronics”.
5. Ajoy Ghatak and Thyagarajan, “Optical Electronics”, Cambridge University Press, 1993.
6. Meyspere and saragunt, “Elements of quantum optics”, Springer Verlag, 2003.

UEI 7023 INDUSTRIAL SAFETY AND ENERGY MANAGEMENT

UNIT I

Energy conversion – world fossil fuel reserves – world energy consumption – historical lives of fossil fuels – global energy and environmental management – environmental aspects of fossil, nuclear, hydro and biomass energy conversion – gaseous emissions – solid waste – liquid waste.

UNIT II

Energy management – need for energy conservation – energy auditing – conducting real time continuous energy audits – data collection – automated data acquisition – data analysis – role of energy manager – energy audit instruments – gas analyzer – energy conservation in industries: boilers, pumps, fans, compressed air systems, refrigeration and air conditioning systems, DG sets, electrical motors, variable speed motors.

UNIT III

Air pollutants and global climate – air pollutant effects. Pollution control laws and regulation – national and international – role of environmental monitoring in environmental management systems – continuous emissions monitoring systems. Pollution control – review of pollution control methods in thermal power plants – industrial – nuclear – automobiles – disposal/treatment of solid and liquid wastes – alternate fuels.

UNIT IV

Safety and productivity – causes of accidents in industries – accidents reporting and investigation – measuring safety performance – workman compensation rules.

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:

1. Blake Roland. P, “Industrial safety”, Prentice Hall of India, 1973.
2. Callaghan. P. O, “Energy Management”, McGraw Hill Book Co., 1993.

References:

1. Culp. A. W, “Principles of Energy Conservation”, McGraw Hill Book Co., 1991.
2. Noel de Nervers, “Air Pollution Control Engineering”, McGraw Hill Book Co., 2000.

UEI 7076 COMPUTER CONTROL OF PROCESS LAB

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.

UEI 7077 SYSTEM DESIGN USING MICROPROCESSOR LAB

1. Measurement of voltage, current, resistance, Frequency, Phase difference using
2. microprocessor
3. Programming 8 bit microcontrollers (8031/8051)
4. Simple programs using TMS320C50 DSP kit
5. P+I+D controller for temperature unit
6. Microcontroller based smart scale sensor
7. LVDT position control
8. Fast Fourier Transform using TMS320C50 DSP kit
9. FIR and IIR filter design using TMS320C50 DSP kit

UEI 7078 PROJECT WORK (PHASE I)

Each batch of 2 or 3 students will be assigned an experimental or a theoretical project to be carried out under the supervision of a guide. The project work has to be carried out in the 7th and 8th semesters and completed by the end of the 8th semester. In the Phase I of the Project work, the progress of the work carried out in the 7th semester will be monitored and assessed internally for a total of 50 marks. A committee of departmental faculty members comprising the project guide, the Head of the Department and one more faculty member will conduct the internal assessment.

UEI 7079 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 of the material available on the assigned topic and prepare a report, running to 30 or 40 pages. The student will make a oral presentation for a period of about 30 minutes, followed by a brief question and answer session. The Seminar (presentation and report) will be evaluated by the internal assessment committee (comprising of the Head of the Department and two faculty members) for a total of 50 marks.

UEI 70710 INDUSTRIAL VISIT / TRAINING

The students are required to undergo inplant training for a period of two weeks during the summer vacation after the sixth semester. Each student has to submit a detailed report on the training programme undergone. Each student will be evaluated by an internal assessment committee (comprising of the Head of the Department and two faculty members) for a total of 50 marks.

UEI 8231 MANAGEMENT TECHNIQUES

UNIT I

Management concepts – principles and functions – various school – functions of management – planning, organising – staffing – directing – co-ordinating – controlling – decision making process.

UNIT II

Marketing Management: Introduction – core concepts of marketing – needs, wants and demand – marketing Vs selling – products and market – pricing and its related factor – basic concepts in channels of distribution – sales promotion – Advertising – Market research – sales forecasting.

UNIT III

Financial Management: Sources of finance – internal and external – types of investment – evaluation of investments – preparation of balance sheet, profit and loss statement – types of accounting and significance of each type.

UNIT IV

Production Management: Types of production – Forecasting of sales – Absorbing in demand – process – planning – scheduling – Routing – Functions and objects of material management – inventory control – functions of inventories.

UNIT V

Personal Management and Industrial relations: Scope of personal management and industrial relations – human resource planning – recruitment and selection, training – wage policy and compensation systems – company union relationship – collective bargaining – accidents absentism and turnover, Grievances – conflicts identification and resolution.

References:

1. Harold Koontz. C.O. Donnel and H. Weirich, “Management”, Tata McGraw Hill.
2. Philip B. Kotter, “Marketing Management”, Prentice Hall Publications.
3. Memosia, “Personal Management”, Himalaya Publications.
4. Pandy I. M, “Financial Management”, Vikas Publishing House.
5. O.P Khanna, “Industrial Engineering and Management”, Khanna Publishers.

UEI 8072 DATA ACQUISITION AND COMMUNICATION

UNIT – I

Data Acquisition & Conversion: Introduction – Signal Conditioning of the inputs – single channel data acquisition system – Multichannel data acquisition system – Data Conversion – D/A converter – A/D converter – multiplexers and sample and hold circuits – PC based data acquisition system.

UNIT – II

Digital Signal Transmission and Processing: Introduction Techniques for digital data Transmission – serial data communication – Telemetry systems – Digital signal processing Digital filters – Fast Fourier Transform.

UNIT – III

Communication System Requirements: Issues – codes and formats – protocol – synchronous and asynchronous systems – Data rates and serial and parallel communication – hardware versus software: Protocol conversion – RS-232 interface standard – EIA interface standards.

UNIT – IV

Telephone Systems and Modems: Telephone network – network hierarchy – switching – Transmission characteristics of the network – modems role of modems – some specific modems – satellite based data networks.

UNIT – V

Optical Fiber Systems: Fiber optic communication system – Building blocks – Propagation of light – Types of fibers - Sources – Detectors – Losses – couplers – connectors – Telecommunication Application.

Text Books:

1. C.S. Rangan, G.R. Sarma, V.S.V Mani, “Instrumentation devices and system”, Tata McGraw Hill, II Edition, 1997.
2. Willam L.Scheweber, “Data Communications”, McGraw Hill international Edition, 1988.
3. Thiagarajan, Viswanathan, “Telecommunication Switching systems and Networks”, Prentice Hall, 1999.

UEI 8075 SERVICING LAB

1. Identifying the fault location in power supply unit.
2. Identifying the fault location in VDU.
3. Identifying the fault is transmitters.
4. Zero suppressions and Zero elevation in level transmitters.
5. Identifying the fault in micro controller based systems.
6. Calibration of transmitters.
7. Identifying the fault in PC.
8. Identifying the fault in process control loops.
9. Identifying the fault in communication devices.
10. Identifying the fault in PC Networking.

UEI 8076 PROJECT WORK (PHASE II)

Extension and completion of project work started in the previous semester. On completion of the project work, each student has to prepare a project report and submit the same to the department. In the Phase II, the project work and the report will be evaluated by the internal assessment committee for a total of 50 marks. The external university examination, which carries a total of 100 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.

UEI 8077 COMPREHENSIVE VIVA-VOCE

The student will be tested for his understanding of the basic principles of the core engineering subjects. The internal assessment for a total of 50 marks will be made by a committee comprising of the faculty members of the department. The committee will conduct a written examination (objective type and short questions from all the core subjects) followed by a viva voce examination. 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.

UIE E701 POWER ELECTRONICS

UNIT –I

Power Semiconductor Devices : Construction and characteristics of power diodes- Power transistors –SCRs –Diacs –Triacs –LASER- Two transistor analogy for SCR-Gate characteristics –Methods of turning on-Methods of turning off –SCR ratings –Series and parallel connections of SCRs –Equalization of voltage and current-triggering of series connected SCRs- Triggering of parallel connected SCRs – Protection against over voltage and over current –Gate protection.

UNIT-II

SCR turn on and turn off Circuits : Simple RC, R,RL and RC phase shift triggering circuits –UJT –CUJT-PUT trigger circuits-synchronisation to AC line –phase control I.C.S-Digital triggering schemes –Turn off circuits – Natural commutation –Forced commutation circuits-Class A, B,C, D , E, F commutation circuits –phase control circuits-Ramp control –Ramp and pedestal control –signals phase and three phase trigger circuits.

UNIT-III

Converters : Single phase and three phase Half wave rectifiers, Full wave rectifier-Half controlled and fully controlled bridges-Output voltage equation with resistive load –free wheeling diodes-operation with inductive loads-Effect of supply line inductance –six phase star circuit –Six phase double star circuit-Basic principles of dual converters-cyclo converters-Single phase and three phase Half wave and Full wave bridges-circulating current and non circulating current schemes-cyclo inverter –speed control of AC motors.

UNIT-IV

Inverters : Parallel inverter-poly phase ring inverter-series inverter-improved series inverters-three phase series inverters –bridge inverters-commutation circuits-single phase bridge inverter-three phase bridge inverter-complementary impulse commutated inverters-auxillary impulse commutated inverters-current source inverter –inverter output voltage and waveform control.

UNIT-V

Choppers : Chopper control technique - type A,B,C of choppers- Chopper circuits-D.C.choppers-Morgan chopper –Jones chopper - step up chopper-control of d.c.series motor - D.C. to D.C converters-A.C.choppers-control of induction motors.

