COURSE STRUCTURE
AND
DETAILED SYLLABUS
(MR12Regulations)

for

M.Tech (Control Systems)

(Applicable for the batches admitted from 2012-13)

MALLA REDDY ENGINEERING COLLEGE

(Autonomous)

Maisammaguda, Dhulapally (PO) Via (Hakimpet), Hyderabad- 500 014.

www.mrec.ac.in **E-mail: mrec.2002@gmail.com**

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)
Maisammaguda, Dhulapally (Post via Hakimpet), Secunderabad – 500 014.

August/September 2012

Academic Regulations 2012 for M.Tech. (Regular)
(*Effective for the students admitted into first year from the academic year 2012-2013*)

The M.Tech Degree of Malla Reddy Engineering College, Hyderabad shall be conferred on candidates by the Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad who are admitted to the program and fulfill all the requirements for the award of the Degree.

1.0 ELIGIBILITY FOR ADMISSIONS:

Admission to the above program shall be made subject to the eligibility, qualifications and specialization prescribed by the university/college from time to time.

Admissions shall be made on the basis of merit rank obtained by the qualifying candidate at an Entrance Test conducted by the university/college or on the basis of any other order of merit approved by the university/college (say **PGECET / GATE)** subject to reservations prescribed by the university/college from time to time.

Candidates seeking admission to programmes on a part time basis should be working in or around the place where the programme is being run after passing qualifying examination.

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 and completes it successfully for not less than two academic years and not more than four academic years.

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 minimum instruction for each semester 90 clear instruction days.

3.0 A. COURSE OF STUDY:

A candidate after securing admission must pursue the prescribed course of study for the following duration.

M.Tech - Four Semesters

Each Semester shall be of 22 Weeks of duration including examinations.

A candidate admitted to a programme should complete it within a period equal to twice the prescribed duration of the programme from the date of admission.

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

1. Control Engineering
2. Computer Science and Engineering
3. Computer Science
4. Control Systems
5. Digital Systems & Computer Electronics
6. Structural Engineering
7. Thermal Engineering
8. Transportation Engineering
9. VLSI System Design

and any other course as approved by the authorities of the university/college from time to time.

Each subject is assigned certain number of credits depending upon the number of contact hours as follows.

Theory subjects	***4 Periods / Week***	***3 Credits***
Practical/ Drawing	***4 Periods / Week***	***2 Credits***
Seminar	***_***	***2 Credits***

Comprehensive Viva – Voce/ Independent Study 2 Credits
Project Work 40 Credits
(Each period will be of 50 minutes duration)

3.0 B. Departments offering M. Tech Programs with Specializations mentioned below:

Civil Engineering Department	1. Structural Engineering 2. Transport Engineering
Computer Science & Engineering Department	1. Computer Science & Engineering 2. Computer Science
Electrical Electronics Engineering Department	1. Control Systems 2. Control Engineering
Electronics & Communication Engineering Department	1. Digital Systems & Computer Electronics 2. VLSI System Design
Mechanical Engineering Department	1. Thermal Engineering

4.0 ATTENDANCE:
The programs are offered on a unit basis with each subject being considered unit.
4.1 A candidate shall be deemed to have eligibility to write end semester examinations in a subject if he has put in at least 65% of attendance in that subject.

4.2 ***Shortage of attendance up to 10% in any subject (i.e. 65% and above and below 75%) may be condoned by the College Academic Committee on genuine and valid reasons on representation by the candidate with supporting evidence.***
4.3 A candidate shall get 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.

4.4 ***Shortage of attendance below 65% shall in no case be condoned.***

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

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 practical, 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, 40 marks shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the better 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 for a total of 30 marks. Each mid term examination shall be conducted for a duration of 120 minutes with 4 questions to be answered out of 6 questions. In addition, there shall be two assignments evaluated for 10 marks each and average of the two taken as the final assignment mark. The sum of the best of the two mid examinations and the assignment marks obtained shall be the final marks for internal evaluation.

5.2 For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations, 40 marks shall be awarded based on the day-to-day performance as internal Marks.
And 25 marks to be awarded by conducting an internal laboratory test. The End Examination shall be conducted by the teacher concerned and another faculty member of the same Department, as suggested by the Head of Department.

5.3 There shall be two seminar presentations during I year I semester and II Semesters. 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 Committee. The Departmental Committee consists 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% to be declared successful. *There shall be no external examination for Seminar*

5.4 Every candidate shall be required to execute his P.G. Project and submit his Dissertation, after taking up a topic approved by the Project Review Committee (PRC). The PRC shall be constituted by the Head of the Department, and shall consist of the Head of the Department, the Project supervisor, and a Senior faculty member of the Department. The PG project shall start immediately after completion of the I Year II Semester, and shall be of one year duration. The student has to decide his topic for his M.Tech Project Work within the first 6 weeks of the summer vacation at the end of the II semester and should submit his PG Project Work Proposal to the PRC, on whose approval he can register for the PG project. The PRC will monitor the progress of the project work through Two-Seminar presentations – one during II Year I Semester, and one before the submission of the PG Project/ Dissertation. The student shall submit a project Report at the end of that semester by the PRC as SATISFACTORY or UNSATISFACTORY. In the case of Unsatisfactory declaration, the student shall resubmit the Project report after carrying out the necessary modifications / additions in the Project work, within the specified time as suggested by the PRC. The student can submit the Dissertation, only after completion of 40 weeks from the Date of Registration, after obtaining the approval from PRC. Extension of time, within the total permissible limit for the completion of the Degree, may be considered by the PRC, on sufficient valid/ genuine grounds.

5.5 There shall be a Seminar presentation in the II year I Semester, for the award of 50 marks. The seminar shall be on the topic chosen for PG Project/ Dissertation Work and the assessment will be done by the same PRC as constituted above. There shall be no external marks for the Seminar.

There shall be a Comprehensive Viva-Voce in II year II Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members in that area of specialisation. The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects he/she studies during the M.Tech course of study. The Comprehensive Viva-Voce is valued for 100 marks by the Committee. There are no internal marks for the Comprehensive viva-Voce

5.6 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 Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

5.7 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.4) he has to reappear for the End 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 he has failed in the end examination. In such case candidate must re-register for the subject(s) and secure required minimum attendance. Attendance in the re-registered subject(s) has to be calculated separately to become eligible to write the end examination in the re-registered subject(s). The attendance of re-registered subject(s) shall be calculated separately to decide upon the eligibility for writing the end examination in those subject(s). In the event of taking another chance, the internal marks and end examination marks obtained in the previous attempt are nullified.

