ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

M.TECH
ELECTRONICS & INSTRUMENTATION

(Applicable for the batches admitted from 2013-14)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
KUKATPALLY, HYDERABAD – 500 085.

ACADEMIC REGULATIONS R13 FOR M. TECH. (REGULAR) DEGREE COURSE

Applicable for the students of M. Tech. (Regular) Course from the Academic Year 2013-14 and onwards

The M. Tech. Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the program and who fulfil all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.

Admissions shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test conducted by the University or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Govt. from time to time.

2.0 AWARD OF M. TECH. DEGREE

2.1 A student shall be declared eligible for the award of the M. Tech. Degree, if he pursues a course of study in not less than two and not more than four academic years. However, he is permitted to write the examinations for two more years after four academic years of course work.

2.2 A student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the year of his admission, shall forfeit his seat in M. Tech. course.

2.3 The student shall register for all 88 credits and secure all the 88 credits.

2.4 The minimum instruction days in each semester are 90.

3.0 A. COURSES OF STUDY

The following specializations are offered at present for the M. Tech. course of study.

1. Advanced Manufacturing Systems
2. Aerospace Engineering/ Aeronautical Engineering
3. Automation
4. Biomedical Signal Processing and Instrumentation
5. Bio-Technology
6. CAD/CAM
7. Chemical Engineering
8. Communication Systems
9. Computer Networks
10. Computer Networks and Information Security
11. Computer Science
12. Computer Science and Engineering
13. Computers and Communication Engineering.
14. Construction Management
15. Control Engineering
16. Control Systems
17. Cyber Forensic / Cyber Security & Information Technology
18. Design for Manufacturing/ Design and Manufacturing
19. Digital Electronics and Communication Engineering.
20. Digital Electronics and Communication Systems
21. Digital Systems and Computer Electronics
22. Electrical Power Engineering
23. Electrical Power Systems
24. Electronics & Instrumentation

25. Electronics and Communication Engineering
26. Embedded Systems
27. Embedded Systems and VLSI Design
28. Energy Systems
29. Engineering Design
30. Environmental Engineering
31. Geoinformatics and Surveying Technology
32. Geotechnical Engineering.
33. Heating Ventilation & Air Conditioning.
34. Highway Engineering
35. Image Processing
36. Industrial Engineering and Management
37. Information Technology
38. Infrastructure Engineering
39. Machine Design
40. Mechatronics.
41. Microwave & Radar Engineering
42. Nano Technology
43. Neural Networks
44. Parallel Computing
45. Power and Industrial Drives
46. Power Electronics
47. Power Electronics and Electrical Drives
48. Power Engineering and Energy Systems
49. Power Plant Engineering & Energy Management
50. Power System Control and Automation
51. Power System with Emphasis H.V. Engineering / H.V. Engineering
52. Production Engineering.
53. Real Time Systems
54. Software Engineering
55. Structural Engineering
56. Systems & Signal Processing
57. Thermal Engineering.
58. Transportation Engineering
59. VLSI
60. VLSI and Embedded System/ Electronics Design Technology
61. VLSI Design
62. VLSI System Design
63. Web Technologies
64. Wireless and Mobile Communication

and any other course as approved by the University from time to time.

3.0 B. Departments offering M. Tech. Programmes with specializations are noted below:

Civil Engg.	Construction Management Environmental Engineering Geoinformatics and Surveying Technology Geotechnical Engineering Highway Engineering Infrastructure Engineering Structural Engineering Transportation Engineering
EEE	Control Engineering Control Systems Electrical Power Engineering Electrical Power Systems Power and Industrial Drives Power Electronics Power Electronics and Electrical Drives Power Engineering and Energy Systems Power Plant Engineering & Energy Management Power System Control and Automation Power System with Emphasis H.V. Engineering / H.V. Engineering
ME	Advanced Manufacturing Systems Automation CAD/CAM Design for Manufacturing/ Design and Manufacturing Energy Systems Engineering Design Heating Ventilation & Air Conditioning Industrial Engineering and Management Machine Design Mechatronics. Power Plant Engineering & Energy Management Production Engineering Thermal Engineering.
ECE	Biomedical Signal Processing and Instrumentation Communication Systems Computers and Communication Engineering. Digital Electronics and Communication Engineering. Digital Electronics and Communication Systems Digital Systems and Computer Electronics Electronics & Instrumentation Electronics and Communication Engineering Embedded Systems Embedded Systems and VLSI Design

	Microwave & Radar Engineering Systems & Signal Processing VLSI VLSI and Embedded System/ Electronics Design Technology VLSI Design VLSI System Design Wireless and Mobile Communication
CSE	Computer Networks Computer Networks and Information Security Computer Science Computer Science and Engineering Cyber Forensic / Cyber Security & Information Technology Image Processing Information Technology Neural Networks Parallel Computing Real Time Systems Software Engineering Web Technologies
Aeronautical Engg.	Aerospace Engineering / Aeronautical Engineering
Bio-technology	Bio-Technology
Chemical Engg.	Chemical Engineering
Nano Technology	Nano Technology

4.0 ATTENDANCE

The programs are offered on a unit basis with each subject being considered a unit.

4.1 A student shall be eligible to write University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

4.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester shall be granted by the College Academic Committee.

4.3 Shortage of Attendance below 65% in aggregate shall not be condoned.

4.4 Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class and their registration shall stand cancelled.

4.5 A prescribed fee shall be payable towards condonation of shortage of attendance.

4.6 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

4.7 A candidate shall put in a minimum required attendance at least in three (3) theory subjects in the present semester to get promoted to the next semester. In order to qualify for the award of the M. Tech. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

4.8 A student shall not be promoted to the next semester unless he satisfies the attendance requirements of the previous semester including the days of attendance in sports, games, NCC and NSS activities.

5.0 EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Internal Evaluation and End Semester Examination.

5.1 For the theory subjects 60 marks shall be awarded based on the performance in the End Semester Examination and 40 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction. Each mid term examination shall be conducted for a total duration of 120 minutes with Part A as compulsory question (16 marks) which consists of four sub-questions and carries 4 marks each and Part B with 3 questions to be answered out of 5 questions each question for 8 marks. If any candidate is absent from any subject of a mid-term examination, an on-line test will be conducted for him by the University. The details of the Question Paper pattern for End Examination (Theory) is given below:

- The End semesters Examination will be conducted for 60 marks which consists of two parts viz. i).Part-A for 20 marks, ii). Part –B for 40 marks.
- Part-A is compulsory question where it consists of five questions one from each unit and carries four marks each. This will be treated as Question 1.
- Part-B consists of five Questions (numbered from 2 to 6) carries 8 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer only one question)

5.2 For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations and 40 marks shall be awarded based on the day-to-day performance as Internal Marks.