Text Books :

1. M.Ramamoorthy “ An introduction to thyristors and their Applications” ,East-west Press.
2. M.S.Berde , “ Thyristor Engineering ” , Khanna Publishers.

References:

- 1.B.K.Datta “ Power Electronics and Controls” , PHI.
- 2.R.K.Sugandhi and K.K.Sugandhi “Thyristors –Theory and Applications”.
- 3.B.R.Pelly “Thyristor phase controlled converters and cyclo converters”.
- 4.Dewan and Stranger “ Power Semiconductor Circuits”.

UEI E702 VLSI SYSTEM

UNIT – I

Crystal growth, Epitaxy and oxidation: Crystal growth and wafer preparation – vapour phase epitaxy – Molecular beam epitaxy – silicon insulation – Epitaxial evaluation – oxidation techniques and systems – oxide properties – oxidation of polysilicon.

UNIT – II

Lithography: Optical Lithography – Electron Lithography – X-ray Lithography-Ion Lithography – Reactive plasma etching techniques and equipments – Specific etch processes – Dielectric and polysilicon film deposition – plasma assisted deposition.

UNIT – III

Diffusion: Models of diffusion in solids – Diffusivity – Measurement techniques – Diffusion in silicon, Silicon dioxide – Ion implantation – Implantation equipment – Annealing – Shallow junction – physical vapour deposition – patterning – Metallization problems.

UNIT – IV

Process simulation and Integration: Process simulation – Ion implantation – Diffusion and oxidation – Epitaxy Lithography – Etching and deposition – process integration – NMOS IC technology – MOS, CMOS memory – Bipolar IC-BIC MOS fabrication.

UNIT – V

Analytical techniques, packaging and reliability: Analytical techniques – Analytical techniques – Analytical instrument – Electron beam instruments – scanning electron microscopes – Ion beam techniques – chemical methods – package fabrication technologies – reliability requirements for VLSI – yield loss in VLSI – Failure mechanism – Design automation.

Text Books:

1. Sze, “VLSI Technology”, Tata McGraw Hill Ltd., 1984.
2. Patnaik, “VLSI System Design”, Tata McGraw Hill, Ltd.
3. Dillinger, “VLSI Engineering”, Prentice Hall of India Ltd.

References:

1. Elliot, “Integrated Circuit Fabrication Technology”, McGraw Hill Ltd.
2. Punknell, “Basic VLSI Engineering”, Prentice Hall of India Ltd.

UEI E703 TELEMETRY AND TELECONTROL

UNIT – I

Telemetry Fundamentals and Classification: Fundamental concepts – Significance, Principle, functional blocks of Telemetry and Telecontrol system-Methods of telemetry – Electrical, Pneumatic, Hydraulic and Optical Telemetry – State of the art-Telemetry standards.

UNIT – II

Landline Telemetry: Electrical Telemetry-Current Systems – Voltage Systems – Synchro Systems – Frequency systems – Position and Pulse systems – Example of a landline telemetry system.

UNIT – III

Radio Telemetry: Block diagram of a Radio Telemetry system – Transmitting and receiving techniques – AM, FM, PM, Multiplexing and demultiplexing – Transmitting and receiving techniques – Digital coding methods – Advantages of PCM, PWM, PM, FSK – Delta modulation – coding and decoding equipment – Example of a radio telemetry system.

UNIT – IV

Optical Telemetry: Optical fibers for signal transmission – Sources for fiber optic transmission – Optical detectors – trends in fiber – optic device development – Example of an optical telemetry system.

UNIT – V

Telecontrol Methods: Analog and Digital techniques in telecontrol, telecontrol apparatus – Remote adjustment, Guidance and regulation – Telecontrol using information theory – Example of a telecontrol system.

References:

1. Gruenberg. L “Handbook of telemetry and remote control”, McGraw Hill, New York, 1987.
2. Swobodoa. G., “Telecontrol methods and applications of telemetry and remote control”, Reinhold Publishing Coup., London, 1988.
3. Young R.E., “Telemetry Engineering”, Little Books Ltd, London 1988.
4. Housley T, “Data communication and teleprocessing system”, Prentice Hall International, Englewood Cliffs, New Jersey, 1987.

UEI E704 POWER PLANT INSTRUMENTATION

UNIT I

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 strokes-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:

1. B.G.Liptak, Instrumentation in process industries, Vol. I and II, Chilton books co, 1973.
2. Sam G. Dukelow. The control of boilers, Instrument Society of America press.
3. A.Sherryet. Al. (Editors), Modern power station practice, Vol.6 (Instrumentation controls and testing), Pergamon Press, 1971.

UEI E705 MICROPROCESSOR BASED SYSTEM DESIGN

UNIT I

Need for micro processor based system design- design cycle-dimensions of the design problem –hardware-design and software design-system integration.

Structure and characteristics:8253 Timer/Counter-8259 Keyboard/display controller - 6845 CRT controller -8237 DMA controller-8272 diskette controller.

UNIT II

I/O control-I/O timing-data buffering with FIFO's-keyboards and switches-remote instrument control-self test hardware. Keyboard parsing –real time programming-self test algorithm. Multiplication and division algorithms.

UNIT III

Troubleshooting systems-Logic analyzers: Logic analyzers: logic state analyzers, logic timing analyzers, display modes, logic features-signature analysis, error detection using signature analysis. Development systems: Basic features-software development aids-mass storage devices-development system architecture-emulators. System software-assembler, linker, loader.

UNIT IV

Review of architecture and instruction set of 8086 processor-8086/8088 based multiprocessing systems. Coprocessor configuration, closely coupled configurations, loosely coupled configurations-8087 coprocessors: architecture Instruction set 8089 I/O processor.

UNIT V

System design applications: LCR meter 0 PID controller-D.C motor speed control-digital weighing machine temperature control-controller for a washing machine true RMS meter.

Text Books:

1. John B. Peatman. Microcomputer Based Design, McGrwa Hill, 1988.
2. Douglas V. Hall, Microprocessor and Interfacing, McGraw Hill,1987.

References:

1. G.B.Williams, Troubleshooting on Microprocessor Based systems, Pergamon Press, 1984.
2. Yu-Chang Liu and Glenn A.Gibson, Microcomputer systems: The 8086/8088 Family, second Edition, Prentice Hall of India, 1990.

UEI E706 INSTRUMENTATION IN PETRO CHEMICAL INDUSTRIES

UNIT – I

Petroleum Exploration – Petroleum recovery techniques –oil-gas separation-Processing of wet gases – refining of crude oil.

UNIT – II

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

UNIT – III

Chemicals from petroleum – Methane derivatives – Acetylene derivatives – ethylene derivatives – Propylene derivatives – other products.

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:

1. Waddams A.L, “Chemicals from Petroleum”,Butter and Tanner Ltd., 1968.
2. Balcen J.G. and Mumme K.I., “Process Control Structures and Applications”, New York. 1968.
3. Austin G.T. Shreves, “Chemical Process industries”, McGraw Hill international student edition Singapore. 1985.

UEI E707 DIGITAL SIGNAL PROCESSING

UNIT I

Discrete Time Signals and Systems: **Digital Signal processing-Advantages and Applications-Types of signals--Types of systems- Linear time invariant systems (LTIS)- Causal and stable systems-Convolution and interconnection of LTI systems – FIR and IIR systems- Correlation of discrete time signals – Auto correlation and Cross correlation sequences-Solution of difference equations using classical method .Step and Impulse responses.**

UNIT II

Frequency Domain Analysis of Discrete-Time Signals: **Discrete-time Fourier Series (DTFS)-properties-Power density spectrum-Discrete-time Fourier Transform(DTFT)- properties-Energy density spectrum-Frequency response of first and second order systems-Transfer function-Z-transform-Properties-Inverse z-transform-solution of difference equations using z-transform-Discrete Fourier Transform(DFT)-Properties-circular and sectioned convolution-linear convolution from circular convolution-FFT computation using DIT and DIF algorithms.**

UNIT III

Infinite Impulse Response Filters: Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of digital filters using bilinear transform – pre warping – Frequency transformation in digital domain – Realization using direct, cascade and parallel forms.

UNIT IV

Finite Impulse Response Filters: Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Frequency sampling technique – Window design using Hamming, Hanning and Blackman Windows – Concept of optimum equiripple approximation – Realization of FIR filters – Transversal, Linear phase and Polyphase realization structures.

UNIT V

Finite Word Length Effects: Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representations – Comparison – Overflow error – truncation error – coefficient quantization error – limit cycle oscillations- signal scaling- Finite word length effects on DFT and FFT computation. DSP Hardware: Architecture and programming of TMS320C50 and ADSP 2181 DSP chips

Text Book:

1. John G. Proakis and Dimitris G.Manolakis, “Digital Signal Processing , Algorithms and Applications”,Pearson Education India Pvt Ltd., New Delhi, 2002.

References:

1. Sanjit K.Mitra, “Digital Signal Processing - A Computer Based Approach”, Tata McGraw Hill, New Delhi, 1998.
2. P.Ramesh Babu, “Digital Signal Processing”, Second Edition, Scitech publications ,Chennai,2003

UEI E801 ADAPTIVE CONTROL THEORY

UNIT –I

Mathematical Model: Mathematical Model for process of I order, II order – I order with pure delay & higher order system. Discretization techniques and computer solution of differential equations – simulation of process dynamics – state models.