5.8 In case the candidate secures less than the required attendance in any subject(s), he shall not be permitted to appear for the End Examination in that subject(s). He shall re-register the subject when next offered.

5.9 Laboratory examination for M.Tech courses must be conducted with two Examiners, one of them being Laboratory Class Teacher and second examiner shall be other Laboratory Teacher or any other member from inside/outside of the college.

6.0 EVALUATION OF PROJECT/ DISSERTATION WORK:

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

6.1 A Project Review Committee (PRC) shall be constituted with Principal as chair person Heads of all the Departments which are 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 (theory and practical subjects).

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 Committee for its approval. Only after obtaining the approval of Departmental Committee the student can initiate the Project work. ***Departmental Committee Consists of Head of the Department as Chairman, along with two Senior Professors and few subject experts too.***

6.4 If a candidate wishes to change his supervisor or topic of the project he can do so with approval of Departmental Committee. However, the Departmental Committee shall examine whether the change of topic/supervisor leads to a major change of his initial plans of project proposal. If so, 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 Candidate shall submit 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 in the beginning of the second year and the duration of the project is for 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 shall make an oral presentation/demonstration 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 College. For this, Head of the Department shall submit a panel of 5 examiners to the Principal of the College, who are eminent in that field with the help of the concerned guide and Head of the department.

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

6.10 If the report of the examiner is favorable, 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 candidates work as:

A. Excellent
B. Good
C. Satisfactory
D. Unsatisfactory

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 will retake the viva-voce examination 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 unless he is asked to revise and resubmit by the Board.

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	*Program Credits*
First Class with Distinction	70% and above	***From the Aggregate secured for all the 88 credits***
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 marks memorandum)

8.0 WITH-HOLDING OF RESULTS:

If the candidate has not paid any dues to the university or if any case of in-discipline is pending against him, the result of the candidate will be withheld and he will not be allowed into the next higher semester. The issue of the degree is liable to be withheld in such cases.

9.0 TRANSITORY REGULATIONS:

Candidate who have discontinued or have been detained for want of attendance or who have failed after having undergone the course are eligible for admission to the same or equivalent subjects as and when subjects are offered, subject to rule 5.5 and 2.0 of these regulations.

10.0 GENERAL:

10.1 The academic regulations should be read as a whole for purpose of any interpretation.

10.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

10.3 The College may change or amend the academic regulations and syllabus at any time and the changes and amendments made shall be applicable to all the students with effect from the date notified by the College.

10.4 Wherever the word he, him or his occur, it will also include she, her and hers.

10.5 Wherever the word 'Subject' occurs in the above regulations, it implies the 'Theory Subject' and 'Practical Subject' or 'Lab'.

10.5 Transfers not allowed among group colleges.

M Tech - Control Systems
Course structure and syllabus
FIRST SEMESTER

Code	Group	Subject	L	T	P	Credits
MR12P0M7		Advanced Engineering Mathematics	3	1	0	3
MR122101		Digital Control Systems	3	1	0	3
MR122102		Advanced Control Systems	3	1	0	3
MR122103		Advanced Microprocessors	3	1	0	3
MR122104	Elective-1	1. Programmable logic Controllers & applications	3	1	0	3
MR122105		2. Advanced Instrumentation Systems	3	1	0	3
MR122106		3. State and Parameter Estimation theory	3	1	0	3
MR122123	Elective-2	1. Embedded Systems	3	1	0	3
MR122107		2. Robot Modeling & Control	3	1	0	3
MR122124		3. DSP processor architecture and Applications	3	1	0	3
MR122108	**Lab**	Control Engineering lab	0	-	3	2
MR122109		Seminar-1	-	-	3	2

SECOND SEMESTER

Code	Group	Subject	L	T	P	Credits
MR122110		Optimal Control Theory	3	1	0	3
MR122111		Adaptive and learning control	3	1	0	3
MR122112		Control system design	3	1	0	3
MR122125		Advanced Digital Signal Processing & Applications	3	1	0	3
MR122126	**Elective-3**	1. Computer Aided VLSI Design	3	1	0	3
MR122113		2. Neural Networks & Fuzzy Systems	3	1	0	3
MR122114		3. Distributed Control Systems	3	1	0	3
MR122115	**Elective-4**	1. Real time systems	3	1	0	3
MR122116		2 Intelligent & Knowledge based systems	3	1	0	3
MR122117		3. Nonlinear Systems	3	1	0	3
MR122118	**Lab**	Simulation Lab	0	-	3	2
MR122119		Seminar-2	-	-	3	2

THIRD SEMESTER

Code	Subject	L	P	Credits
MR122120	Comprehensive Viva	-	-	2
MR122121	Project Seminar	0	3	2
MR122122	Project Work	-	-	40

FOURTH SEMESTER

Subject	End Exam
Project work & Seminar	Grade
Grade (A/B/C/D)	A. Excellent B. Good C. Satisfactory D. Unsatisfactory

T – Tutorial;
P – Practical;
D – Drawing;

2012-13 MR12P0M7

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

I Semester

L	T/P/D	C
3	1/-/-	3

ADVANCED ENGG MATHEMATICS
(Common to Control Systems & Control Engineering)

UNIT-I: VECTOR SPACES
Vector space, linear dependence, bias, linear transformation; inner product space, Hilbert space, Linear functions, Riedsz representation theorem and adjoints.

UNIT II: ORTHOGONAL PROJECTIONS:
Orthogonal projections, product of projections; orthogonal direct sums; unitary and orthogonal transformations;

UNIT – III: ORTHONORMAL SETS:
Orthonormal sets and Parsevals identity; closed subspace and projection theorem for Hilbert spaces. Polynomials, algebra of polynomials, matrix polynomials, annihilating polynomials, invariant subspace; Jordan forms.

UNIT-IV: ORTHOGONAL SPACES IN NETWORKS:
Complimentary orthogonal space in networks; graphs, their relation to vector space, properties of their matrix representations; solution of state equations in linear system theory; relation between rational and Jordan forms.

UNIT V: ITERATIVE TECHNIQUES:
Direct and iterative methods of solution of linear equations; Matrices, norms, complete metric spaces and complete normal linear spaces (Banach spaces); Least square problems (Constrained and unconstrained); Non linear equations,Eigen value problem.