5.3 There shall be two seminar presentations during I year I semester and II semester. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Departmental Academic Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each Seminar there will be only internal evaluation of 50 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

5.4 There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the students' understanding of various subjects he has studied during the M. Tech. course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive Viva-Voce.

5.5 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

5.6 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.5) he has to reappear for the End semester Examination in that subject. A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and so has failed in the end examination. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt stand cancelled.

5.7 In case the candidate secures less than the required attendance in any subject, he shall not be permitted to write the End Examination in that subject. He shall re-register the subject when next

offered.

5.8 Laboratory examination for M. Tech. courses must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be another Laboratory Teacher.

6.0 EVALUATION OF PROJECT/DISSERTATION WORK

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

6.1 A Project Review Committee (PRC) shall be constituted with Principal as Chairperson, Heads of all the Departments offering the M. Tech. programs and two other senior faculty members.

6.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.

6.3 After satisfying 6.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the Departmental Academic Committee for approval. Only after obtaining the approval of the Departmental Academic Committee can the student initiate the Project work.

6.4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Departmental Academic Committee. However, the Departmental Academic Committee shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

6.5 A candidate shall submit his status report in a bound-form in two stages at least with a gap of 3 months between them.

6.6 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of theory and practical course with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Principal through Head of the Department and make an oral presentation before the PRC.

6.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College/ School/Institute.

6.8 The thesis shall be adjudicated by one examiner selected by the University. For this, the Principal of the College shall submit a panel of 5 examiners, eminent in that field, with the help of the guide concerned and head of the department.

6.9 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is unfavourable again, the thesis shall be summarily rejected.

6.10 If the report of the examiner is favourable, Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work as one of the following:

A. Excellent

B. Good

C. Satisfactory

D. Unsatisfactory

The Head of the Department shall coordinate and make arrangements for the conduct of Viva- Voce examination.

If the report of the Viva-Voce is unsatisfactory, the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva- Voce examination, he will not be eligible for the award of the degree.

7.0 AWARD OF DEGREE AND CLASS

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not less than 50%
Pass Class	Below 50% but not less than 40%

The marks in internal evaluation and end examination shall be shown separately in the memorandum of marks.

8.0 WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

9.0 TRANSITORY REGULATIONS

9.1 Discontinued, detained, or failed candidates are eligible for admission to two earlier or equivalent subjects at a time as and when offered.

9.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per R13 academic regulations.

10. GENERAL

10.1 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

10.2 The academic regulation should be read as a whole for the purpose of any interpretation.

10.3 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

10.4 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/ year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show cause notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.TECH - ELECTRONICS & INSTRUMENTATION

COURSE STRUCTURE AND SYLLABUS

I Year I Semester

Code	Group	Subject	L	P	Credits
		Transducer Technology	3	-	3
		Real Time and Embedded Systems	3	-	3
		Design and Analysis of Signal Conditioning Circuits	3	-	3
		CPLD & FPGA Architectures & Applications	3	-	3
	Elective –I	Advanced Process Control Instrumentation Artificial Intelligence Optimal Control systems	3	-	3
	Elective -II	Biomedical Signal & Image Processing Image & Video processing Wireless Sensor Networks	3	-	3
	Lab	Instrumentation Laboratory	-	3	2
		Seminar	-	-	2
		Total Credits	18	3	22

I Year II Semester

Code	Group	Subject	L	P	Credits
		Data Acquisition System	3	-	3
		Quality & Reliability Engineering in Electronic System	3	-	3
		Robotics Design and Control	3	-	3
		Virtual Instrumentation	3	-	3
	Elective –III	Industrial Instrumentation System on Chip Architectures Advanced Digital Signal Processing	3	-	3
	Elective -IV	PLC & its Applications Fiber Optic and Laser Instrumentation MEMS & Applications	3	-	3
	Lab	Virtual Instrumentation Laboratory	-	3	2
		Seminar	-	-	2
		Total Credits	18	3	22

II Year - I Semester

Code	Group	Subject	L	P	Credits
		Comprehensive Viva	-	-	2
		Project Seminar	-	3	2
		Project work	-	-	18
		Total Credits	-	3	22

II Year - II Semester

Code	Group	Subject	L	P	Credits
		Project work and Seminar	-	-	22

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –I Sem (EIE)

TRANSDUCER TECHNOLOGY

Unit – I :

Introduction to Measurement Systems

General concepts and terminology, measurement systems, sensor classification, static characteristics of measurement systems-accuracy, linearity, resolution, precision and sensitivity etc. estimation of errors. Dynamic characteristics of measurement systems. Zero-order first-order and second-order measurement systems and response.

Unit – II :

Measuring devices:

Displacement

Resistive Potentiometer, Resistive strain gauges inductive displacement transducer, Capacitive Displacement Transducers, Piezo Electric Transducers, Ultrasonic Methods.

Temperature

Thermal expansion methods, Thermo electric, radiation methods-thermal and photon detectors based thermometers.

Unit – III:

Measuring devices:

Pressure

Methods of pressure measurement: Dead weight gauges and manometers, elastic transducers, high pressure measurement.

flow

Anemometers, velocity sensors obstruction meters, averaging Pitot tubes, Rota meters, Electromagnetic, Vortex shedding, Ultrasonic Flow meters.

Unit – IV :

Measuring devices

Velocity and acceleration:

Seismic displacement, velocity and acceleration pickups (Accelerometers). Gyroscopic angular displacement and velocity sensors.

Force and Torque:

Methods of force measurement and characteristics, Bonded strain gauge, Variable Reluctance, Piezo Electric Transducer, Torque measuring on rotating shafts.

Unit – V:

Measuring devices

Humidity, Density and Radiation measurement

Capacitive Impedance and Piezoelectric Hygrometers.

Differential Pressure, U-tube and ultrasonic Densitometers. pH measurement: Ion Selective Type.

Radiation Fundamentals-Radiation Detectors-Radiation Thermometers. Optical Pyrometers.

Digital Sensors

Position encodes, variable frequency sensors-quartz digital thermometer, SAW sensors, digital flow meters, sensors based on semiconductor junctions: thermometers based on semiconductor junctions, magneto diodes and magneto transistors, photodiodes and phototransistors, charge-coupled sensors.