UNIT –II

Identification of Methods: Conventional techniques of identification, Identification of systems with dead time Discrete Systems, ARMA process, discrete state model – least squares techniques – recursive least squares – generalized recursive least squares algorithms – fixed memory algorithm, Minimum variance method.

UNIT –III

Adaptive Control of Deterministic Systems: Gain scheduling, MRAC, STC, Minimum variance controller – Predictive control, Minimum prediction error adaptive controls – adaptive control algorithms for closed loop pole assignment – adaptive control of time varying systems.

UNIT –IV

Adaptive Control of Stochastic Systems: Stochastic processes, Stochastic minimum prediction error adaptive controller – adaptive pole placement – adaptive optimal controllers.

UNIT –V

State Estimation and Observers: Parameter estimation and state estimation, Luenberger, Asymptotic observers – adaptive observer – Extended Recursive least squares, FM and Kalman filter.

References:

1. Goodwin G.C. and Sin K.S. Jersey,, “Adaptive filtering, prediction and control”, Prentice Hall, inc., 1984.
2. Mendel J.M., Marcel, Dekker, “Discrete techniques of parameter estimation”, New York, 1994.
3. Hsia T.C.H.A., “System Identification”, Lexington books, 1974.
4. Harris C.J. and Billings S.A. Peter ,“Self Tuning and Adaptive control”, Peregnius Ltd., 1984.

UEI E802 ENVIRONMENTAL MONITORING INSTRUMENTATION

UNIT I

Need for environmental monitoring-Indian standards for population levels (concentrations) in respect of air quality and water quality. Noise levels, impact of pollution on human health, vegetation, animals and property value. Biological quality of water-bacteria and virus-applications of sophisticated microprocessor including electron microscope for identification of microbial organism.

UNIT II

Water quality parameter-PH-conductivity-temperature-turbidity-chemical pollutants-chlorides, sulphides-Nitrates and nitrites-phosphate-flouride, phenolic compounds-measurement techniques for these parameters.

UNIT III

Elemental concentration in Water-Mercury, Lead, chromium, Arsenic, Zinc, Cadmium, Copper, Selenium, Nickel, Sodium, Potassium, Lithium-measurement techniques for these parameters air pollutants-gases, vapours particulate matter and their impact. Air quality standard prescribed by B.I.S.

UNIT IV

Measurement techniques for particulate matter in air-oxides of sulphur oxides of nitrogen, unburnt hydrocarbons carbon dioxide carbon monoxide, ozone.

UNIT V

Noise pollution-desirable levels of sound. Measurement of sound level. Soil pollution-insecticides, pesticides, fertilizers measurement techniques for these pollutants. Solid waste disposal techniques-incinerators-impact of solid waste dumps.

References:

1. S.P. Mahajan, Pollution control in process industries, Tata McGraw Hill, 1985.
2. G.N. Pandey and G.C. Carney, environmental engineering, Tata McGraw Hill, 1989.

UEI E803 ROBOTICS AND AUTOMATION

UNIT – I

Robotics – Basic components – Classification – Performance characteristics – Drives and control systems – Electric, hydraulic and pneumatic actuators – control loops using current amplifier and voltage amplifiers.

UNIT – II

Sensors and vision systems: Transducers and sensors – Tactile sensors – Proximity and range sensors – vision systems – Image processing and analysis – image data reduction – segmentation feature extraction – Object recognition.

UNIT – III

End effects – type – Mechanical grippers – Vacuum cups – Magnetic grippers – Robot end effectors interface = software for industrial robots. Point to point program, point to point program, and continuous path program.

UNIT – IV

Robot motion analysis and control: Manipulator kinematics – Homogeneous transformations and robot Kinematics Robot dynamics Configuration of a robot controller.

UNIT – V

Industrial robots, Robots for welding, painting and assembly – Remote Controlled robots – Robots for nuclear, thermal and chemical plants – Industrial automation – Typical examples of automated industries.

Text Books:

1. Yoran Koren, “Robotics of Engineers”, McGraw Hill 1980.
2. Mikel P. Grover , et. Al. “Industrial Robots – Technology Programming and Applications”, McGraw Hill, 1980.

UEI E804 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

Types of pumps – pump – performance – pipe work calculation – characteristics of different pumps – pump operation maintenance – instruments used in pumping practice pump noise and vibration – selection of pumps.

UNIT - V

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

Text Books:

1. N.A. Anderson, “Instrumentation for Process Measurement and Control”, Chillton Company, 1980.
2. D.M. Considine, “Process Instruments and Controls Handbook”, McGraw Hill Book Co. 1985.

References:

1. R.H. Warring, “Pumping Manual”, Gulf Publishing Co., 1984.
2. C.D. Johnson, “Process Control Instrumentation Technology”, Prentice Hall Inc. 1988.

UEI E805 NEURAL AND FUZZY LOGIC CONTROL

UNIT – I

Motivation for the development of neural networks – artificial Neural networks – biological neural networks – Typical architecture – Training common Activation functions. McCulloch Pitts neuron: Architecture, algorithm and applications – Back propagation neural net – standard architecture – Algorithm – derivation of learning rules – number of hidden layers – Hopfield net architecture algorithm and applications Adaptive Resonance Theory: Architecture and operation.

UNIT – II

Neural networks based on Competition: Kohinor’s Self Organizing map- Counter propagation Networks – Neural networks for control: Schemes of neuro control – Inverse dynamics. Case study: Neuro controller for a temperature process and Inverted Pendulum problem.

UNIT – III

Introduction to fuzzy logic: Fuzzy sets – properties of fuzzy sets – operations on fuzzy sets. Fuzzy relations linguistic variables – linguistic approximation. Fuzzy statements: Assignments, Conditional and unconditional statements fuzzy rule base – fuzzy algorithm.

UNIT – IV

Fuzzy logic control system: Fuzzy logic controller – Fuzzification, Membership functions. Triangular, Trapezoidal, Grassian – Membership value assignments using neural networks, intention, inference – knowledge base – Inference Mechanism – Defuzzification case study: Fuzzy logic controller for a temperature process – inverted pendulum control problem.

UNIT – V

Neurofuzzy logic control: Adaptive fuzzy controller – self timing and self organizing controllers – stability of FLC – Non linear Fuzzy control – Fuzzy neuron.

Text Books:

1. SLaurence fauset, “Fundamentals of neural networks”, Prentice Hall, New Jersey 1994.
2. Jacek. M. Zurada “Introduction to Artificial Neural Systems”, Jaico Publishing House, 1999.

References:

1. Timothy. J. Ross, “Fuzzy logic with Engineering Application”, McGraw Hill, New york,1996.
2. Klir G. J. and fogler T.A, “ Fuzzy sets, Uncertainty and Information”, Prentice Hall of India, New Delhi, 1994.
3. James. A. Freeman David. M.S. Kapura, “Neural networks Algorithms, Applications and Programming Techniques”.

UIE E806 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

UNIT I

Introduction to AI and basic problem solving methods: Meaning of AI-AI problems-AI techniques-criteria for success. Production systems-State space search control strategies-Heuristic Approach-Forward and backward reasoning-Hill climbing techniques-breadth first search-depth first search-best search-staged search.

UNIT II

Knowledge: representation: predicate logic-resolution-question answering-nonmonotonic reasoning-statistical and probabilistic reasoning-fuzzy logic.

UNIT III

Game playing: Minimax search-adding alpha beta cutoff-futility cutoff.
Natural language processing: Syntax and semantic analysis-semantic grammar-core grammar-augmented transition network-discourse and pragmatic processing.

UNIT IV

Machine learning: Rote learning-learning by advice-learning by problem solving and examples –discovery as learning –AM learning and analog.

UNIT V

Expert systems: Introduction-rule based system architecture-knowledge system building tools.

Text Books:

1. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill, second edition,1991.
2. Dan W. Paterson, “Introduction to Artificial Intelligence and expert systems”, Prentice Hall of India, 1990, Third edition.

References:

1. P.H. Winston, “Artificial Intelligence”, Addison Wesley, 1983.
2. Yoshikai Shirai and Junichi Tsujii, “ Artificial Intelligence-concepts, techniques and applications”, John Wiley and sons, 1986.
3. M.W. Richaugh, “Artificial Intelligence-A knowledge based application “, PWS Rent publishing Boston, 1986.

UEI E807 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 –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.

References:

1. Lukcas M.P., Distributed control systems, Van Nostrand Reinhold co., Newyork,1986.
2. Moore, Digital control devices, ISA press, 1986.
3. Huges T, Programmable Logic Controllers, ISA press,1994.
4. Tanaenbaum A.S., Computer networks, Prentice Hall, 1998.

UEI E808 BIOMEDICAL INSTRUMENTATION

UNIT – I

Electro physiology: Review of Physiology and anatomy – sources of Bioelectric Potentials – Resting and Action Potentials – Propagation of Action Potentials – Electrodes theory – Bio potential electrodes – Bio chemical transducers – Transducers for Bio Medical applications.

UNIT – II

Biomedical Recorders and Cardiovascular measurement: Physiology of cardiovascular and nervous system – ECE-EEE-EME – Foetal ECE- Phonocardiography – Vector Cardiography – Holtel monitoring – BP – Blood flow – cardiac output – ICCU – Bedside unit and central monitoring unit.

UNIT – III

Pulmonary measurement and Bio telemetry: Physiology of respiratory system – Respiratory rate measurement – wire and wireless Biotelemetry – Telemetering multiple information – implanted transmitters – sources of electrical hazards and safety techniques.