BOOKS RECOMMENDED:
1. Hoffman,K.& Kunzc,R.-Linear Algebra; PHI
2. Golub, G.H.& Van Loan,C.F-Matrix computations; North Oxford Academic
3. Bachman,G. & Narici,l-Functional Analysis with Applications; Iohu Wiley

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

I Semester

L	T/P/D	C
3	1/-/-	3

DIGITAL CONTROL SYSTEMS
(Common to Control Systems & Control Engineering)

UNIT – I

Block Diagram of typical control system- advantages of sampling in control systems – examples examples of discrete data and digital systems – data conversion and quantization – sample and hold devices – D/A and A/D conversion – sampling theorem – reconstruction of sampled signals –ZOH.

Z-transform: Definition and evaluation of Z-transforms – mapping between s-plane and z-plane –inverse z-plane transform – theorems of the Z-transofmrs –limitations of z-transofrm –pulse transfer function – puulse transfer function of ZOH –relation between G(s) and G(z) – signal flow grapoh method applied to digital systems.

UNIT 2: STATE SPACE ANALYSIS

State space modeling of digital systems with sample and hold – state transition equation of digital time in variant systems – solution of time in variant discrete state equations by the Z-Transformation – transfer function from the state model – Eigen values – Eigen vector and diagonalisation of the A-matrix – Jordan canonical form. Computation of state transition matrix-Transformation to phase to variable canonical form-The state diagram – decomposition of digital system – Response of sample data system between sampling instants using state approach.Stability : Definition of stability – stability tests – The second method of Liapunov.

UNIT 3 : TIME DOMAIN ANALYSIS

Comparision of time response of continuous data and digital control systems-correlation between time response and root locus j the s-plane and z-plane – effect of pole-zero configuration in the z-plane upon the maximum overshoot and peak time of transient response – Root loci for digital control systems – steady state error analysis of digital control syetems – Nyquits plot – Bode plot-G.M nad P.M.

UNIT 4: DESIGN

The digital control design with digital controller with bilinear transformation – Digital PID controller-Design with deadbeat response-Pole placement through state feedback-Design of full order state observer-Discrete Euler Lagrance Equation – Discrete maximum principle.

UNIT 5: DIGITAL STATE OBSERVER

Design of - Full order and Reduced order observers.

Design by max.principle: Discrete Euler language equation-discrete maximum principle.

TEXT BOOKS:

1.Discrete-Time Control systems- K. Ogata, Pearson Education/PHI, 2nd Edition
2. Digital Control and State Variable Methods by M.Gopal, TMH

REFERENCE BOOKS:

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition,2003.
2. Digital Control Engineering, M.Gopal

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

I Semester

L	T/P/D	C
3	1/-/-	3

ADVANCED CONTROL SYSTEMS
(Common to Control Systems & Control Engineering)

UNIT I:
Control system design by root locus method-lead,lag and lead lag compensation. PI, PD and PID controllers design procedures and examples.Control system design by frequency response approach-lead,lag and lead lag compensation. PI, PD and PID controllers design procedures and examples.

UNIT II: EIGEN VALUE AND EIGENVECTOR SENSITIVITIES IN LINEAR SYSTEM THEORY
Continuous time systems: Introduction, first-order Eigen value sensititvities, first order eigenvector sensivities, second-order Eigen value sensititvities, first order eigenvector sensivities, second-order Eigenvector sensititvities.

UNIT III: MODE-CONTROLLABILITY MATRIX:
Distinct eigenvalues, confluent eigenvalues associated with single Jordan block, confluent eigenvalues associated with number of distinct Jordan blocks, confluent eigenvalues associated with a number of nondistinct Jordan block.
Mode – Controllability structure of multivariable linear systems:Introduction, Distinct eigenvalues, confluent eigenvalues associated with single Jordan block, confluent eigenvalues associated with a number of no distinct Jordan blocs.

UNIT IV: OBSERVABILITY MATRICES:
Distinct eigenvalues, confluent eigenvalues, mode observability structure of multivariable linear systems: Introduction, Distinct eigenvalues, confluent eigenvalues.
Nonlinear systems: Common physical nonlinearities: the phase plane method – basic concept, singular points, construction of phase trajectories – Isocline and delta methods, Describing function – basic concept – derivation of describing functions – stability analysis by describing function method.

Unit V: LYAPUNOV STABILITY ANALYSIS:
Second method of Lyapunov, stability in the sense of Lyapunov, construction of Lyapunov functions – Krasovskii's and variable gradient methods, Lyapunov stability analysis of linear time varying systems.

TEXT BOOKS:

1. Control Systems – N K Sinha – New Age International – 3rd edition.
2. Automatic Control Systems – B C Kuo – PHI – 7th edition.
3. Modern Control Systems – Hsu and Meyer.
4. Modal Control theory and applications – Brian Porter & Roger Corssley.

REFERENCE BOOKS:

1. Modern Control Engineering - K. Ogata – PHI – 3rd edition.
2. Control System Engineering – I J Nagarath, M. Gopal – New Age International – 3rd edition.

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

I Semester

L	T/P/D	C
3	1/-/-	3

ADVANCED MICROPROCESSORS
(Common to Control Systems & Control Engineering)

UNIT-I INTEL 8086/8088
Architecture, its register organization, pin diagram, minimum and maximum mode system and timings, machine language instruction formats, addressing modes, instruction set, adssembler directives and operators.

UNIT-II:ALP AND SPECIAL ARCHITECTURE FEATURES
ALP,Programming with an assembler, stack structure, interrupts,service subroutines and interrupt programming amd Macros.

UNIT-III: MULTIPROCESSOR SYSTEMS
Inter connection topologies, numeric processor 8087, I/O processor 8089.Bus arbitration and control deisgn of PC based multiprocessor systems, virtual memory, paging, segmentation.

UNIT-IV:ADVANCED PROCESSORS:
Architecturtal fetaurs of 80836,486 and Pentium processors their memory management , introduction to penyium pro processors their deatures, RISC Vs CISC processors, RISC properties, evaluation, architectural features of DEC alpha AXP, power PC family and sun SPARC family ssyetms.

UNIT-V MICROOCNTROLLER
Microcontrollers – 8051 architectures,hardware , interrupys, addressing modes, instruction set – programming-applications.