Text Books:

1. Measurement Systems, E.O. Doeblin, Mc-Graw Hill Publication
2. Transducers and Instrumentation, D.V.S. Murthy, PHI Publication
3. Sensors & Transducers, D. Patranbis, Wheeler Publishing
4. Sensor Technology Handbook - Jon S. Wilson, Elsevier Publications

References:

1. Instrument transducers, H.K.P Neubert, Oxford University Press.
2. Process Measurement and Analysis, B.G. Liptak, ISA Publication IVth edition
3. A Text Book of Mechanical Measurements and Instrumentation, A.K. Sawhney.
4. Mechanical Measurements, E.O. Doeblin, Mc-Graw Hill Publication.
5. Transducer Engineering, Ranganathan.S, Allied Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –I Sem (EIE)

REAL TIME AND EMBEDDED SYSTEMS

Unit-I :

Introduction

Embedded systems overview, design challenge, processor technology, IC technology, Design Technology, Trade-offs. Single purpose processors RT-level combinational logic, sequential logic (RT-level), custom single purpose processor design (RT-level), optimizing custom single purpose processors.

General Purpose Processors

Basic architecture, operation, Pipelining, Programmer's view, development environment, Application Specific Instruction-Set Processors (ASIPs) – Micro Controllers and Digital Signal Processors.

Unit-II:

State Machine and Concurrent Process Models

Introduction, models Vs. languages, finite state machines with data path model (FSMD), using state machines, program state machine model (PSM), concurrent process model, concurrent processes, communication among processes, synchronization among processes, implementation, data flow model, real-time systems.

Communication Interface

Need for communication interfaces, RS232 / UART, RS422 / RS485, USB, Infrared, IEEE 1394 Firewire, Ethernet, IEEE 802.11, Blue tooth.

Unit-III :

Introduction to RTOS

Architecture of the Kernel, Tasks and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message Queues, Event Registers, Pipes, Signals

Basic Design Using RTOS

Principles, Semaphores and Queues, Hard real time scheduling considerations, Saving memory and power an example RTOS like µC – OS (Open Source) Embedded S/W Development tools.

Unit-IV :

Real Time Operating Systems

Timers, Memory Management, Priority inversion problem, Embedded operating systems Embedded Linux, Real-time operating systems, RT Linux, Handheld operating systems, Windows CE.

Unit-V :

Design Technology

Introduction, Automation, Synthesis, Parallel evolution of compilation and synthesis, Logic Synthesis, RT synthesis, Behavioral Synthesis, Systems Synthesis and Hardware/ Software Co-Design, Verification, Hardware/Software co-simulation, Reuse of intellectual property codes.

TEXT BOOKS

1 Embedded System Design – A Unified Hardware/Software Introduction – Frank Vahid, Tony D. Givargis, John Wiley, 2002.

2. Embedded / Real Time Systems – KVKK Prasad, Dreamtech Press, 2005.

REFERENCES

1 Embedded Microcomputer Systems – Jonathan W. Valvano, Brooks/Cole, Thompson Learning.

2. An Embedded Software Primer – David E. Simon, Pearson Ed., 2005.

3. Introduction to Embedded Systems – Raj Kamal, TMH, 2002.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –I Sem (EIE)

DESIGN AND ANALYSIS OF SIGNAL CONDITIONING CIRCUITS

Unit-I

CLASSIFICATION OF INSTRUMENT TRANSDUCERS

Input characteristics, output characteristics, Electromechanical coupling characteristics-Electromechanical analogies, unified theory of bilateral electromechanical transducers, Basic two-port equations, Ideal transducers, Real transducers, generalized performance analysis of bilateral electromechanical transducers, The transducer constants: Feedback systems.

UNIT-II:

SIGNAL CONDITIONING FOR RESISTIVE SENSORS: measurement of resistance, voltage dividers, Wheatstone bridge. Balance and deflection measurements, sensor bridge calibration and compensation instrumentation amplifiers, interference types and reduction

UNIT-III:

SIGNAL CONDITIONING FOR REACTANCE VARIATION SENSORS:

problems and alternatives, ac bridges, carrier amplifiers - application to the LVDT, variable oscillators, resolver-to-digital and digital-to-resolver converters

UNIT-IV:

SIGNAL CONDITIONING FOR SELF-GENERATING SENSORS: chopper and low-drift amplifiers, offset and drifts, amplifiers- electrometer amplifiers, charge amplifiers, noise in amplifiers

UNIT-V:

DIGITAL SENSORS: position encoders, variable frequency sensors - quartz digital thermometer, vibrating wire strain gages, vibrating cylinder sensors, saw sensors, digital flow meters, Sensors based on semiconductor junctions: thermometers based on semiconductor junctions, magneto diodes and magneto transistors, photodiodes and phototransistors, sensors based on MOSFET transistors, charge-coupled sensors - types of CCD imaging sensors, ultrasonicbased sensors, fiber-optic sensors

TEXT BOOKS:

1. Instrument Transducers, an introduction to their performance and design – Hermann K P Neubert. Oxford Publishers, 2nd edition.

2. Sensors and Signal Conditioning: Ramon Pallás Areny, John G. Webster; 2nd edition, John Wiley and Sons, 2000.

REFERENCES:

1. Sensor Technology Handbook – Jon Wilson, Newne 2004.
2. Measurement System: Applications and Design – by E.O. Doeblin, McGraw Hill Publications.
3. Process Control Instrumentation Technology – D. Johnson, John Wiley and Sons
4. Sensors and Transducers – D.Patranabis, TMH 2003

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –I Sem (EIE)

CPLD AND FPGA ARCHITECTURES AND APPLICATIONS

UNIT –I:

Programmable Logic

ROM, PLA, PAL PLD, PGA – Features, programming and applications using complex programmable logic devices Altera series – Max 5000/7000 series and Altera FLEX logic-10000 series CPLD, AMD's- CPLD (Mach 1to 5), Cypress FLASH 370 Device technology, Lattice PLST's architectures – 3000 series – Speed performance and in system programmability.

UNIT –II:

FPGAs

Field Programmable gate arrays- Logic blocks, routing architecture, design flow technology mapping for FPGAs, Case studies XILINX's XC4000 & ALTERA's FLEX 8000/10000 FPGAs: AT &T ORCA's (Optimized Reconfigurable Cell Array): ACTEL's ACT-1,2,3 and their speed performance

UNIT-III:

State Machines

One–hot state machine, petrinetes for state machines-basic concepts, properties, extended petrinetes for parallel controllers, Traffic Light Controller, Electrical Aspects of CMOS FPGAs.

UNIT -IV:

Design Process Flows and Software Tools

Design Process Flows and Software Tools-The Software Toolbox, The FPGA Design Dichotomy, Design Process Flow, Design Process Flow: The Application Specific Integrated Circuit Route, Libraries and Design Idioms, Placement, Routing and Wireability.

UNIT –V:

Case Studies

Case studies of parallel adder cell parallel adder sequential circuits, counters, multiplexers, parallel controllers.