UNIT – IV

Medical Imaging System: Ultrasound scanner – Echo cardiography – Color Doppler system – CAT and CT scan – MRI Imaging – Cine angiogram – LASER Imaging – Endoscope.

UNIT – V

Therapeutic units: Physiotherapy and Electrotherapy - Short wave, Microwave diathermy –Defibrillators – Cardio vector – Hearing aid – dialysis machine.

Text Books:

1. Leshie Cromwell, Fred. J. Weibell and Erich. A. Pfeiffer, “Biomedical Instrumentation and Measurements”, 2nd Edition, PHI, 2003.
2. M. Arumugam, “Biomedical Instrumentation”, Anuradha Agencies Publishers, Vidyal Karuppar, 612 606, Kumbakonam, R.M.S: 1992.

References:

1. R.S. Khandpar, “Hand Book of Biomedical Instrumentation and measurement”, McGraw Hill publishing Co., 1990.
2. Aston, “Principles of Biomedical Instrumentation and measurements”, McGraw Hill publishing Co., 1990.

**LIST OF INTERDEPARTMENTAL ELECTIVES
(UID 5005 & UID 6005)**

UID : 011 - EXPERIMENT STRESS ANALYSIS
(Offered by Civil Engineering)

Unit –I

Experimental stress analysis – its scope and importance characteristics of ideal strain gauge – Mechanical- optical – acoustical – inductance – capacitance strain gauges.

UNIT –II

Electrical resistance strain gauges – gauge characteristic and types – selection of gauges – gauge factor – gauge materials – transverse sensitivity - rosettes – analysis of stress and strain using rosettes – circuiting – equipment for recording static and dynamic strains - load , pressure and displacement transducers.

UNIT –III

Model analysis – direct and indirect models – law of structural similitude – choice of scales – model materials – limitations of model studies – Buckingham Pi theorem - design of direct and indirect models – begg’s deformer and its application

UNIT –IV

Two dimensional photo- elasticity - optical principles stress optical law – methods of producing isoclinics and isochromatics – methods measuring fractional fringe orders model materials – methods for separating principle stresses.

UNIT –V

Photo elastic coatings
Moire fringe and brittle lacquer techniques
Introduction to stress freezing techniques

Test Books

1. V.M. Vazirani, S.P Chandola, “Experimental stress Analysis”,Khanna publishers,1988
2. L.S Srinath “Experimental stress Analysis” Tata McGrand Hill, New Delhi , 1984
3. Experimental stress Analysis, Dr. Sadhu Singh, Khanna Publishers ,1982

Reference

James W Dalley and William F Riley “ Experimental Stress Analysis” Tata McGrand Hill, 1965.

**UID 012 - COMPUTER AIDED PLANNING AND DRAFTING
(Offered by Civil Engineering)**

UNIT –I

Introduction - Creating New drawing – Opening existing drawings – working with tool bars – using short cut menus – pointing devices- setting drawing units- modifying AutoCAD environment – viewing and updating drawing properties – modifying tool bars

UNIT –II

Using commands and systems variables – creating objects – Hatching drawing with previsions – controlling the drawing display – Editing method - using layers and object properties – auditing text to drawing – creating dimensions .

UNIT –III

Using blocks and external reference – management content with auto cad design centre – creating a layout to plot – plotting drawings batch plotting – using scripts files – working three – dimensional space – interactive veering in 3D – creating three – dimensional object

UNIT –IV

Rendering and imaging – using 3D images- drawing 3D models creating hidden –line images – using render with related applications. Working with raster image –managing raster images- accessing raster image using internet- modifying images and image boundaries

UNIT –V

Creating compound documents with OLD – linking and embedding information –using information from other application in AutoCAD. Accessory external database-working with table data- creating labels – accessing the internet visual Lisp and auto Lisp – VBA and active X automation

Text Books

1. Introduction to AutoCAD 2002 by J.T Roberts
2. Introduction to AutoCAD 2002 by George Omura
3. Introduction to AutoCAD 2002 by A. Yarwood

Reference

1. 3D Modelling in AutoCad by John EL Wilson Arnie Willians - 2002

UID 021 – MECHATRONICS
(Offered by Mechanical Engineering)

Unit – I : Introduction

Introduction to Mechatronics – Mechatronics in Products – Mechatronics in Engineering Design – Measurement Systems – Electronics for Mechanical – Mechanical System for Electronics. System Response – Dynamic Characteristics of Systems – zero order - First order – Second order – System Modeling and analogies.

(9 hours)

Unit – II : Amplifying and Digital Circuits

Amplifier – Operational amplifier – Instrumentation amplifier – comparator. Digital Representations – Boolean algebra – Design of logic Network – Flip flops – Application of flip flops – Special purpose Digital integrated circuits.

(9 hours)

Unit – III : Microprocessor and Data Acquisition

Microprocessors and micro Computers – Micro Controllers – Numeric key board – LCD Display – Method to Design a Micro controller based system. Data acquisition – quantizing theory – Analog to Digital conversion – Digital to Analog conversion.

(9 hours)

Unit – IV : Sensors and PLC

Performance Terminology – Semi conductor Sensors and micro electro mechanical Devices - Actuators – Hydraulics Actuators – pneumatic Actuators. Programmable Logic Controllers (PLC) – basic structure – input / output processing – programming – Mnemonics Timers – relays and counters – data handling – selection of PLC.

(9 hours)

Unit – V : Control Architecture and Mechatronic Systems

Control architecture – Analog – Digital – Micro Controller – Single Board Computer – personal Computer designing. Case studies of Mechatronic system. Introduction to design of Mechatronic systems - Coin counter - Robotics - Magnetic Bearings etc..

(9 hours)

Text Books :

1. David G.Alciatore and McGraw Mecheal.B.Histand - Introduction of Mechatronics and Measurement Systems, Hill International Editio, 1999.
2. HMT - Mechatronics, Tata McGraw Hill Publishing Company Ltd., 1998.
3. Lawrence J.Kamm - Understanding Electro – Mechanical Engineering, An Introduction to Mechatronics”, Prentice Hall, 2000.

UID 022 - TOTAL QUALITY MANAGEMENT
(Offered by Mechanical Engineering)

Unit – I

Introduction to TWM – Strategies concepts and objectives – Total quality model – TQM as applied to Indian Industries – Quality circle concepts – concepts, objectives and functions of quality circles – Benefits of the organization – Training of quality Circle members – Implementation.
(9 hours)

Unit – II

Tools and Techniques – The seven management tools =- Technique for analyzing a quality process – Statistical process Control – Introduction to S-S concepts
(9 hours)

Unit – III

Cost of quality – Taguchi's quality loss function – House keeping concepts for industries, tool room, production shop – processing industries.
(9 hours)

Unit – IV

Quality based product and process Design – Design for reliability – Design for maintainability – Quality Function Deployment (QFD) – QFD and Quality Assurance – QFD Principles, Concepts and applications – case studies.
(9 hours)

Unit – V

KAIZEN Concepts – Kaizen by TQC – POKA YOKE ISO 9000 certification system – 9001 to 9004 systems – procedures, audits and reviews – case studies.
(9 hours)

TEXT / REFERENCE BOOKS

1. S.M.Sundara Raja : Total Quality Management Tata Mc Graw Hill, 1998.
2. Patrick.J.Sweeney(editor) : TQM for Engineering, Quality Resources, Newyork, 1993.
3. John Bank : The Essence of Total Quality Management, Prentice Hall of India, 1998.
4. James I Bossert, : Quality Function Deployment, ASQC quality press, Wisconsin, 1994.

UID 031 - COMMUNICATION ENGINEERING
(Offered by Electronics & Communication Engineering)

UNIT – I

Modulation – Need for modulation – Amplitude modulation – frequency spectrum – Power relation – different types of modulators – SSB and VSB generation. AM transmitters – Block diagram – functions of each block – high level transmitters.

UNIT – II

Angle modulation – principle of Frequency and Phase modulation – Relation between FM and PM waves – Bandwidth of FM – Narrow band wide band FM – Generation of FM wave – Direct and Indirect methods – FM transmitters – Block diagram – functions of each block.

UNIT – III

Detection and Receivers – Detection – Diode detectors – Synchronous detection – FM detectors – slope detectors – Phase discriminators – Ratio detectors.

Receiver – different types – super-heterodyne receivers – Block diagram – Choice of IF and Oscillator frequencies – Tracking – alignment – AVC, AFC – Receiver characteristics.

UNIT – IV

Pulse modulation systems – Sampling theorem – Pulse amplitude modulation – Channel bandwidth for PAM – detection of PAM signals – Pulse time modulation – generation of PDM and PPM – conversion of PDM and PPM – conversion of PDM to PPM – detection of PTM signals – Pulse code modulation – quantization – PCM systems – Encoder – decoder – Time division multiplexing – Frequency division multiplexing.

UNIT – V

Broadband communication system (Block Diagram Approach) – Telegraph system – Tele printer and Facsimile system – Telephone system – crossbar and electronic exchanges – Television system – microwave communication and optical communication systems – Principle of satellite communication – computer communication – Electronic Mail.

Text Books:

1. G. Kennedy, “Electronic Communication Systems”, McGraw Hill, 1984.
2. Wayne Tomasi, “Electronic Communications Systems – Fundamentals Through advanced”, 4th Edition, Pearson Education, 2001.