REFERENCE BOOKS:

1. Intel microprocessors, architecture, programming and interfacing 8086/8088, 80186,80836 and 80846-BARRY b.Brey.PHI-5th edition-2001
2. Adavnced microprocessors-TABAK-McgrawHill Inc 2ns edition.
3. 8051 microcontroller – architecture prohramming & applications-K.J.Ayala-penram Intl.
4. Programming & customizing the 8051 microcorntroller – Myke Pretko – TMH,1st edition ,1999
5. The 8088 and 8086 microprocessor-W.A.Triebel &Avtar singh-PHI,4th edition 2002

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

I Semester

L	T/P/D	C
3	1/-/-	3

Elective-1
1.PROGRAMMABLE LOGIC CONTROLLERS &APPLICATIONS
(Common to Control Systems & Control Engineering)

UNIT-I:
PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT - II
PLC programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation. Digital logica gates programming in the Boolean algebra SYSTEM, CONVERSION EXAMPLES- Ladder diagrams for process control – Ladder diagrams for sequence listings – ladder diagram construction and flow chart for spray process system.

UNIT-III
PLC Registers: Characteristics of registers – module addressing – holding registers – output registers – PLC functions – Timer functions and industrial application counters – counter function industrial application – Architecture functions – number function comparison functions.- number conversion functions.

UNIT -IV
Data handling functions: SKIP, Master control relay – Jump Move FIFO, FAL, ONS, CLR and sweep functions and their applications.
Bit pattern and changing a bit shift register, sequence functions and applications – controlling of two axis and three axis Robots with PLC, Matrix functions.

UNIT-V
Analog PLC operation: Analog modules and systems – Analog signal processing, multibit data processing, analog output application examples, PID principles, position indicator with PID control, PID modules, PID tuning, PID functions.

TEXT BOOK:

1. Programmable Logic Controllers – Programming methods and Applications by J R Hackworth and F D Hackworth Jr - Pearson Publications – 200

REFERENCE BOOK:
1. Programmable Logic Controllers – Principles and Applications by John W Webb and Ronald A Reiss – Fifth edition – PHI

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

I Semester

L	T/P/D	C
3	1/-/-	3

Elective-1
2.ADVANCED INSTRUMENTATION SYSTEMS
(Common to Control Systems & Control Engineering)

UNIT I: PASSIVE ELECTRICAL TRANSDUCERS
Resistive Transducers - Resistance Thermometers - Hot wire resistance Transducers - Resistive displacement Transducers - Resistive strain Transducers - Resistive magnetic flux Transducers - Resistive optical radiation Transducers - Inductive Thickness Transducers - Inductive displacement Transducers - Capacitive Thickness Transducers - Capacitive displacement Transducers**.**

UNIT II: ACTIVE ELECTRICAL TRANSDUCERS
Thermoelectric Transducers - Piezo electric phenomenon - Piezo electric materials - Piezo electric torque Transducers - Piezo electric Acceleration transducers - Magnetostrictive phenomenon - Magnetostrictive Acceleration transducers - Hall effect Transducers - Tachometers - variable reluctance tachometers - Electromagnetic Flow meter.Photoelectric phenomenon - photoconductive and photovoltaic Transducers - Photo emissive Transducers - Ionization vacuum gauges - Ionization displacement Transducers - Digital displacement Transducers - Digital Tachometers - Electromechanical Transducers.

UNIT III: **FEEDBACK TRANSDUCER SYSTEMS**
Feedback fundamentals - Inverse Transducers - Temperature balance system - self - balancing potentiometers - self - balancing bridges - servo - operated manometer - Feedback pneumatic load cell - servo - operated electromagnetic flow meter - feedback accelerometer system - Non - contact position measurement.

UNIT IV: DATA ACQUISITION SYSTEMS
General configurations - single and multichannel DAS - A/D converters (successive approximation and dual slope integration) - sample and hold circuits - Anti alia filters - multiplexers and demultiplexers - Digital multiplexers.

UNIT V: DATA TRANSMISSION, TELEMETRY AND DISPLAY
Characteristics of a Telemetry system - landline telemetry - radio telemetry - frequency division multiplexing - time division multiplexing. Data Display and recording systems Data loggers - Analog indicators - Digital Readout systems - analog recorders - magnetic tape recorders - direct recording - frequency modulation recording - digital recording technique - floppy discs.

TEXT BOOK:
1. D.V.S.Murthy, Transducers & Instrumentation; Prentice Hall of India Pvt. Ltd., First edition – 1995

REFERENCE BOOK:

1. C. S. Rangan - G. R. Sarma - V. S. V. Mani, Instrumentation Devices & Systems, TMH - 2nd edition - 2003

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

I Semester

L	T/P/D	C
3	1/-/-	3

Elective-1
3.STATE AND PARAMETER ESTIMATION

UNIT-1

Maximum likelihood method, Inverse of maximum likelihood estimator, ayes cost method, Mean square error (Minimum error variance)

UNIT-2

Uniform cost method, Absolute cost method, relationships of these stimators Linear minimum variance method, least square method, sequential method

UNIT-3

Non linear estimation, unbiased estimators, asymptotic properties, sensitivity and error analysis Gauss –Markov discrete time model, initial state description, propagation of means and co variances,

UNIT-4

Signal model, state statistics, output statistics, Estimation criteria, minimum variance estimate Discrete time kalman filter, best linear estimator property of kalman filter, identification as a kalman filtering problem, Kalman filter applications

UNIT-5

Fixed point smoothing, fixed lag smoothing, fixed interval smoothing, extended kalman filter

Reference books:

1. J.L.Melsa,Decision and estimation theory ,international student Edition ,Mc Gaw Hill-Kogakusha (chapters 8,9,10&11)
2. B.D.O.Anderson and J.B.Moore, Optimal Filtering,

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

I Semester

L	T/P/D	C
3	1/-/-	3

Elective-2
1.EMBEDDED SYSTEMS
(Common to Control Systems & Control Engineering)

UNIT-I OVERVIEW OF EMBEDDED SYSTEM:
Embedded system, types of embedded systems, requirements of embedded system, issues in embedded software development, applications.

UNIT-II: PROCESSOR & MEMORY ORGANIZATION:
Structural units in a processor, processor selection, memory devices, memory selection, memory allocation & map , interfacing.

UNIT-III: DEVICES, DEVICE DRIVERS & BUSES FOR DEVICE NETWORKS:
I/O devices, timer & counter devices, serial communication, communication between devices using different buses.
Device drivers parallel and serial port device drives in a system, interrupt servicing mechanism and context & periods for context switching, deadline and interrupt latency.

UNIT-IV: PROGRAMMING & PROGRAM MODELING CONCEPTS
Program elements , modeling processes for software analysis, programming models, modeling of multiprocessors systems, software algorithm concepts, design, implementation, testing validating, debugging, management and maintenance, necessicity of RTOS.