TEXT BOOKS:

1. Field Programmable Gate Array Technology - S. Trimberger, Edr, 1994, Kluwer Academic Publications.
2. Field Programmable Gate Arrays, John V.Oldfield, Richard C Dore, Wiley Publications.

REFERENCE BOOKS:

1. Digital Design Using Field Programmable Gate Array, P. K. Chan & S. Mourad, 1994, Prentice Hall.
2. Digital System Design using Programmable Logic Devices – Parag. K. Lala, 2003, BSP.
3. Field Programmable Gate Array, S. Brown, R. J. Francis, J. Rose, Z. G. Vranesic, 2007, BSP.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –I Sem (EIE)

ADVANCED PROCESS CONTROL INSTRUMENTATION

(ELECTIVE-I)

UNIT – I

Process Dynamics

Process variables – Load variables – Dynamics of simple pressure, flow, level and temperature process – interacting and non-interacting systems – continuous and batch process – self-regulation – Servo and Regulator operation - problems.

UNIT – II

Control Actions and Controllers and Types of Controllers

Basic control actions – characteristics of two position, three position, Proportional, Single speed floating, Integral and Derivative control modes – PI, PD, PID control modes – Problems -types of controllers - Pneumatic, Hydraulic and Electronic Controllers t o realize various control actions.

UNIT – III

Controller Settings and Tuning of Controllers

Evaluation criteria – 1/4th decay ratio, I AE, ISE,ITSE, ITAE - determination of optimum settings for mathematically described process using time response and frequency response-tuning of controllers- process curve reaction method – continuous oscillation method – damped oscillation method – problems.

UNIT – IV

Final Control Elements and Control Valves

I/P Converter , P/I converter - pneumatic, electric and hydraulic actuators – valve Positioned -Control valves – characteristic of control valves – valve body – Globe, Butterfly, diaphragm, Ball valves – Control valve sizing – Cavitations, flashing - problems.

UNIT – V

Multiloop Control System

Feed forward control – Ratio control – Cascade control – Split range – Multivariable control and examples from distillation column, Boiler system and heat exchanger. Plantwide control issues, Hypothetical plant for plantwide control studies, internal feedback for material and energy, Interaction of plant design and control system design, Systematic Procedure for plantwide control system design – Case Study: The Reactor/ Flash Unit plant, effect of control structure on Closed loop performance.

Text Books

1. Chemical Process Control : An introduction to Theory and Practice – by Stephanopoulos, Prentice Hall, New Delhi, 1999.
2. Process Control – Harriott P. , TMH, 1991
3. Process Control Instrumentation technology by Curtis.D.Johnson,Edition 8,PHI Publishers

References

1. Process Control, Third Edition – Liptak B.G., Chilton Book Company, Pennsylvania, 1995
2. Process control – by Pollard A., Heinemann Educational Books, London, 1971.
3. Automatic Process Control – by Eckman D.P. , Wiley Eastern Ltd., New Delhi, 1993.
4. Process Control – by Patranabis.
5. Process System Analysis and Control – Coughanowr, McGraw Hill, Singapore, 1991
6. Process dynamics and control, second edition by Dale E. Seborg. Seborg, Thomas.F.Edga, Duncan.A. Mellichamp, Published by John Wiley & Sons.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –I Sem (EIE)

ARTIFICIAL INTELLIGENCE

(ELECTIVE-I)

UNIT-I

Introduction, History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications

Problem Solving - State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem, Exhaustive Searches, Heuristic Search Techniques, Iterative-Deepening A*, Constraint Satisfaction

Game Playing, Bounded Look-ahead Strategy and use of Evaluation Functions, Alpha-Beta Pruning

UNIT-II

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames

UNIT-III

Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and Tools

Uncertainty Measure - Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster-Shafer Theory

UNIT-IV

Machine-Learning Paradigms: Introduction. Machine Learning Systems. Supervised and Unsupervised Learning. Inductive Learning. Learning Decision Trees (Text Book 2), Deductive Learning. Clustering, Support Vector Machines.

Artificial Neural Networks: Introduction, Artificial Neural Networks, Single-Layer Feed-Forward Networks, Multi-Layer Feed-Forward Networks, Radial-Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks

UNIT-V

Advanced Knowledge Representation Techniques: Case Grammars, Semantic Web

Natural Language Processing: Introduction, Sentence Analysis Phases, Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal Networking Knowledge

Text Books:

1. Saroj Kaushik. Artificial Intelligence. Cengage Learning. 2011
2. Russell, Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Second Edition. 2004

References:

1. Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –I Sem (EIE)

OPTIMAL CONTROL SYSTEMS

(ELECTIVE-I)

UNIT-I:

Optimal control law, the principal of optimality, application of their optimality principle to decision making, an optimal control system. Recurrence relation of dynamic programming, computational procedure for solving control problem, characteristics of dynamic programming solution.

UNIT-II:

Discrete linear regulator problem. Hamilton –jocobi-bellman equation. Continuous linear regulator problems, necessary and sufficient conditions examples. The calculus of variations & Pontrygin's minimum principle**:** Fundamental concepts, functional of a single function, functional involving several independent functions, necessary conditions for optimal control, linear regulator problem.

UNIT-III:

Pontrygin's minimum principle and state inequality constrains, minimum time problems, minimum control effort problems. Iterative numerical techniques for finding optimal controls and trajectories**:** Two point boundary value problems, method of steepest descent algorithm, variation of extremalas, variation of extremal algorithm, gradient projection algorithm

UNT-IV:

The nature of the state estimation problem, non-statistical estimation design with full estimator dimension, non-statistical estimation with reduced estimator design.

UNIT-V:

Description of plants noise statistics, statement of optimal estimation problem, information of the optimal estimation problem as an optimal regulator problem, solution to the regulator problem in feedback form, explicit solution of the optimal estimation problem.

TEXT BOOKS:

1. Jasbir S. Arora, Introduction to optimum design, Elesevier, 2005.
2. A Ravindran, K.M. Ragsdell, and G.V. Reklaitis, Engineering optimization: Methods and applications, Wiley India Edition.
3. Donald E.Kirk, Optimal Control Theory an Introduction, Prentice - Hall Network series - First edition, 1970.

REFERENCE BOOKS:

1. D.S. Naidu, Optimal control systems, CRC Press, First edition, 2002.
2. Arturo Locatelli, Optimal control: An Introduction, Birkhauser Verlag, 2001.
3. S.H.Zak, Systems and Controll, Indian Edition , Oxford University, 2003.
4. Niclas Anreasson, Anton Evgrafov and Michael Patriksson, An introduction to continuous optimization, Overseas Press (India) Pvt. Ltd.
5. Optimal control systems-A.P. Sage
6. Optimal Theory and application –Dr.S.S.Rao-eastern Willy- First Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –I Sem (EIE)

BIOMEDICAL SIGNAL AND IMAGE PROCESSING

(ELECTIVE-II)

UNIT-I:

Random Processes

Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth and noise figure of systems.

Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DICOM Standards

UNIT-II:

Cardiological Signal Processing: Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia Detection Algorithms, Automated ECG Analysis, ECG Pattern Recognition.

Adaptive Noise Cancelling: Principles of Adaptive Noise Cancelling, Adaptive Noise Cancelling with the LMS Adaptation Algorithm, Noise Cancelling Method to Enhance ECG Monitoring, Fetal ECG Monitoring.

UNIT-III:

Signal Averaging, Polishing – Mean and trend removal, Prony's method, Prony's Method based on the Least Squares Estimate, Linear prediction, Yule – Walker (Y –W) equations, Analysis of Evoked Potentials.

UNIT-IV:

Fundamentals of Image Processing and Image Transforms

Basic steps of Image Processing System Sampling and Quantization of an image, Basic relationship between pixels.

Image Segmentation

Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region based segmentation.

UNIT-V:

Image Enhancement

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

Image Compression

Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy & Lossless, Huffman coding, , Bit plane coding, Transform coding, Predictive coding, Wavelet coding, Lossy Predictive coding, JPEG Standards.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, 4th Ed., 2009, TMH.
2. Biomedical Signal Processing- Principles and Techniques - D. C. Reddy, 2005, TMH.
3. Digital Image Processing – Gonzaleze and Woods, 3rd ed., Pearson.

REFERENCE BOOKS:

1. Digital Bio Dignal Processing - Weitkunat R, 1991, Elsevier.
2. Biomedical Signal Processing - Akay M , IEEE Press.
3. Biomedical Signal Processing -Vol. I Time & Frequency Analysis - Cohen.A, 1986, CRC Press.
4. Biomedical Digital Signal Processing: C-Language Experiments and Laboratory Experiments, Willis J.Tompkins, PHI.
5. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –I Sem (EIE)

IMAGE AND VIDEO PROCESSING

(ELECTIVE-II)

UNIT –I:

Fundamentals of Image Processing and Image Transforms

Basic steps of Image Processing System Sampling and Quantization of an image, Basic relationship between pixels.

Image Segmentation

Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region based segmentation.

UNIT –II:

Image Enhancement

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

UNIT –III:

Image Compression

Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy & Lossless, Huffman coding, , Bit plane coding, Transform coding, Predictive coding, Wavelet coding, Lossy Predictive coding, JPEG Standards.

UNIT -IV:

Basic Steps of Video Processing

Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

UNIT –V:

2-D Motion Estimation

Optical flow, General Methodologies, Pixel Based Motion Esimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

1. Digital Image Processing – Gonzaleze and Woods, 3rd ed., Pearson.
2. Video Processing and Communication – Yao Wang, Joem Ostermann and Ya–quin Zhang. 1st Ed., PH Int.

REFRENCE BOOKS:

1. Digital Video Processing – M. Tekalp, Prentice Hall International
2. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –I Sem (EIE)

WIRELESS SENSOR NETWORKS

(ELECTIVE-II)

Unit I:

Introduction

Unique constraints and challenges, advantages of Sensor Networks, Sensor Network Applications, Collaborative Processing, Overview and applications of Wireless Sensor Networks, Basic Wireless Sensor Technology-Sensor Node Technology, Sensor Taxonomy, WN operating Environment, WN trends. Radio Propagation primer.

Unit II:

MAC protocols for Wireless Sensor Networks

Introduction, Background, Fundamentals of MAC protocols, MAC protocols for WSNs, Sensor-MAC case study, IEEE 802.15.4 LR-WPANs standard case study.

Unit III:

Routing protocols for Wireless Sensor Networks

Introduction, background, Data dissemination and gathering, routing challenges and design issues, routing strategies in wireless sensor networks.

Networking Sensors

Key assumptions, Medium Access Control, General Issues, Geographic, Energy-Aware Routing, Attribute-based Routing.

Unit IV:

Transport Control protocols for Wireless Sensor Networks

Traditional Transport control protocols, Transport protocol design issues, Examples of existing transport control protocols, performance of transport control protocols.

Performance and Traffic Management

Introduction, background, WSN Design Issues, Performance Modeling of WSNs, Case Study-Simple computation of the system life span.

Unit V:

Network Management for Wireless Sensor Networks

Introduction, Network management requirements, traditional network management models, network management design issues, MANNA, Naming and Localization.

Operating Systems for Wireless Sensor Networks

Introduction, operating system design issues, Examples of operating systems-TinyOS, Mate, MagnetOS, MANTIS, OSPM, EYES OS, SenOS, EMERALDS, PicOS.

Text Books:

1. Wireless Sensor Networks- Technology, protocols and applications, Kazem Sohraby, Daniel Minoli and Taieb Znati, Wiley Student Edition.
2. Wireless Sensor Networks-An Information processing approach, Feng Zhao, Leonidas Guibas, Morgan Kaufmann publications, 2004.

Reference Books:

1. Adhoc Mobile Wireless Networks-Principles, Protocols and Applications, Subir kumar Sarkar, T G Basavaraju and C Puttamadappa, Auerbach Publications, Taylor & Francis group.
2. Adhoc Wireless Networks-Architectures and Protocols, C. Siva Ram Murthy and B.S. Manoj, Pearson Education.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –I Sem (EIE)

INSTRUMENTATION LABORATORY

(Minimum of 12 experiments should be conducted)

1. Measurement of strain using strain gauge
2. LVDT – characteristics
3. Piezoelectric transducers
4. Accelerometers
5. Stroboscope – measurement of RPM & Gyroscope – measurement of Torque
6. Measurement of Density and Viscosity of Fluid
7. Flow measurement of liquid using Ultrasonic Doppler effect
8. PID pressure controller
9. Multi loop control systems – Ratio control
10. Multi loop control systems – Cascade Control
11. pH meter
12. Flame Photometer
13. Chromatography
14. UV-VIS Spectrophotometer
15. FTIR spectrophotometer

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –II Sem (EIE)

DATA ACQUISITION SYSTEM

Unit-I :

Data Loggers and Data Acquisition Systems: Data acquisition systems-configurations components, analog multiplexes and sample and hold circuits-specifications and design considerations.

DACs: specifications – characteristics, types of DACs (serial, parallel, direct and indirect). Hybrid and monolithic DACs.

ADCs: specifications – characteristics, types of ADCs (serial, parallel, direct and indirect). Hybrid and monolithic ADCs,. sigma – delta ADCs', Hybrid DAS – Schematic diagram – configurations – specifications

Unit-II:.