References:

1. Taub and Schilling, “Principles of Communication Systems”, McGraw Hill, 1989.
2. Bruce Carlson, “Communication Systems”, McGraw Hill, 1985.

UID 032 - COMPUTER NETWORKS

(Offered by Electronics & Communication Engineering)

UNIT I

Data Communication Concepts: Transmission media – Data encoding – Interface and modems – Multiplexing – Error detection and correction – Digital subscriber line – Circuit switching – Packet switching – Message switching.

UNIT II

Wide Area Networks: ISO-OSI layered architecture – Function of the layers – Data link protocols – HDLC, LAPB, LAPD, Inter networking devices – Repeaters, bridges, routers, routing algorithms – Distance vector routing, link state routing, X.25 protocol, congestion control.

UNIT III

Frame Relay and ATM Networks: Frame relay operation – Layers and traffic control; ATM networks – Architecture switching, Layers service classes.

UNIT IV

Local Area Networks: LAN topology – Ethernet – Token bus – Token ring – FDDI – Wireless LAN, ATM LAN – IEEE 802 Medium access control layer standard – Random access protocols – ALOHA – Slotted ALOHA.

UNIT V

OSI Layers: Transport layer issues – Session layer – Synchronization – Presentation layer – Encryption, decryption, Application layer – Message handling system, file transfer, virtual terminal – E-mail.

Text Book:

Achyut S. Godbole, Atul Kahate, “Computer Communication Networks”, Tata McGraw Hill, New Delhi, 2004.

References:

1. Andrew. S. Tanenbaum, “Computer Networks”, PHI, 1956.
2. W. Stallings, “Data and Computer Communication”, Second Edition, New York, Mc Millan, 1988.

**UID 041 - RELATIONAL DATABASE MANAGEMENT SYSTEMS
(Offered by Computer Science & Engineering)**

UNIT I

Introduction to Database Systems-applications-Comparison with file systems-Data models-View of data-database languages-database users and administrators -Transaction management system structure-application architecture-constraints-keys-Design issues.

UNIT II

Entity_Relationship Diagrams-Relational model-structure of relational database: basic structure-Schema-Fundamentals of Normalization-1NF, 2NF, 3NF-Introduction to Query languages.

UNIT III

Introduction to Oracle-Introduction to PL/SQL: Why PLSQL-Features of PL/SQL-PL/SQL Block-lexical units-variable declaration-PL/SQL types-PL/SQL Control Structures-PL/SQL records and tables-SQL statement-DML-pseudo columns –grant and revoke privileges -transaction control. Built in SQL functions: character functions, numeric-date-conversions-group and other functions.

UNIT IV

Cursors: Introduction-fetch loops-variables-subprograms : creating procedures and functions, subprogram locations and dependencies-privileges-packages-Triggers-error handling.

UNIT V

Introduction to Microsoft SQL Server-MY SQL-MS ACCESS. Case Studies: Material Management-Library Information System.

TEXT BOOKS

1. "Database System Concepts" – Silberschatz And Korth, McGraw Hill-Fourth Edition,2002.
2. "Oracle 8: PL/SQL Programming" – Scott Urman, Oracle Press, Tata McGraw Hill, 1999.

UID 042 - VISUAL PROGRAMMING

(Offered by Computer Science & Engineering)

UNIT I

INTRODUCTION: Operating System fundamentals: DOS-WINDOWS. Features of Object Oriented Programming: Abstraction-Encapsulation-Inheritance-Classes-Derived classes-Virtual functions-Streams.

UNIT II

VB INTRODUCTION: Datatypes and Variables-Keywords-Statements-Controls and forms: types-properties-events-methods. Built-in: functions-procedures. User-defined: functions-procedures-properties.

UNIT III

DATA OBJECTS: Open Data Base Connectivity (ODBC)-Active Data Objects (ADO)-Data Access Objects (DAO)- Active X Data Objects and Data Connection (ADODC)-Data environment-Data report-ADODC based controls.

UNIT IV

APPLICATION DEVELOPMENT AND AUTOMATION: MDI-Menu-Toolbar-Active X-Mouse events- OLE based Automation-Class-Modules-DLL.

UNIT V

VC++ INTRODUCTION: Windows console application-AppWizard-MFC introduction-Windows MFC application.

TEXT BOOKS:

1.Gary Cornell, 'Visual Basic 6.0', Tata McGraw Hill, 1998.

2.C.H. Pappas, W.H. Murray, III 'Visual C++: The Complete Reference', Tata McGraw Hill, 1999.

**UID 051 - INTRODUCTION TO SOFT COMPUTING
(Offered by Electrical & Electronics Engineering)**

UNIT-I

Fuzzy systems: Crisp sets – Fuzzy sets – Operation and properties. Fuzzy relations – Equivalence and tolerance relations. Fuzzy membership function- types and definitions. Membership value assignments – Rule based systems. Type of fuzzy inference. Structure and parameters of a Fuzzy system- computer assignment.

UNIT-II

Neural Networks: Biological inspiration – Neuron model and Network architectures perception – architecture, learning rule. Limitations of multiplayer perception- Back propagation algorithm – learning rule – computer assignments.

UNIT-III

Genetic Algorithm: Goals of optimization – Introduction to GA – terminologies. Simple GA- Data structure. Genetic operation – crossover, mutation, fitness scaling, Inversion- A Multi parameter mapped fixed point coding – computer assignments.

UNIT-IV

Evolutionary programming: Single and multi objective optimization-general algorithm-Binary GA, Real parameter GA, constraint handling in GA Evolution strategies general programming – computer assignments.

UNIT-V

Applications to various branches of Engineering and science- Application of fuzzy, neural, GA and EP in computer science, electrical, communication, instrumentation and control, mechanical and civil engineering.

TEXT BOOKS

1. Timothy J. Ross ‘Fuzzy logic with Engineer application’ McGraw Hill.
2. Martin T. Hagan Howard B.Deruth, Mark Beale ‘Neural Network Design’ Thompson Learning 1996
3. David E. Gold Berg ‘Genetic Algorithm’ Pearson Education 2002.
Multi objective optimization using Evolutionary Algorithm – by Kalyanmoy Deb.
John Wiley and sons 2002

UID 052 - INDUSTRIAL ELECTRONICS
(Offered by Electrical & Electronics Engineering)

UNIT – I: THYRISTERS

SCR – SCR behaviour and rating – phase control of SCR – turn-off of SCR – SCR with resistive load and inductive load – rectifiers with back emf load – TRIAC – TRIAC circuits – phase control of SCR

UNIT – II: REGULATORS OF VOLTAGE AND MOTOR SPEED

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 – III: INDUSTRIAL HEATING

Induction heating – principles- theory – merits – applications – high frequency power source for induction heating

Dielectric heating – theory – electrodes used in dielectric heating – method of coupling of electrodes to RF generator – thermal losses in dielectric heating

UNIT – IV: INDUSTRIAL TIMING CIRCUITS

Constituents of industrial timing circuits – timers – classification of timers – thermal timers – electromechanical timers – electronic timers – classification of electronic timers – digital timing element – digital counters – SCR delay timer – IC electronic timer

UNIT – V: PROGRAMMABLE LOGIC CONTROLLERS

Number system and codes – basics of PLC programming – timer and counter instructions – data manipulation instructions – shaft register and sequence instructions

TEXT BOOKS

1. Frank D. Petruzella, Industrial Electronics, McGraw Hill International Editions, 1996
2. G.K. Mithal, Ravi Mithal, Industrial Electronics, Khanna Publishers, Delhi, 1995
3. George M. Chute, Robert D Chute, Electronics in Industry, McGraw Hill International Editions

**UID 061 - ELEMENTS OF BIOTECHNOLOGY
(Offered by Chemical Engineering)**

UNIT-I

What is Biotechnology, Biotechnology -an interdisciplinary pursuit, public perception of Biotechnology, Biotechnology and the developing world? Classification of micro-organisms, The cell, its organelles and their respective functions, Basic metabolism of cells, DNA – Structure and function, RNA-Structure and function.

UNIT-II

Enzyme Technology: Proteins, Protein Structure & Function, Protein –Protein interactions, The nature of enzymes, application of enzymes, Technology of enzyme production, immobilized enzymes.

UNIT-III

Biotechnology and Medicine: Introduction, Pharmaceuticals and bio-pharmaceuticals, Antibiotics, vaccines and monoclonal antibodies, gene therapy. Biotechnology and Environment: Introduction, Microbial ecology / environmental biotechnology, waste water and sewage treatment, landfill technologies, composting, bioremediation, microbes and the geological environment, sustainability.

UNIT – IV

Genetics And Biotechnology: Introduction, industrial genetics, protoplast and cell fusion technologies, genetic engineering, Introduction to Bio-informatics, potential lab biohazards of genetic engineering, Bioethics.

UNIT V

Biotechnology in Agricultural, food and Beverage industries: Introduction, plant biotechnology, diagnostics in agriculture, food and beverage fermentation, speciality fermentation products e.g.: biopolymers, bio-pesticides, miscellaneous microbial derived food products.

Text Books/ Reference Books:

1. Shuler, M.L. and F. Kargi. 1992. *Bioprocess Engineering*, Prentice-Hall, Englewood Cliffs, NJ.
2. Bailey, J.E. and D.F. Ollis. 1986. *Biochemical Engineering Fundamentals*, 2nd Ed. McGraw-Hill, New York.
3. Biotechnology by Smith, Cambridge Press.
4. Modern Concepts of Biotechnology by H.D. Kumar, Vikas Publishing House Pvt. Ltd.
5. Elements of Biotechnology by P.K. Gupta, Rastogi Publications.