UNIT-V: HARDWARE AND SOFTWARE CO-DESIGN
Embedded system design and codesign issues in software development, deisgn cycle in development phase for embedded systems, use of ICE & software tools for development of ES,Issues in embdede system deisgn.

TEXT BOOK

1. Embedded systems: Architectures, programming and Design – Rajkamal, TMH 2003

REFERENCE BOOK:
1. Programming for Embedded systems: DreamTech software Team-John Wiley-2002

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

I Semester

L	T/P/D	C
3	1/-/-	3

Elective-2
2.ROBOT MODELLING & CONTROL
(Common to Control Systems & Control Engineering)

UNIT I: SPATIAL DESCRIPTIONS AND TRANSFORMATIONS

Introduction - Descriptions: positions, orientations and frames - Mappings: Changing descriptions from frame to frame - Operators: translations, rotations, transformations, Transformation arithmetic - Transform equations - More on representation of orientation - Transformation of free vectors - Computational considerations. Manipulator Kinematics Introduction - Link description - Link connection description - convention for affixing frames to links - Manipulator kinematics - Actuator space, Joint space and Cartesian space - Examples: Kinematics of two industrial robots - Computational considerations

UNIT II: INVERSE MANIPULATOR KINEMATICS

Introduction – Solvability - The notation of manipulator subspace when n<6 - Algebraic Vs. Geometric - Algebraic solution by reduction to polynomial - Pieper's solution when three axes intersect - Examples of inverse manipulator kinematics - The standard frames - SOLVE - ing a manipulator - Repeatability and accuracy - Computational considerations.

Jacobians: Velocities and Static Forces: Introduction - Notation for time varying position and orientation - Linear and Rotation of velocity of rigid bodies - More on angular velocity - Motion of the links of a Robot - Velocity " propagation" from link to link – Jacobians – Singularities - Static forces in Manipulators - Jacobians in the force domain - Cartesian transformation of velocities and static forces.

UNIT III: MANIPULATOR DYNAMICS

Introduction - Acceleration of a rigid body - Mass distribution - Newton's Equation, Euler's equation - Iterative Newton –Euler dynamic formulation - Iterative Vs. Closed form - An example of closed form dynamic equations - The structure of the Manipulator dynamic equations - Lagrangian Formulation of manipulator Dynamics - Formulating manipulator dynamics in Cartesian space - Computational considerations. **:** Linear Control of Manipulators: Introduction - Feedback and closed loop control - Second order linear systems - Control of second order systems - Control law partitioning – Trajectory - Following control - Disturbance rejection - Continuous Vs. Discrete time control - Modeling and control of a single joint - Architecture of industrial robot controller.

UNIT IV: NON - LINEAR CONTROL OF MANIPULATORS

Introduction - Nonlinear and time - varying systems - multi - input, Multi - output control systems - The control problem for manipulators - Practical considerations - Present industrial robot control systems - Lyapunov stability analysis - Cartesian based control systems - adaptive control.

UNIT V: FORCE CONTROL OF MANIPULATOR

Introduction - Application of Industrial robots to assembly tasks - A frame work for control in partially constrained tasks - The hybrid position/force control problem - Force control of a mass - spring - The hybrid position / force control scheme - Present industrial robot control scheme.

TEXT BOOKS:

1. J. J. Craig, Introduction to Robotics, Addison Wesley , 1986
2. Mark W. Sponge, Sethhutchinson and M. Vidyasagar Robot Modeling and Control, Wiley student Edition, 2006.

REFERENCES:

1. Tsuneo Yoshikawa, Foundations of Robotics –Analysis and Control, Eatern economy Edition, 1990
2. Znihua Qu and Drasen M Dawson, Robust Tracking Control of Robot Manipulators, IEEE Press, 1996.
3. J. J. Craig, Adaptive Control of Mechanical Manipulators, Addison Wesley, Reading MA, 1988.

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I Semester

L	T/P/D	C
3	1/-/-	3

Elective-2
3.DSP PROCESSOR ARCHITECTURE AND APPLICATIONS
(Common to Control Systems & Control Engineering)

UNIT-I
INTRODUCTION TO DIGITAL SIGNAL PROCESING:
Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences, Discrete Fourier Transform(DFT) and Fast Fourier Transform(FFT),Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB,DSP using ATLAB.COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS: Number formats for signals andcoefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSPimplementations, A/D Conversion errors,DSP Computational errors,D/A Conversion Errors,Compensating filter.

UNIT-II
ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES:
Basic Architectural features,DSP computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed issues Features for External interfacing.EXECUTION CONTROL AND PIPELINING: Hardware looping, Interrupts, Stacks, Relative Branch Support, Pipelining and performance, Pipeline Depth, Interlocking, Branching effects,Interrupt effects, pipeline Programming models.

UNIT-III
PROGRAMMABLE DIGITAL SIGNAL PROCESSORS:
Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs,Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

UNIT-IV
IMPLEMENTATION OF BASIC DSP ALGORITHMS:
The Q-notation, FIR Filters, IIR Filters, interpolation Filters, Decimation filters, PID Controller, Adaptive Filters,2-D Signal Processing. Implementation of FFT Algorithms: An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit reversed index generation, An 8-point FFT implementation on the TMS320C54XX,Computation of signal spectrum.

UNIT-V
INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES:
Memory space organization, External bus interfacing signals, Memory interface, parallel I/Ointerface, Programmed I/O, Direct Memory access(DMA).A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit,CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS:

1. Digital signal processing-S.Salivahanan,A.Vallavaraj .C.Gnanpriya-TMH-2nd reprint 2001.
2. Theory and applications of digital signal processing – Lourens R Rebinarand Bernold.
3. Digital filter analysis and design auntoniam-TMH.