Error Budget of DACs and ADCs: Error sources, error reduction and noise reduction techniques in DAS. Error budget analysis of DAS. Case study of a DAC and an ADC.

Data Acquisition Hardware and Software: Specifications of Hardware-IO analog signal range, gain for analog input and resolution in ADC converter, resolute\ion in DAC and counter chips, sampling frequency and maximum update rates, triggering capacity. Digital lines and ports, data acquisition VIs.

Unit-III:

Distributed and stand alone data loggers: Introduction, methods of operation-programming and logging data using PCMCIA cards, standard alone operation-direct and remote connection to the host PC, stand alone logger/controller hardware interface – RS232C, RS485 standard, communication bottlenecks and system performance, using Ethernet to connect data loggers.

Unit-IV:

IEEE 488 standard: Introduction, characteristics, physical connection configurations, device types, bus structure, GPIB hand shake, device communication, IEEE 488.2, standard commands for programmable instruments.

Display systems- CRT displays, LCD Flat panel displays, Digital storage CROs, Plasma displays, Projection systems.

Unit-V:

Recorders- Basic recording system, general considerations for electronic amplifiers used for recording. Direct strip-chart recording. Servo type recorders, Potentiometric (or null), X-T and X-Y recorders, Digital memory waveform recorders.

Text Books:

1. Users Handbook of D/A & A/D Converters, E.R. HNATEK
2. Electronic Analog/Digital converters, H.Schmid
3. Data Converters, G.B. Clayton
4. Electronic Measurements, Oliver and Cage (ISE), Mc. Graw Hill
5. Transducers and Display systems, B.S. Sonde, Tata Mc. Graw Hill

References:

1. Electronic Instrumentation (ISTE Learning Material) (Ch:7) H.S. Kalsi, Learning Material Center, Indian Society of Technical Education, New Mehrauli Road, New Delhi – 110 016
2. Electronic Instrumentation & Measurements, David A.BELL
3. Hand book of Biomedical Instrumentation, Khandapur R.S., Tata Mc. Graw Hill, 1996.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –II Sem (EIE)

QUALITY & RELIABILITY ENGINEERING IN ELECTRONIC SYSTEM

UNIT-I:

Elements of probability theory Probability distributions: Random variables, density and distribution functions. Mathematical expectation. Binominal distribution, Poisson distribution, normal distribution, exponential distribution, Weibull distribution.

Reliability: Definition of Reliability. Significance of the terms appearing in the definition. Component reliability, Hazard rate, derivation of the reliability functions in terms of the hazard rate. Hazard models.

UNIT-II:

Failures: Causes of failures, types of failures (early failures, chance failures and wear-out failures). Modes of failure. Bath tub curve. Effect of preventive maintenance.

Measures of reliability: mean time to failure (MTTF) and mean time between failures (MTBF).

UNIT-III:

Reliability logic diagrams: (reliability block diagrams) Classification of engineering systems: series, parallel, series-parallel, parallel-series and non-series-parallel configurations (mainly for Electronic system configurations). Expressions for the reliability of the basic (Electronic systems) configurations.

UNIT-IV:

Reliability evaluation of Non-series-parallel configurations (mainly for Electronic systems configurations): minimal tie-set, minimal cut-set and decomposition methods. Deduction of the minimal cutsets from the minimal path sets.

More than two components Electronics systems reliability evaluation: Series systems, parallel systems with two and more than two components, Network reduction techniques. Minimal cutest / failure mode approach.

UNIT-V:

Discrete Markov Chains: General modelling concepts, stochastic transitional probability matrix, time dependent probability evaluation and limiting state probability evaluation, absorbing states **(mainly for Electronic systems).**

Continuous Markov Processes: Modelling concepts, State space diagrams, Stochastic Transitional Probability Matrix, Evaluating limiting state Probabilities. Reliability evaluation of repairable systems **(mainly for Electronic systems).**

TEXT BOOKS:

1. Reliability Evaluation of Engineering Systems", Roy Billinton and Ronald N Allan, Plenum Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –II Sem (EIE)

ROBOTICS DESIGN AND CONTROL

Unit-I:

Robot Fundamentals

Definitions, History of robots, present and future trends in robotics, Robot classifications,Robot configurations, Point to Point robots, Continuous Path robots, Work volume, Issues in design and controlling robots Repeatability, Control resolution, spatial resolution, Precision,Accuracy, Robot configurations, Point to Point robots, Continuous Path robots, Work volume, Applications of robots. Drives used in robots- Hydraulic, Pneumatic and Electric drives, Comparison of drive systems and their relative merits and demerits.

Unit-II:

Manipulator Kinematics: Matrix Algebra, Inverse of matrices, rotational groups, matrix representations of coordinate transformation, transformation about reference frame and moving frame Forward & Inverse Kinematics examples of 2R, 3R & 3P manipulators, Specifying position and orientation of rigid bodies Euler's angle and fixed rotation for specifying position and orientation Homogeneous coordinate transformation and examples D-H representation of kinematics linkages Forward kinematics of 6R manipulators using D-H representations Inverse kinematics of 6R manipulators using D-H representations, Inverse Kinematics geometric and algebraic methods.

Unit III :

Robotics Dynamics

Velocity Kinematics, Acceleration of rigid body, mass distribution Newton's equation,Euler's equation, Iterative Newton –Euler's dynamic formulation, closed dynamic, Lagrangian formulation of manipulator dynamics, dynamic simulation, computational consideration.

Trajectory Planning

Introduction, general considerations in path description and generation, joint space schemes, Cartesian space schemes, path generation in runtime, planning path using dynamic model point to point and continuous trajectory, 4-3-4 & trapezioidal velocity strategy for robots.

Unit-IV:

Robot Sensors

Internal and external sensors, position- potentiometric, optical sensors ,encoders - absolute, incremental ,touch and slip sensors velocity and acceleration sensors, proximity sensors,force & torque sensors, laser range finder, camera. Micro-controllers, DSP, centralized controllers, real time operating systems.

Robot Controllers

Essential components-Drive for Hydraulic and Pneumatic actuators, H-bridge drives for Dc motor Overload over current and stall detection methods, example of a micro-controller/ microprocessor based robot Controller.

Unit V :

Robot Vision

Introduction, Image acquisition, Illumination Techniques, Image conversion, Cameras, sensors, Camera and system interface, Frame buffers and Grabbers, Image processing, low level & high level machine vision systems.

Futuristic topics in Robotics

Micro-robotics and MEMS (Microelecto mechanical systems), fabrication technology for Micro-robotics, stability issue in legged robots, under-actuated manipulators.