UID 062 - INDUSTRIAL POLLUTION ABATEMENT

(Offered by Chemical Engineering)

UNIT I

Man and environment, types of pollution, pollution controls aspects, industrial pollution, pollution monitoring and analysis of pollutants, Indian pollution regulations.

UNIT II

Water pollution- source of water pollution- measurement of quality- BOD- COD- colour and odor-PH- heavy metals-treatments etc (qualitatively). Industrial waste water treatment (qualitatively) and recycle.

UNIT III

Solid wastes- quantities and characterizations – industrial –hazardous waste- radio active waste- simple treatments and disposal techniques (qualitatively treatment).

UNIT IV

Air pollution-types and sources of gaseous pollutants-particulate matter-hazardous air pollutants-global and atmospheric climatic change (Green house effect)-acid rain. Industrial exhaust – characterization and Methods of decreasing the pollutants content in exhaust gasses (qualitatively)

UNIT V

Noise pollution –sound level-measuring transient noise-acoustic environment-health effects of noise –noise control.

Text books / Reference books:

- 1.'Environmental pollution and control' J.Jeffrey peirce etl, Butterworth-Heinemann; 4th edition , 1997.
- 2.'Pollution control in Process Industries', S.P.Mahajan, Tata Mc.Graw Hill, 1990.
- 3.'Environmental Pollution Control Engineering', C.S.Rao, New Age International Ltd., 1992.
- 4.'Industrial Air Pollution Engineering', V.Cavaseno, Mc.Graw Hill, 1980.
- 5.'Pollution Control Theory', Martin Crawford, Mc.Graw Hill, 1976.
- 6.'Solid Wastes', Martell, John Wiley, 1975.

UID 071 - INDUSTRIAL CONTROL SYSTEMS
(Offered by Electronics & Instrumentation Engineering)

UNIT – I

INTRODUCTION: Need for control – block diagram representation of a Control System- mathematical modelling-transfer function and state space modelling-examples in mechanical, electrical, level, pressure and thermal processes –time response analysis of first order and second order processes- stability-self-regulation – servo and regulator operation.

UNIT – II

CONTROL ACTIONS AND CONTROLLERS: Basic control actions characteristics of on-off, proportional, integral and derivative control modes – P+I, P+D and P+I+D control modes – Tuning of controllers-Finite control elements-valves and actuators-characteristics of control valves – inherent and installed characteristics.

UNIT-III

COMPUTER CONTROL: Basic building blocks of computer control system – SCADA – Direct Digital Control – AI and expert control systems – Case studies on computer control for Industrial process.

UNIT-IV

PROGRAMMABLE LOGIC CONTROLLERS: Evolution of PLC's – Sequential and programmable controllers – Programming of PLC – Relay logic – Ladder logic – Functional blocks connecting PLC to computer – Case study of bottle filling system.

UNIT-V

DISTRIBUTED CONTROL SYSTEMS: Evolution – Different architecture – local control unit – Operator interface – Displays – Engineering interface-DCS applications.

References:

1. Stephanopoulos, G., Chemical Process Control, Prentice Hall of India, New Delhi, 1990.
2. Michal P.Lucas, Distributed control systems, Van nostrand Reinhold Co.,1986.
3. Petrezeulla, Programmable Controllers, McGraw Hill, 1989.

UID 072 - TRANSDUCERS AND INSTRUMENTATION

(Offered by Electronics & Instrumentation Engineering)

UNIT – I

Generalised scheme of measurement-Statistical analysis of measurement data- Mean, Standard deviation-Probability of errors-Gaussian Distribution- Probable error and limiting error Static characteristics of instruments – Accuracy, Precision, Sensitivity, Linearity, Resolution. Hysteresis, Threshold, Input impedance, Loading effects- generalised mathematical model of measurement systems-Dynamic characteristics.

UNIT-II

Electronic analog meters-DC and AC Voltmeters, AC and DC bridges- Digital method of measuring frequency, period, velocity. Displacement and speed Display Devices- CRO's - LED'S ,LCD's.

UNIT – III

Transducers-Characteristics-Strain gauges-LVDT, Eddy current transducers, Hall effect transducers, Magnetostrictive transducers, capacitive Transducers –Piezoelectric transducers- photoelectric Transducers-Thermo electric transducers.

UNIT – IV

Measurement of temperature and Pressure: Manometers ,Bourdon Gauges -Diaphragm, Bellows-Vacuum Gauges- Mcloid Gauge-Knudsen Gauge, Pirani gauge

Temperature scales –resistance thermometers-Thermistors-Thermocouples-Radiation Pyrometer- Types and characteristics

UNIT-V

Flow measurement: Differential Flow meters-Operating principle-Different types-Orifice-Rotameter-Mass flow meter-positive displacement meter-Electromagnetic and Ultrasonic Flow meters

Level Measurements: Slight glass flow gauge, Displacer torque tubes ,Bubbler tube, Diaphragm box, D/p methods, resistance <capacitance and Ultrasonic level Gauging Measurement of PH, humidity ,Moisture and Viscosity

Textbooks:

1. A course in Electronic measurements and Instrumentation , A.K.Sawhney, Dhanpat Rai & sons,1998
2. Measurement Systems , Application and design, E.O.Doeblin, McGraw Hill,1990.
Mechanical and Industrial Measurement, R.K.Jain, Khanna Publishers,1996

UID 081 : INFORMATION TECHNOLOGY FOR ENGINEERS

(Offered by Information Technology)

UNIT I

INTRODUCTION:Information Age; Responses – Information system; Infrastructure and Architecture – IT support for organizations; Types of information systems – Managing IT – Basic of computer hardware and software for IT infrastructure- input devices, output devices, memory devices.

UNIT II

COMMUNICATION NETWORKS FOR IT:Telecommunication system: Networks: LAN, WAN, ETHERNET, Network server, Network software; Network processing strategy; Telecom applications; Network OS; Operation and services provided; ftp, Usenet, Remote login, Telnet.

UNIT III

INTERNET : Evolution - WWW, Websites, Homepages, Search Engines, URL, Name server, Proxy server, Gateways, Routers, Modem, Switches, Email server, Inter Service Providers, Internet connectivity (VSAT, Leased line, Dial-up line, Radio link) .

UNIT IV

E-COMMERCE AND IT SYSTEMS : E-commerce: Business applications: Market research and customer support Infrastructure, payments and other support - Planning and Management: Principles for IS planning: Role of IS and user departments; Resources; IT architecture; Centralized and no centralized; Client/server; End user computing architecture; Managing IS; Organizational structure; IS vulnerability; protection; Security; Network Protection and Firewalls Risk management and cost-Benefit analysis.

UNIT V

APPLICATIONS: Information system; GIS EDI and EFT; Extranets; Implementation; Data, Knowledge and decision support; Decision making- and support systems; Data visualization technologies; Knowledge Management- and Discovery and analysis - AI and Expert systems; Intelligent agents; Virtual reality; Ethical and global issues;

REFERENCE BOOKS :

1. E. Turban et al, *'Introduction to IF'* , John Wiley and sons, IC, 2000.
2. Turban et al, *'IT for management: Making connection for strategic Advantage'*, 2nd Edition, John Wiley and sons, Inc., 2001.
3. Dennis, P., Curtin et al, *'IT the breaking wave'* Tata McGraw-Hill, 1999.
4. Steven Alter, *IS, A management perspective*, 1999.
5. Gralla Preston, *'How the internet works'*, Techmedia Publication, 4th Edition, 2000.

UID 082 - BIO INFORMATICS
(Offered by Information Technology)

UNIT I

Coding -Common health care language - coding techniques – coded and quasi coded data Medical vocabulary – industry wide communication standards HL7 – unified medical language system – quality of care paradigms, risk management bioethics.

UNIT II

Information networks - Internet – facilities used in the internet web browsers STTP 5, HTTP, HTML, URL – European molecular biology network – national centre for biotechnology information.

UNIT III

Patient record maintenance - Electronic patient record – models or ERP – environmental services – metrics – telemedicine – community networks – telemedicine peripherals and equipment selection – anatomy of video conferencing technology.

UNIT IV

Basic Genetic Science : Study of cell, nucleus, chromosomes and their components Evaluation of chromosomes, Impact of chromosomes on genes, gene study. Protein information resources - Biological data basics – primary secondary data basics – Protein pattern data basics – DNA sequences data basics - DNA analysis - Genes structure and DNA sequences – interpretation of EST structures – different approach to EST analysis.

UNIT V

Alignment techniques - Data base searching - comparison of two sequences– identity and similarity – global and local similarity – global and local alignment- multiple sequence alignment – data basis of multiple alignment – secondary data base. Expert system- Principles of expert system – statistical decision trees – integration of decision support in clinical processors.

TEXT BOOK

1. T.K. Attwood , D.J. Parry-Smith, "*Introduction to Bioinformatics*", Pearson Education, 1999

REFERENCE BOOKS

1. Coiera E, "*Guide to medical informatics, The internet and telemedicine, Chajzman & Hall medical*", London 1997.
2. Bernser, E.S., "*Clinical decision support systems, Theory and practice, Springer-Verlag*", New York, 1999.
3. Dan E. Krane , Michael L., Raymer, "*Fundamental Concepts of Bioinformatics*", Pearson Education, 2002.