REFERENCE BOOKS:

1. Digital signal processing-Sanjit K.Mitra-TMH second edition
2. Discrete time signal processing – LAN V.OPPHENHEIM,RONALD W.Shafer-PHI 1996 1st edition reprint
3. Digital signal processing principles – algorithms and applications-John G.Proakis-PHI-3rd edition2002

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
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I Semester

L	T/P/D	C
3	1/-/-	2

CONTROL ENGINEERING & SIMULATION LAB

Any 12 experiments form the following can be conducted:

1. Determination of Transfer function of DC motor.
2. Time Response Characteristics of a Second order System (Typical RLC network).
3. Characteristics of Synchros:
   (a) Synchro transmitter characteristics.
   (b) Implementation of error detector using synchro pair.
4. Determination of Magnetic Amplifier Characteristics with different possible connections.
5. Process Control Simulator:
   (a) To determine the time constant and transfer function of first order process.
   (b) To determine the time response of closed loop second order process with Proportional Control.
   (c) To determine the time response of closed loop second order process with Proportional-Integral Control.
   (d) To determine the time response of closed loop second order process with Proportional-Integral-Derivative Control.
   (e) To determine the effect of disturbances on a process.
6. To study the compensation of the second order process by using:
   (a) Lead Compensator.
   (b) Lag Compensator.
   (c) Lead- Lag Compensator
7. Realization of AND, OR, NOT gates, other derived gates and ladder logic on Programmable Logic Controller with computer interfacing.
8. To determination of AC servomotor Characteristics.
9. To study the position control of DC servomotor with P, PI control actions.
10. Temperature controller using PID
11. Linear System Analysis(Time domain analysis, error analysis) using MATLAB
12. Stability analysis(Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB.
13. State space model for classical transfer function using MATLAB-Verification.
14. Microprocessor based stepper motor control.
15. Transfer function of DC generator.

TEXT BOOKS:

1. PSPICE reference guide – Microsim, USA
2. MATLAB and its tool books user's manual and –Mathworks, USA.

REFERENCE BOOKS:

1. Simulation of electrical and electronics circuits using PSPICE-By M.H.Rashid.M/s PHI publications.
2. PSPICE A/D user's manual – Microsim USA

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

II Semester

L	T/P/D	C
3	1/-/-	3

OPTIMAL CONTROL THEORY
(Common to Control Systems & Control Engineering)

UNIT I : DYNAMIC PROGRAMMING:

Optimal control law,the principal of optimality,application of thr 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 : ANALYTICAL RESULTS OF DYNAMIC PROGRAMMING:

Discrete linear regulator problem.hamilton –jocobi-bellman equation.continues 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,nesassary conditions for optimal contraol ,linear regulator problem.

UNIT III:

Pontrygin's minimum principle and state ineuqliti 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 projecy=tion algorithem

.**UNT IV:**
The nature of the state estimation problem ,non-statical estimation design with full estimator dimention,non statical 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

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

II Semester

L	T/P/D	C
3	1/-/-	3

ADAPTIVE AND LEARNING CONTROL
(Common to Control Systems & Control Engineering)

UNIT I

Introduction - use of Adaptive control - definitions - essential aspects – classification - Model Reference Adaptive Systems - different configurations - classification - mathematical description - Equivalent representation as a nonlinear time varying system - direct and indirect MRAC.

UNIT II

Continuous time MRAC systems - Model Reference Adaptive System Design based on Gradient method, Design of stable adaptive controllers based on Kalman - Meyer - Yakubovich Lemma, Lyapunov theory, Hyper stability theory - Narendra's error model approach.
Discrete time MRAC systems - Hyper stability approach - Narendra's error model approach - Introduction - stability theorem - Relation to other algorithms - hybrid adaptive control.

UNIT III

Self Tuning Regulators (STR) - different approaches to self tuning - Recursive parameter estimation - implicit STR - Explicit STR. hybrid STR, . hybrid predictor design and algorithems
STR design based on pole - placement technique and LQG theory - Gain scheduling. - Stability of adaptive control algorithms.

UNIT IV

Adaptive control of a nonlinear systems - Adaptive predictive control - Robustness of adaptive control systems - Instability phenomena in adaptive systems.Concept of learning control systems. Different types of learning control schemes. LTI learning control via parameter estimation schemes. Convergence of learning control.fuzzy logic adaptive control ,stochastic adaptive control –multi decision problems-dual control.

UNIT V

Case Studies: Robotic manipulators, Aerodynamic curve identification, Electric drives, Satellite altitude control, regulators, power system, electrical generator..

TEXT BOOKS

1. K.J.Astrom and Bjorn Witten mark, Adaptive control, Pearson Edu., 2nd Edn.
2. Sankar Sastry, Adaptive control

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REFERENCE BOOKS

1. V.V.Chalam, Adaptive Control System - Techniques & Applications, Marcel Dekker Inc.
2. Miskhin and Braun, Adaptive control systems, MC Graw Hill
3. Karl Johan Åström, Graham Clifford Goodwin, P. R. Kumar, Adaptive Control, Filtering and Signal Processing
4. G.C. Goodwin, Adaptive control.
5. Narendra and Anna Swamy, Stable Adaptive Systems.

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
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II Semester

L	T/P/D	C
3	1/-/-	3

CONTROL SYSTEM DESIGN
(Common to Control Systems & Control Engineering)

UNIT-I : SYNTHESIS OF SISO CONTROLLERS AND ARCHITECTURAL ISSUES IN SISO CONTROL
Polynomial approach,PI and PID synthesis revisited by using pole assignment,Smith predictor

UNIT- II: MODELS FOR DETERMINISTIC DISTURBANCES AND REFERENCES Internal Model principle for disturbance and for reference tracking, feed forward control-cascade control, Dealing With Constraints and SISO Controllers Parameterizations:windup,anti windup scheme, state saturation, introduction to model predictive control, preview-open loop inversion revisited.

UNIT-III: AFFINE PARAMETERIZATION
The stable case PID synthesis by using the affine paramertization,affine parametization for systems having time delays , undesirable closed loop poles, affine parameterization: the unstable open loop case. Analysis of MIMO control loops: Preview –motivational examples, models for multi variable systems, the basic MIMO control loop.

UNIT IV: CLOSED LOOP STABILTY
Steady state response for steps inputs, frequency domain analysis, Robustness issues-problems, Exploring SISO Techniques in MOMO control: preview-completely decentralized control, pairing of inputs and outputs, robustness issues in decentralized control, feed forward action in decentralized control, converting MIMO problems to SISO problems, Industrial case study (Strip flatness control).

UNIT-V: MODEL PREDICTIVE CONTROL
Preview-anti windup-revisited-what is model predictive control –stability-linear models with quadratic cost function-state estimation and disturbance prediction.

TEXT BOOKS:

1. MATLAB control system toolbox

2. Control system design – Graham C Good win-Stefan F.Graebe Mario E.Salgado-Pearson Publications-2003

REFERENCE BOOK:

1. Computer aided design of control systems-by Resenbrock (Academic press)

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
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II Semester

L	T/P/D	C
3	1/-/-	3

ADVANCED DIGITAL SIGNAL PROCESSING & APPLICATIONS

Unit -1 :

SIGNALS AND SYSTEMS: Introduction, Continuous time and discrete time signals, Transformations of independent variable, Exponential and Sinusoidal Signals, Unit impulse and unit step functions, basic properties. LTI Systems: Introduction, Convolution sum, Convolution integral, Properties of LTI systems.