TEXT BOOKS

1) S.R.Deb, " Robotics Technology and Flexible Automation ", Tata Mc Graw Hill 1994.

2) M.P.Groover, M. Weiss R.N. Nagel, N.G. Odrey " Industrial Robotics (Technology, Programming and application s) , McGraw, Hill 1996.

3) K.S.Fu, R.C.Gonzalez and C.S.G.Lee," Robotics : Control , sensors , vision and intelligence", McGraw-Hill.1987.

4) J.J.Craig , introduction to Robotics , Addision-wesely 1989.

5) Klafter , Richard D., et al " Robotics Engineering",PhI,1996.

6) Zuech,Nello, "Applying Machine Vision" John Wiley and sons, 1988.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –II Sem (EIE)

VIRTUAL INSTRUMENTATION

UNIT- I

Virtual Instrumentation: An introduction

Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Real-time systems.

UNIT- II

VI programming techniques:

VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

UNIT- III

Data acquisition basics:

Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements.

UNIT -IV

VI Interface requirements:

Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI.

UNIT- V

VI toolsets:

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

TEXTBOOKS

1. LabVIEW Graphical Programming , Gary Johnson, Second edition, McGraw Hill, Newyork, 1997.
2. LabVIEW based Advanced Instrumentation Systems, S. Sumathi and P. Surekha, Spinger.

REFERENCES

1. PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Kevin James, Newnes, 2000.
2. WEB RESOURCES: www.ni.com.
3. LabVIEW for everyone, Lisa K. wells & Jeffrey Travis Prentice Hall, New Jersey, 1997.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –II Sem (EIE)

INDUSTRIAL INSTRUMENTATION

(ELECTIVE-III)

UNIT – I

METROLOGY

Measurement of length – Plainness – Area – Diameter – Roughness – Angle – Comparators – Gauge blocks. Optical Methods for length and distance measurements.

VELOCITY AND ACCELERATION MEASUREMENT

Relative velocity – Translational and Rotational velocity measurements – Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods.

Accelerometers-different types, Gyroscopes-applications.

UNIT – II

FORCE MEASUREMENT

Force measurement – Different methods –Gyroscopic Force Measurement – Vibrating wire Force transducer.

PRESSURE MEASUREMENT

Basics of Pressure measurement –Manometer types – Force-Balance and Vibrating Cylinder Transducers – High and Low Pressure measurement – McLeod Gage, Knudsen Gage, Momentum Transfer Gages, Thermal Conductivity Gages, Ionization Gazes, Dual Gage Techniques, Deadweight Gauges.

UNIT – III

FLOW MEASUREMENT

Flow Meters- Head type, Area type (Rota meter), electromagnetic type, Positive displacement type, mass flow meter, ultrasonic type, vertex shedding type, Hotwire anemometer type, Laser Doppler Velocity-meter.

UNIT – IV

DENSITY AND VISCOSITY MEASUREMENT

Density measurements – Strain Gauge load cell method – Buoyancy method - Air pressure balance method – Gamma ray method – Vibrating probe method.

Units of Viscosity ,specific gravity scales used in Petroleum Industries, Different Methods of measuring consistency and Viscosity –Two float viscorator –Industrial consistency meter.

UNIT – V

OTHER MEASUREMENTS

Sound-Level Meters, Microphones, Basic Level measurements, Humidity Measurement, Chemical Composition. Particle Instruments and Clean-Room.

TEXT BOOKS

1. Measurement Systems – Applications and Design – by Doeblin E.O., 4/e, McGraw Hill International, 1990.
2. Principles of Industrial Instrumentation – Patranabis D. TMH. End edition 1997

REFERENCES

1. Process Instruments and Control Handbook – by Considine D.M., 4/e, McGraw Hill International, 1993.
2. Mechanical and Industrial Measurements – by Jain R.K., Khanna Publishers, 1986.
3. Instrument Technology, vol. I – by Jones E.B., Butterworths, 1981.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –II Sem (EIE)

SYSTEM ON CHIP ARCHITECTURE

(ELECTIVE-III)

UNIT – I:

Introduction to the System Approach

System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT – II:

Processors

Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT – III:

Memory Design for SOC:

Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I , and D – Caches , Multilevel Caches, Virtual to real translation , SOC Memory System , Models of Simple Processor – memory interaction.

UNIT - IV:

Interconnect Customization and Configuration

Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses , Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT – V:

Application Studies / Case Studies

SOC Design approach, AES algorithms, Design and evaluation, Image compression – JEPG compression.

TEXT BOOKS:

1. Computer System Design System-on-Chip by Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
2. ARM System on Chip Architecture – Steve Furber –2nd Eed., 2000, Addison Wesley Professional.

REFERENCE BOOKS:

1. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer
2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM
3. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –II Sem (EIE)

ADVANCED DIGITAL SIGNAL PROCESSING

(ELECTIVE-III)

UNIT –I:

Review of DFT, FFT, IIR Filters and FIR Filters.

Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:

Applications of Multi Rate Signal Processing:

Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Subband Coding of Speech Signals, Quadrature Mirror Filters, Transmultiplexers, Over Sampling A/D and D/A Conversion.

UNIT -III:

Non-Parametric Methods of Power Spectral Estimation: Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:

Implementation of Digital Filters:

Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:

Parametric Methods of Power Spectrum Estimation: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

TEXT BOOKS:

1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis & D. G. Manolakis, 4th Ed., PHI.
2. Discrete Time Signal Processing - Alan V Oppenheim & R. W Schaffer, PHI.
3. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 ed., Pearson Education.

REFERENCE BOOKS:

1. Modern Spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech. – I Year –II Sem (EIE)

PLC & ITS APPLICATIONS

(ELECTIVE-IV)

UNIT – I:

Programmable logic controller (PLC) basics:

Definition, overview of PLC systems, input/output modules, power supplies and isolators.Basic PLC programming Programming on-off inputs/ outputs. Creating Ladder diagrams Basic PLC functions PLC Basic Functions, register basics, timer functions, counter functions.

UNIT – II:

PLC intermediate functions:

Arithmetic functions, number comparison functions, Skip and MCR functions, data move systems. Utilizing digital bits, sequencer functions, matrix functions. PLC Advanced functions: Analog PLC operation, networking of PLC, PLC-PID functions.

UNIT – III:

Related Topics

Alternate programming languages. Auxiliary commands and functions. PLC installation, troubleshooting and maintenance. Field bus: Introduction, concept. HART protocol: Method of operation, structure, and applications. Smart transmitters, smart valves and smart actuators.