UID 201 - FINITE ELEMENT METHOD

(Offered by Mathematics)

UNIT – I (Weighted residual and Variational methods)

Introduction, Weighted residual methods: Least square, Partition, Galerkin, Moment and Collocation methods. Variational method: Ritz method. (10 Hours)

UNIT - II (Finite Element method)

Finite elements: Different types and their functions. Numerical integration over finite elements. Finite Element method: Ritz method, Least square method and Galerkin method. (10 Hours)

UNIT - III

Solution of initial value problems for ordinary differential equations and initial boundary value problems for partial differential equations by finite element method. (9 Hours)

UNIT - IV

Solution of boundary value problems for ordinary differential equations and partial differential equations by finite element method. (9 Hours)

UNIT - V

Solution of some nonlinear differential equations by finite element method. Solution of some practical application problems arising in various branches of engineering. (7 Hours)

Text Book:

1. M.K. Jain, Numerical solution of differential equations, Wiley Eastern Limited, New Delhi, 1987.
2. J. N. Reddy, An introduction to the Finite Element Method, McGraw Hill, Singapore, 1985.

Reference Book:

1. O.C. Zienkiewicz, The Finite Element Method, 3rd Edition, McGraw Hill, 1977.
2. C.S. Desai and J. F Abel, Introduction to the Finite Element Method, CBS Publishers and Distributors, New Delhi, 1987.
3. R. Wait and A.R. Mitchell, Finite Element Analysis and Applications, John Wiley & Sons, New York, 1986.
4. A. J. Davies, The Finite Element Method: A first approach, Clarendon Press, Oxford, 1980.
5. H. Grandin Jr., Fundamentals of the Finite Element Method, Mcmillan, New York, 1986.
6. K.W. Morton, Numerical solution of convection-diffusion problems, Chapman and Hall, 1996.

UIE 202 - COMPUTATIONAL FLUID DYNAMICS

(Offered by Mathematics)

1. Classification and finite difference formulations :

Classification: Elliptic, Parabolic, Hyperbolic, System of first order p.d.e and System of second order p.d.e. Initial and boundary conditions, Lax's equivalence theorem,

Finite difference formulations: central, forward, backward differences.

Uniform and non-uniform grids, numerical errors, grid independence test.

2. Numerical Solution of Ordinary and Partial differential equations

Runge-Kutta methods, Finite difference methods for O.D.E,

Elliptic: Laplace and Poisson equations. Parabolic: One- dimensional and Two-dimensional heat conduction equations. Hyperbolic: One- dimensional wave equation.

3. Incompressible flows:

Governing equations: Primitive variables formulation, Vorticity-Stream function formulation in Cartesian, spherical and cylindrical polar coordinates.

Determination of pressure-by-pressure Poisson equation,

Flow inside a lid-driven cavity, axis symmetric flow past a sphere and cylinder, application of upwind difference scheme.

4. Compressible flows:

Governing equations: Euler equations and Burgers equation

Lax-Friedrichs and Lax-Wendroff methods.

Flux splitting method, Riemann solvers, Kinetic schemes, Relaxation schemes.

FTCS, FTBCS, DUFORT-FRANKEL, Mac Cormack (explicit methods)

Mac Cormack, BTCS, BTBCS (implicit methods) for solving inviscid and viscous Burgers equation.

5. Heat flows:

Steady heat conduction in rectangular, spherical and cylindrical geometries, Transient heat conduction, steady one-dimensional convection-diffusion equation, Heat transfer in the boundary layer over a flat plate.

TEXTBOOKS

Muralidhar, K and Sundararajan, T., " Computational Fluid Flow and Heat Transfer"(2nd edition). Narosa Publishing house, New Delhi.
(units 3, 4 and 5)

Klaus A. Hoffmann and Steve T. Chiang, "Computational Fluid Dynamics for Engineers" Vol.1.A publication of Engineering Education system, Wichita, Kansas, 67208-1078, USA. ASIN: 0685272257
(units 1, 3 and 4)

Curriculum & Syllabi (B.Tech. EIE)

Grewal, B. S., " Numerical methods in Engineering and Science", Khanna Publishers
(unit 2)

REFERENCES

Langtangen, Hans P.

Computational Partial Differential Equations

Numerical Methods and Diffpack Programming

Publisher: Springer verlag

Series: [Texts in Computational Science and Engineering](#), Vol. 1

2nd ed., 2003, XXVI, 855 p., Hardcover

ISBN: 3-540-43416-X (\$ 62.99)

Langtangen, Hans P.; Tveito, Aslak (Eds.)

Advanced Topics in Computational Partial Differential Equations

Publisher: Springer verlag

Series: [Lecture Notes in Computational Science and Engineering](#), Vol. 33

2003, XIX, 658 p., Softcover

ISBN: 3-540-01438-1 (\$99.00)

[M.O. Deville](#), [P.F. Fischer](#) and [E.H. Mund](#)

High-Order Methods for Incompressible Fluid Flow

ISBN: 0521453097, Publisher: Cambridge University Press 2002 (\$ 85.00)

[Pieter Wesseling](#) [Principles of Computational Fluid Dynamics](#)

Publisher: Springer-Verlag ISBN:3540678530 (\$ 135.59)

[John D., Jr. Anderson](#). Computational Fluid Dynamics

Publisher: Mc-Graw Hill Science/Engineering/Math,

ISBN:0070016852, (\$82.50)

[Joel H. Ferziger](#), [Milovan Peric](#). Computational Methods for Fluid Dynamics

Publisher: springer verlag, ISBN: 3540420746, (\$59.95)

Suhas V Patankar "Numerical Heat Transfer Fluid Flow",

Publisher: Hemisphere Publishing Corporation, 1980.

ISBN:0891165223 (\$94.95)

Anderson, D.A., Tannehill, I.I., and Pletcher, R.H., "Computational Fluid Mechanics and Heat Transfer (2nd edition)

Publisher: Taylor and Francis

ISBN:156032046X. (\$92.97)

Bose, T. K., "Numerical Fluid Dynamics"

Publisher: Narosa Publishing house Pvt.Ltd

ISBN: 8173191662 .(\$69.99)

UID 211 -INTRODUCTION TO NANO TECHNOLOGY

(offered by Department of Physics)

Unit-1: Introduction to Physics of Solid State

Intermolecular forces: thermodynamic aspects - Quantum Mechanical Treatment of the Many-Particle Problem - Potential Energy Surface - Pair Potential Approximation - Advantages and Limitations of the Pair Potential Approximation - Phenomenological Potentials - Pseudo-Potentials - Many-Body Potentials.

Unit - 2: Fundamentals of nanoscience

Size dependence of properties - Particle size determination - Bulk to nano transition - Semiconducting nanoparticles - Carbon nanostructures - Mechanical properties (hardness, ductility, elasticity) - Optical properties of nanotubes - Electrical properties of nanotubes.

Unit - 3: Preparation of nanosystems.

Introduction to nanolithography - Carbon nanotubes: preparation - Synthesis and preparation of nanomaterials (crystalline and thinfilm) - Physical and chemical methods - Control and stability (size, shape, composition).

Unit - 4: Characterization of nanosystems.

Thermal Stability - Basic Material Properties - Mean Values and Correlation Functions - X-ray diffraction - Scanning Electron Microscopy - Scanning Tunneling Microscopy - Electron Microscopy - X-ray absorption spectroscopy - Photoelectron emission spectroscopy.

Unit - 5 : Nano-Engineering: Applications

Nanotubes, nanowires, and nanodevices-introduction - Functional Nanostructures - Introduction to molecular electronics - Field emission and Shielding - Applications in Computers - Applications in fuel cells - Applications in chemical sensors - Applications in mechanical reinforcement - Microelectromechanical systems (MEMs) - Nanoelectromechanical systems (NEMs) - Molecular and Supramolecular Switches.

Text Books:

Unit-1 and 2:

(a) **Charles P. Poole and Frank J Owens.** *Introduction to nanotechnology.* Wiley Interscience, 2003. (US \$ 80.00).

(b) **Crandall, B. C. and Lewis, James (Eds.)** “*Nanotechnology: Research Perspectives*” MIT Press, 1992. and

Unit-3 and 4:

(a) **P E J Flewitt, R K Wild.** *Physical Methods for Materials Characterization. 2nd Edition,* Institute of Physics Publishing, UK. 2004.

(b) **Gottstein, Günter.** (2004) *Physical Foundations of Material Science.* Springer Verlag.

Unit-5:

Cleland, Andrew N. (2003). *Foundations of Nanomechanics: From Solid-State Theory to Device Applications.* Springer Verlag.