Unit-2

TIME FREQUENCY ANALYSIS: Need for time frequency analysis. Time frequency distributions, short time Fourier transform Wigner distribution. Introduction to wavelet transformation.

Unit-3

MULTIRATE SIGNAL PROCESSING & FILTER BANKS: Introduction, Decimation, Interpolation, Fractional rate conversion, Multistage Filter implementation. Interpolated FIR filter (IFIR), IFIR technique for decimation filter and interpolation filter. Analysis and Synthesis banks. Poly phase structures – Polyphase structure for decimation and interpolation filters.

Unit – 4:

APPLICATIONS OF MULTIRATE SIGNAL PROCESSING: Filter banks, digital audio, analog voice privacy system, transmultiplexers, Multirate adaptive filters, Sub band coding – spectral analysis, amplitude and phase analysis, simple and M channel QMF.

Unit – 5:

ADAPTIVE FILTERING: Principles of adaptive filtering, LMS and RMS algorithms. Applications in noise and echo cancellation. Homographic Signal Processing**:** Homograph systems for convolution, properties of complex spectrum, application of homographic deconvolution.

REFERENCE:

1. P.P. Vaidhyanathan, *Multirate systems and filter banks*, Prentice Hall, 1993.
2. Emmanuel Ifeachor and Barrie Jervis, *Digital Signal Processing: A Practical Approach(2nd Edition)*, Prentice Hall, 2004.
3. J.G Proakis and D.G Manolakis - *Digital Signal Processing: Principles, Algorithms and Applications, PHI*, 2004.
4. A.V. Oppehein and R.W. Schafer, *Discrete time signal processing*, PHI, 1992
5. Haykins, *Adaptive Filter Theory*, Prentice Hall, 1986
6. Leon Cohen, *Time Frequency analysis*, Prentice Hall, 1995
7.Orfanidis Sophocles J, *Optimum Signal Processing*, McGraw Hill, 1988

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

II Semester

L	T/P/D	C
3	1/-/-	3

Elective-3
1.COMPUTER AIDED VLSI DESIGN
(Common to Control Systems & Control Engineering)

UNIT-I
Hardware description Languages; Verifying behavior prior to system construction simulation and logic verification; Logic synthesis;

UNIT-II
PLA based synthesis and multilevel logic synthesis; Logic optimization; Logic Simulation: Compiled and Event Simulators; Relative Advantages and Disadvantages;

UNIT-III
Layout Algorithms Circuit partitioning, placement, and routing algorithms; Design rule verification; Circuit Compaction;

UNIT-IV
Circuit extraction and post-layout simulation; Automatic Test Program Generation; Combinational testing: D Algorithm

UNIT-V
PODEM algorithm; Scan-based testing of sequential circuits.

TEXT BOOKS:

1. Computer Aids for VLSI Design Second Edition *Steven M. Rubin*
2. Computer Aided Design For VLSI **(Paperback)** by S. K. Mehrotra, P. P. Singh

REFERENCE BOOKS:
1. **Computer-Aided Design** Laboratory at Michigan **....**
2. High-Speed **VLSI** Interconnections, A. K. Goel, Wiley Interscience, 1994

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II Semester

L	T/P/D	C
3	1/-/-	3

Elective-3
2.NEURAL NETWORK AND FUZZY SYSTEMS
(Common to Control Systems & Control Engineering)

UNIT-1
Biological neuron Vs artificial neuron, structure and activation functions – Neural network architectures – learning methods, stability and convergence .Single layer networks –Mcculloh–pitts neuron model, Perceptron training and algorithm, delta learning,widrow-Hoff learning rules, limitations, adaline and modification.

UNIT-II
Multilayer networks, architectures and modeling, BP algorithm, radial basis functions. Unsupervised learning-Winner all learning, outstar learning, Counter propagation networks, self organizing networks-Kohonen.

UNIT-III
Grossberg,Hamming NET, MAXNET,Hopfiled networks, recurrent and associative memory, BAM and ART architectures Fuzzy sets and systems – geometry of fuzzy sets – theorems – fuzzy and neural function estimators – FAM system architectures – Uncertainty and estimation – Types of uncertainty.

UNIT-IV
Measures of Fuzziness – Classical measures of uncertainty – measures of Dissonance – confession specificity – knowledge base defuzzifictuon.

UNIT-V
Application to load forecasting, load flow, fault detection-unit commitments, LF control – economic dispatch, Neuro-Fuzzy controllers

TEXTBOOK:

1. Artificial neural networks – B.Yegna Narayana –phi -1st edition 1999.
2. Neural networks – Simon Haykin – prentice hall international inc.1999

REFERENCE BOOKS:

1. Neural networks and fuzzy system – Bart Kosko – 2nd edition, 2001.
2. Neural network fundamentals with graphs, algorithms & applications – N.K.Bose and Liang – McGraw hill, 1996.
3. Fuzzy logic with fuzzy applications – T.J.Rosee-Mcgraw hill Inc .1997.

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

II Semester

L	T/P/D	C
3	1/-/-	3

Elective-3
3.DISTRIBUTED CONTROL SYSTEMS

UNIT I
Architecture of computer control systems-controlled architecture- Distributed control architecture Data Highway system.

UNIT II
Distributed Computing Systems: Distributed processing, Digital control systems-computer control, self tuning and adaptive algorithms Supervising Control systems, multi layer hierarchical structure, system decomposition, open loop co-ordination strategies, model reality differences.

UNIT III
Closed loop co-ordinate strategies, integrated systems, Optimization of parameters (ISOPE), double interactive systems. Real time control systems: design techniques and tools-MASCOT, Structured development of real time systems.

UNIT IV
Fault tolerance in mixed hardware-software systems-fault detection, measures-fault detection mechanism-Damage confident and assessment. Expert system in real time control-Knowledge based process management, representation of Knowledge, reasoning in real time, application of Knowledge based system for process management.

UNIT V
Real time task management, Task scheduling, dispatch, task co-operations and communications, distributed data, distributed control.

REFERENCE BOOK:

1. Distributed Computer control systems by SS Lamba, Y D Singh.
   TMH publications, New Delhi.

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

II Semester

L	T/P/D	C
3	1/-/-	3

Elective-4

1. REAL TIME SYSTEMS

(Common to Control Systems & Control Engineering)

UNIT I:

Introduction to Real - time systems: Typical examples of RTS, Characteristic features of RT applications. Structural, Functional and Performance requirement of Reactive RTS.Distinctive features from Non - RT and off - line system. Modeling RTS: Representation of time, Concurrency and Distributedness in discrete event systems.