UNIT IV:

Encoders, Transducers, and Advanced Sensors

Introduction, Temperature, Liquid Level, Force, Pressure/Vacuum, Flow, Angle Position Sensors, Absolute Encoder, Linear Displacement, PID in Programmable Logic Controllers, Tuning the PID, The “Adjust and Observe” Tuning Method, The Ziegler-Nichols Tuning Method

UNIT V:

Motor controls:

AC Motor Starter, AC Motor Overload Protection, DC Motor Controller, Variable Speed (Variable Frequency) AC Motor Drive,Implementation of PLC to control AC and DC motor.

TEXT BOOKS:

1. John. W .Webb Ronald A Reis , Programmable Logic Controllers – Principles and Applications, Fourth edition, Prentice Hall Inc., New Jersey, 1998.
2. PC Based Instrumentation and Control Third Edition by Mike Tooley ; Elsevier

REFERENCES:

1. Computer Control of Processes – M.Chidambaram. Narosa 2003
2. PC Interfacing and Data Acquisition Techniques for Measurement, Instrumentation and Control. By Kevin James; Elsevier
3. Practical Data Acquisition for Instrumentation and Control Systems by John Park and Steve Mackay
4. Distributed Control Systems, Lukcas M.P, Van Nostrand Reinhold Co., New York, 1986.
5. Programmable Logic Controllers, Second edition, Frank D. Petruzella, McGraw Hill, Newyork, 1997.

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M. Tech. – I Year –II Sem (EIE)

FIBER OPTIC AND LASER INSTRUMENTATION

(ELECTIVE - IV)

Unit -I:

Optical fibers and their properties

Introduction to Optical Fibers - principles of light propagation through a fiber – Different types of fibers and their properties –Transmission characteristics of optical fiber –Absorption losses – Scattering losses – Dispersion- advantages and disadvantages of optical fibers.

Light sources and detectors

Light sources for fiber optics, photo detectors, source coupling, splicing and connectors.

Unit-II:

Laser Fundamentals

Fundamental characteristics of Lasers – Three level and four level lasers – Properties of Laser and Laser modes – Resonator configuration – Q-switching and Mode locking – Cavity dumping – Types of lasers: Gas lasers, Solid lasers, Liquid lasers – Semi conductor lasers.

Unit-III:

Industrial Applications of Optical fibers

Fiber optic sensors – Fiber optic Instrumentation system - Interferometric method of measurement of length - Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain. Fiber optic gyroscope – polarization maintaining fibers - applications.

Laser Instrumentation

Industrial applications of lasers – Laser Doppler Velocity meter – Laser heating

Unit-IV: Holography

Holography – Basic principle; methods, Holographic Components, Holographic Interfercmetry and Applications, Holography for Non-destructive Testing

Unit-V: Medical Applications of Laser

Medical Applications Lasers - Laser and Tissue interaction, Laser instruments for surgery, Removal of tumors of vocal cords, Brain surgery, Plastic surgery, Gynecology, Oncology, Dermatology and Ophthalmology.

Opto-Electronic Components

Magneto Optic and Acoustic – optic and other types of Optical Modulators – Detectors – Application in Instrumentation

TEXT BOOKS:

1. Industrial Applications of Lasers, John F ready, Academic Press 1978
2. Laser Applications, MonteRoss, McGraw Hill, 1968
3. Semi Conductor Opto-electronics, Jasprit Singh, McGraw Hill, 1995
4. Optical Electronics Foundation Book, Ghatak A.K. and Thiagarajar K, TMH, New Delhi, 1991
5. Industrial Lasers and their Applications, John and Harvy Industry, Academic Press.
6. Lasers and Applications, Guimaran W.O.N & Mooradian A, - Spinger Verlag.
7. Laser Electronics, Verdeyn JT, - Prentice Hall.
8. Lasers in Industries, Charaschan SS, Van

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M. Tech. – I Year –II Sem (EIE)

MEMS & APPLICATIONS

(ELECTIVE-IV)

Unit I:

Introduction to MEMS: MEMS ;Use of MEMS. Fabrication process.

The Substrate and adding material to it: Introduction, The silicon substrate, Additive technique: Oxidation, Additive technique: Physical vapour deposition, other additive techniques.

Unit II:

MEMS Fabrication:

Creating and transferring patterns- Photolithography: Introduction, Keeping it clean, Photoresist, Working with resist, masks, Resolution, Permanent resists.

Creating structures-Micromachining: Introduction, Bulk Micromachining processes, Surface Micromachining, Process Integration.

Unit III:

MEMS Transducers: I

Thinking about modelling: What is modeling? Units, The input-output concept, Physical variables and notation, preface to the modeling chapters.

MEMS Transducers-An overview of how they work: What is a transducer? Distinguishing between sensors and actuators, Response characteristics of transducers, MEMS Sensors: Principles of operation, MEMS Actuators: Principles of operation, Signal conditioning, RF applications and Optical applications.

Piezoresistive transducers: Introduction, Modeling Piezoresistive transducers, Piezoresistive pressure sensor.

Unit IV:

MEMS Transducers: II

Capacitive transducers: Introduction, Capacitor fundamentals, Modeling a capacitor sensor, Capacitive accelerometer.

Unit V:

MEMS Transducers: III

Piezoelectric transducers: Introduction, Modeling piezoelectric materials, Mechanical modelling of beams and plates, Cantilever piezoelectric actuator.

Thermal transducers: Introduction,Basic heat transfer, Hot-arm actuator.

TEXT BOOKS:

1. Introductory MEMS Fabrication and Applications.

References:

1. MEMS and microsystems: Design and manufacture, Tai-Ran Hsu, McGraw-Hill, 2002.

2. MEMS: Applications Mohamed Gad-el-Hak, CRC Press, 29-Nov-2005.

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M. Tech. – I Year –II Sem (EIE)

VIRTUAL INSTRUMENTATION LABORATORY

15 Experiments have to be completed atleast 3 from each category

List of experiments

Motion control and gear using Lab VIEW

1) High speed motion control (on-off,PWM)
2) Measurement and processing of sensory data(revolution counter, accelerometer)
3) Automatic control and regulation of rotary speed (PID control)
4) Vibration analysis and diagnostics of gear box

Take off and landing using LabVIEW

1) System modeling and simulation
2) System identification
3) Tracking control and regulation
4) Root locus design
5) Frequency analysis

Inverted pendulum using LabVIEW

1) System modeling
2) Parameter estimation
3) Friction compensation
4) Hybrid control /swing up control
5) Non linear swing up control

Robotics using LabVIEW

1) Controlling of robot using LabVIEW
2) Joint space programming
3) Coordinate space programming
4) Simulation of robot using image processing software
5) Robot programming using vision system

HVAC using LabVIEW

1) System modeling
2) Relay control design
3) Temperature control
4) PI control design
5) Modelvalidatin