References for further study:

1. **J M Vail, Winnipeg.** *Topics in the Theory of Solid Materials.* Institute of Physics Publishing, UK. 2004.
2. **M W Barsoum.** *Fundamentals of Ceramics.* Institute of Physics Publishing, UK. 2004.
3. **A S Edelstein, R C Cammarata,** *Nanomaterials: Synthesis, Properties and Applications.* IOP Publishing, UK, 1998. (\$70.00)
4. **Bhushan, Bharat** (Ed.) (2004) *Springer Handbook of Nanotechnology* (With CD-ROM) ISBN: 3-540-01218-4 (EURO 200.00)
5. **Awschalom, D.D.; Loss, D.; Samarth, N.** (Eds.) (2002) *Semiconductor Spintronics and Quantum Computation.* Springer Verlag. ISBN: 3-540-42176-9 (EURO 70.00)
6. **Vincenzo Balzani.** *Molecular Devices and Machines : A Journey into the Nanoworld* Wiley VCH, 2003, (\$92.00).
7. **Peidong Yang.** *Chemistry of Nanostructured Materials.* World Scientific, 2004. (\$84.00)
8. **Andrzej W. Miziolek et. al.,** *Defense Applications of Nanomaterials* American Chemical Society, 2004. (\$150.00)
9. **Liming Dai.** *Intelligent Macromolecules for Smart Devices: From Materials Synthesis to Device Applications (Engineering Materials and Processes.* Springer Verlag 2004. (\$150.00)
10. **Michael Rieth.** *Nano-engineering in Science and Technology: An Introduction to the World of Nano-Design,* World Scientific, 2003. (\$26.00).
11. **Hari Singh Nalwa.** *Handbook of nanostructured materials and nanotechnology.* 5 volume set, 3583 pages; (US \$ 1500.00). Academic Press, 2000.

UID 212 - Novel and Intelligent Materials

(offered by Department of Physics)

Unit – 1: Introduction to functional materials.

10 hours

Introduction to functional materials - Phase transition and anomalies - Microscopic, mesoscopic, macroscopic phenomena and symmetry - Energy conversion - Examples of functional materials - Thermally responsive materials - Materials responsive to electric, magnetic and stress fields - Increased functionality through (i) Morphotropic phase boundary and (ii) Domain engineering.

Unit-2 Actuators and adaptronics

10 hours

Definition. of an actuator - Actuator as part of system - Intelligent actuators - Smart actuators - Piezoelectric actuators – Theory -Technical transducers - Comparison with other actuator types - Example applications - Magnetostrictive actuators - Theory of magnetostriction in magnetostrictive actuators - Properties of shape memory alloys - Electrical shape memory – actuators - Innovative applications.

Unit-3: Rheological fluid and Chemical actuators.

10 hours

Electrorheological fluid actuators - Limitations to the concept of electrorheological fluids - Summary of advantages of ER fluids - Magnetorheological (MR) fluid actuators - Description of MR fluids - Basic MR device design consideration - Linear MR fluid dampers.- Electrochemical actuators: fundamentals - Construction of reversible actuators.

Unit-4: Nanomaterials

10 hours

Size dependence of properties - Particle size determination - Bulk to nano transition - Semiconducting nanoparticles - Carbon nanostructures - Mechanical properties (hardness, ductility, elasticity) - Optical properties of nanotubes - Electrical properties of nanotubes.

Unit-5: Fiber optic sensors and Magnetoresistance

10 hours

Physical principle of fiber optic techniques - Types of fiber sensors and sensor selection - Integrating and Quasi-Distributed Long-Gauge-Length sensors-Short-Gauge-Length sensors. – Introduction to magneto-resistance – Giant magnetoresistance – Colossal magnetoresistance – Materials – Perovskite oxides – Applications in spintronics like spin transistor and spin valve.

Textbooks:

Unit-1 [Hartmut Janocha](#) (Editor), [Daniel J. Jendritza](#), [Hartmut Hanocha](#).

Adaptronics and Smart Structures: Basics, Materials, Designs and Applications.

Springer Verlag, 1999.

Unit-2: V. Srinivasan. *Smart Structures: Analysis and Design*. Cambridge university press, 2000. **Unit-3:** [Mukesh V. Gandhi](#), [Brian S. Thompson](#). *Smart Materials and Structures*.

Kluwer Academic Publishers, 1992.

Unit-4: Charles P. Poole and Frank J Owens. *Introduction to nanotechnology*. Wiley Interscience, 2003.

Unit-5: [Tapan Chatterji](#). *Colossal Magnetoresistive Manganites*. Kluwer Academic Publishers. 2004.

References for further study:

1. [Mel Schwartz](#). *Encyclopedia of Smart Materials Set. (1200 pages)* John Wiley & Sons 2001.
2. [Zhong Lin Wang](#), [Z. C. Kang](#). *Functional and Smart Materials: Structural Evolution and Structure Analysis* Plenum press. 1998.
3. [Ahsan Hariz](#) , [Vijay K. Varadan](#), [Olaf Reinhold](#). *Smart Materials, Structures, & Integrated Systems*. The International Society for Optical Engineering, 1997.
4. [Alan R. Wilson](#), [Hiroshi Asanuma](#). *Smart Materials*. The International Society for Optical Engineering, 2001.
5. [Janet M. Sater](#), [Manfred Wuttig](#). *Smart Materials Technologies*. The International Society for Optical Engineering; 1998.
6. [Malcolm E. Lines](#), [Alastair M. Glass](#). *Principles and Applications of Ferroelectrics and Related Materials*. Oxford university press; 2001.
7. [Elbio Dagotto](#), [G. Alvarez](#), [S. L. Cooper](#), [A. L. Cornelius](#), [A. Feiguin](#), [J. Fernandez-Baca](#), [D. Gibbs](#), [J. P. Hill](#), [T. Hotta](#). *Nanoscale Phase Separation and Colossal Magnetoresistance*. Springer Verlag. 2003.
8. G Manson; N Parkes; G R Tomlinson; K Worden; W A Bullough; W J Staszewski, (2002) *Smart Technology Demonstrators and Devices* IOP Publishing.
9. Inoue, A., Hashimoto, K. (Eds.) (2001). *Amorphous and Nanocrystalline Materials: Preparation, Properties, and Applications* Springer Verlag.
10. *Sensors and Their Applications XII* (2003). IOP Publishing, U.K.
11. C. M. Friend (Editor). *Smart Materials and Structures*. Chapman and Hall, 1998.

UID 221 - INSTRUMENTAL METHODS OF ANALYSIS
(Offered by Department of Chemistry)

UNIT I

Electromagnetic radiation – different regions, their wavelengths, frequencies and energies. interaction of electromagnetic radiations with matter – atomic, molecular, electronic interaction. Basic principles of spectroscopy – emission and absorption of radiation. Radiation sources, detectors.

UNIT II

Molecular spectra – UV-visible spectroscopy - principle – UV-visible spectrophotometers – instrumentation techniques. IR spectroscopy – principle, single and double beam IR spectrophotometers – instrumentation techniques.

UNIT III

Nuclear magnetic resonance spectroscopy – basic principles and instrumentation techniques. Principles of ion optics – ion sources, single focusing and double focusing mass spectrometers – principles and instrumentation techniques.

UNIT IV

X-ray fluorescence spectrometry - basic principles and instrumentation techniques. Flame emission and atomic absorption spectroscopy - basic principles and instrumentation techniques.

UNIT V

Electrochemical methods – conductometry, potentiometry, pH meter - principles and instrumentation. Principles of gas and liquid chromatography – gas chromatograph and HPLC - instrumentation.

Text book

1. H.H. Willard, L.L. Merit, J.A. Dean and F.A. Settle, Instrumental methods of analysis, 7 th edition, CBS Publishers and Distributors, New Delhi, 1986.

Reference books

1. D.A. Skoog and D.M. West, Principles of Instrumental Analysis, 2 nd edition, Holt-Saunders, 1980.
2. Brain S. Furniss, Antony J. Hannaford, Peter W.G. Smith and Austin R. Tatchel, Vogel's Text book of Practical Organic Chemistry, 5 th edition, ELBS-Longman, 1996.

UID 222 - CERAMIC TECHNOLOGY

(Offered by Department of Chemistry)

Unit I

Nature of ceramic materials-crystalline ceramic materials-silicates and clay minerals and spinal structures-polymorphic transformations-glass and non-crystalline phases-structure and composition of glass-surface and interface-wetting and phase distribution.

Unit II

Ceramic raw materials-clay materials-silicate and silicate minerals-synthetic raw materials-oxide (like Al_2O_3 , ZrO_2 , TiO_2 , MgO) and non-oxide (like Si_3N_4 , AlN , BN , SiC) raw materials. Synthetic techniques-sol-gel processing, liquid-phase reaction and hydrothermal synthesis.

Unit III

Processing of ceramics-powder pressing, extrusion, slip casting, firing-thermal treatment procedure-drying, sintering, annealing-viscosity based transition points in glass-glass forming methods, glass-ceramics.

Unit IV

An outline of ceramic equilibrium diagrams-one component (SiO_2) two component (Al_2O_3 , Cr_2O_3 , MgO-CaO , $\text{MgO-Al}_2\text{O}_3$, Al_2O_3 , SiO_2 , $\text{Al}_2\text{O}_3\text{-BeO}$) and qualitative ideas of methods of representation of three component diagrams-Nucleation-grain growth.

Unit V

Mechanical properties of ceramic materials-elastic properties and strength-Griffith's theory-plastic and viscous deformations-strengthening of glass. Thermal properties-thermal expansion, heat capacity and thermal conductivity-thermal stresses.

Text Books:

14. L.H. Van Vlack, Physical Ceramics for Engineers, Addison Wesley, 1964.
15. F.H. Norton, Elements of Ceramics, Addison Wesley, 1974.

Reference Books:

1. W.D. Kingery, H.K. Bowen, D.R. Uhlmann, Introduction to Ceramics, 2nd edition, John Wiley & Sons, 1991.
2. D. Ganguli and M. Chatterjee, Ceramic powder preparation: A handbook, Kluwer Academic Publishers, 1997.
3. David Segal, Chemical Synthesis of advanced ceramic materials, Cambridge University Press, 1989.
4. W. D. Kingery, Ceramic Fabrication Process, John Wiley 1960.