UNIT II:

Hierarchical representation of complex DES. Input, Output and Communication. Examples of modeling practical systems as RT DES. Modeling programs as RTS. Analyzing RTS: Analysing logical properties of DES such as Reach ability, Deadlock etc. Analyzing timing related properties, Specification and Verification of RT DES properties.

UNIT III:

Temporal logic, Model checking. Example of checking safety and timing properties of industrial systems.Requirements and features of real - time Computing Environments: Real - time Operating Systems, Interrupts, clock, Device support.

UNIT IV:

Real time System, Multi tasking, Static and Dynamical Scheduling of resource Allocation, Real - time Programming.

UNIT V:

Real - time process and applications, Distributed Real - time systems.

TEXTBOOK:

1.Real- Time Systems, 1/e,Pearson publisher,Jane W S Liu 1st edition

REFERENCE BOOK:

1. **Real-Time Systems**: Theory and Practice, Computer Science,Engineering and Computer Science,Higher Education,Rajib Mall, Pearson Education, **India.**

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
HYDERABAD

II Semester

L	T/P/D	C
3	1/-/-	3

Elective -4

2. INTELLIGENT AND KNOWLEDGE BASED SYSTEMS

(Common to Control Systems & Control Engineering)

UNIT-I

Problem solving: State space representation, problem reduction, constraint satisfaction networks. Heuristics. Knowledge Representation, Predicate calculus, resolution-refutation, Prolog.

UNIT-II

Rule based systems: forward and backward chaining. Handling of uncertainty: probabilistic techniques, fuzzy logic. Reasoning with incomplete information :non monotonic reasoning. Elements of temporal logic.

UNIT-III

Structured Knowledge Representation schemes :Semantic Networks, Frames, Inheritence and default reasoning. Description Logic.

UNIT-IV

Expert Systems: Architecture of the expert systems. Expert system shells. Knowledge acquisition. Consistency of the knowledge base. Planning.

UNIT-V

Case studies. Distributed AI and agent based systems

TEXT BOOK:

1. Pratihar D.K., Jain L.C., An introduction to intelligent autonomous systems, *Intelligent Autonomous Systems: Foundation and Applications*, edited by D.K. Pratihar, L.C. Jain, Springer-Verlag, Germany, pp. 1-4, 2010

REFERENCE BOOKS:

1. Hui N.B., Pratihar D.K., Design and development of intelligent autonomous robots, *Intelligent Autonomous Systems: Foundation and Applications*, edited by D.K. Pratihar, L.C. Jain, Springer-Verlag, Germany, pp. 29-56, 2010
2. Vundavilli P.R., Pratihar D.K., Gait planning of biped robots using soft computing: an attempt to incorporateintelligence, *Intelligent Autonomous Systems: Foundation and Applications*, edited by D.K. Pratihar, L.C. Jain, Springer-Verlag, Germany, pp. 57-85, 2010

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
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II Semester

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Elective -4

3. NONLINEAR SYSTEMS
(Common to Control Systems & Control Engineering)

UNIT I:
Phase plane analysis: Phase portraits, Singular points characterization. Analysis of non - linear systems using phase plane technique.Existence of limit cycles. Linearization: Exact linearization, input - state linearization, input - output linearization.

UNIT II:
Linear versus nonlinear systems - Describing function analysis: Fundamentals, common nonlinearities (saturation, dead - zone, on - off non - linearity, backlash, hysteresis) and their describing functions.Describing function analysis of nonlinear systems. Reliability of describing method analysis. Compensation and design of nonlinear system using describing function method.

UNIT III:
Concept of stability, stability in the sense of Lyapunov and absolute stability. Zero - input and BIBO stability. Second (or direct) method of Lyapunov stability theory for continuous and discrete time systems. Aizerman's and Kalman's conjecture. Construction of Lyapunov function - Methods of Aizerman, Zubov, Variable gradient method. Lure problem.

UNIT IV:
Popov's stability criterion, generalized circle criterion, Kalman - Yakubovich - Popov Lemma. Popov's hyper stability theorem.

UNIT V:
Concept of variable - structure controller and sliding control, reaching condition and reaching mode, implementation of switching control laws. Reduction of chattering in sliding and steady state mode. Some design examples of nonlinear systems such as the ball and beam, flight control, magnetic levitation and robotic manipulator etc.

TEXT BOOKS:
1. J. E. Slotine and Weiping LI, Applied Nonlinear Control, Prentice Hall,
2. Hassan K. Khalil, Nonlinear Systems, Prentice Hall, 1996

REFERENCE BOOKS:
1. Sankar Sastry, Nonlinear Systems Analysis, Stability and Control.
2. M. Vidyasagar, Nonlinear Systems Analysis, Prentice - Hall International editions,1993.

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II Semester

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ELECTRICAL SYSTEMS SIMULATIONS LAB

(15 OUT OF 20 Experiments are to be performed)

1) Write program and simulate dynamical system of following models:
   a) I/O model
   b) State variable model
   c) Also identify time domain specifications of each.

2) Obtain frequency response of a given system by using various methods:
   a) General method of finding the frequency domain specifications.
   b) Polar plot
   c) Bode plot
   d) Also obtain the gain margin and phase margin.
3) Determine stability of a given dynamical system using following methods:
   a) Root locus
   b) Bode plot
   c) Nyquist plot
   d) Liapunov stability criterion
4) Transform a given dynamical system from I/O model to state variable model and vice versa.
5) Obtain model matrix of a given system, obtain it's diagonalise form if exists or obtain Jordan canonical form of the system.
6) Write a program and implement linear quadratic regulator.
7) Design a compensator for a given systems for required specifications.
8) Conduct a power flow study on a given power systems.
9) Design a PID controller.
10) Conduct a power flow study on a given power system network using Gauss-Siedel iterative method.
11) Develop a program to solve swing equation.
12) Develop a simulink model for a single area load frequency problem and simulate the same.
13) Develop a simulink model for a two-area load frequency problem and simulate the same.
14) Design a PID controller for two-area power system and simulate the same.
15) PSPICE: simulation of single phase full converter using RL & E loads.
16) PSPICE: simulation of three phase full converter using RL & E loads.
17) PSPICE: simulation of single phase full converter using RL loads.
18) PSPICE: simulation of three phase full converter with PWM controller.
19) PSPICE: simulation of resonant pulse commutation circuit.
20) PSPICE: simulation of impulse commutation circuit.