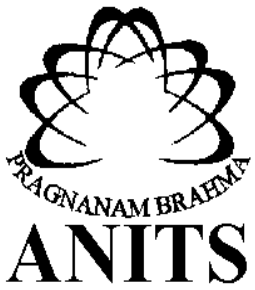
ANIL NEERUKONDA
INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)

Affiliated to Andhra University



M.Tech
(Electrical & Electronics Engineering Department)

Academic Regulations
Curriculum &
Syllabi (First Year I-Sem)

ACCREDITED BY NBA & NAAC WITH 'A' GRADE

ACADEMIC REGULATIONS FOR M.TECH PROGRAMME UNDER AUTONOMOUS STATUS

W.E.F. THE ADMITTED BATCH OF 2015-16

I. Admissions:

Admissions into first year of M.Tech Programme of the Institute will be as per the norms stipulated by Andhra University & Andhra Pradesh State Council for Higher Education (APSCHE), Govt. of Andhra Pradesh.

II. Programmes Offered:

The following are the M.Tech. programmes offered by the Institute.

01. Control Systems Engineering – EEE Department
02. Computer Science and Technology – CSE Department
03. Communication Systems – ECE Department
04. Machine Design – Mech. Engg Department

III. Structure Of The M. Tech. Programme:

The normal duration of the course is 2 academic years for M.Tech Degree. Candidates should pursue a regular course of study, as detailed below, for not less than two academic years which consists of 4 semesters and should fulfil the academic requirements and pass all the prescribed examinations for the award of the degree.

The curriculum of M.Tech programme is designed to have a total of about 80 credits of which a student should acquire a minimum of 74 credits to get the degree awarded. If a student earns all the total credits, then the best 74 credits are considered to determine the final CGPA. However, the credits which a student can forego will be in accordance with the mandatory courses and electives offered by the individual departments.

IV. Duration of the Programme:

The duration of the programme is 2 academic years consisting of 2 semesters in each academic year. A student is permitted to complete the Programme in a stipulated time frame of 4 consecutive academic years from the date of initial admission and if fails will forfeit his seat in M. Tech Programme.

V. Medium of Instruction:

The medium of instruction and examination is English.

VI. Minimum Instruction Days:

Each semester normally consists of a minimum of 16 weeks of instruction.

VII. Academic Calendar:

The dates of all important events, such as commencement of class work, examinations, vacations, etc., during the academic year will be specified in the Academic Calendar of the Institute, as approved by the Academic Council.

VIII. Examinations & Evaluation Process:

The performance of a student in each semester shall be evaluated course-wise with a maximum of 100 marks each for theory and practical courses.

(a) Theory Course:

For all lecture based theory courses, the assessment shall be for 40 marks through internal evaluation and 60 marks through external semester-end examination of three hours duration.

The sessional marks shall be awarded through internal evaluation by the teachers concerned based on the continuous assessment which includes class tests, quiz, viva-voce, assignments, student regularity, two mid-examinations etc., according to a scheme notified by the department at the beginning of the semester.

Out of the 40 internal evaluation marks, 20 marks are assigned for 2 internal-mid exams, 10 marks are assigned for assignments, 5 marks are assigned for projects/ case studies /quiz/tests and 5 marks are assigned for attendance. The average of 2 internal-mid exams is considered for the 20 marks allocated.

Under any circumstances, no re-examination shall be conducted for the internal mid examinations.

ii) External evaluation:

The question paper shall be set externally and the answer scripts are valued through a double valuation system.

The average of the two valuations will be taken for award of marks. In case, the difference of the marks obtained in the two valuations is more than 20% then a third examiner shall value the script. Out of the three valuations, the average of marks obtained in third valuation and the marks obtained nearer to third valuation out of first two valuations shall be considered. No revaluation for any subject/course shall be entertained as already double valuation system is in existence. However, recounting is allowed on the request of the candidate on payment of specified fee. Challenge valuation shall also be entertained on payment of specified fee.

(b) Laboratory Course:

Each student will perform about 10 to 12 experiments in each laboratory course. Laboratory course will be evaluated for 100 marks, out of which 50 marks are for external examination and 50 marks are for internal evaluation. The internal marks are awarded based on continuous assessment, record work, internal lab examination and student regularity. The external examination will be conducted by two examiners, one of them being laboratory class teacher as internal examiner (nominated by the Principal on recommendation of HOD) and an external examiner nominated by the Principal from the panel of experts recommended by the HOD.

A candidate shall be declared to have passed in any theory subject/course if he secures not less than 40% in external theory examination and also a minimum of 50% of total marks of that course which assures a minimum of 'E' grade.

A candidate shall be declared to have passed in any practical course if he secures not less than 50% of total marks of that course which assures a minimum of 'E' grade.

Any student appearing for the semester-end practical examination is eligible only if he submits the bonafide record certified by the laboratory class teacher and the HOD.

(C) Thesis Work:

The thesis work shall be carried out in two semesters of one full academic year. The students will be allotted for thesis by the Department committee to various faculty members who act as guides. However, a student can carry-out his thesis work either in the

Department or in any other industry / research institute. In any such request to carryout thesis work outside the college, the permission of the Principal and an internal guide is mandatory. Such students should report to the internal guide once in a week essentially through mail or other communication.

The progress report of such work is to be submitted by the guide/external guide every month to the HOD. If the work is not found satisfactory, the HOD has the right to call back the student with the permission of the Principal. In any case the time and conditions for submission of the thesis will be same as for the regular candidates working in the college.

The third semester work is evaluated internally by the committee nominated by the HOD consisting a minimum of four members (concerned in area of specialization) including the HOD. If the work is not satisfactory, the candidate has to improve to the satisfaction of the committee within one month from the end of the semester to carry on his fourth semester work. If he fails to satisfy the committee in the second attempt he has to get readmitted into the third semester as per college norms. The grades will be awarded just as in the case of laboratory work. An internal viva voce by a committee nominated by the HOD is a prerequisite for the submission of the thesis. The fourth semester evaluation will be done through the viva voce examination on the thesis by a board consisting of the following four examiners after submission of the thesis by the candidate duly certified by the Guide and the HOD.

1. The Head of the Department as Chairman
2. Senior Professor in the Department
3. Internal Guide and External Guide (if any)
4. External examiner nominated by the Principal from a panel recommended by the HOD.

The panel of the external subject experts shall be submitted to the Principal by the HOD in mutual consent with the guide and other subject experts of the Department.

The valuation of the thesis shall be as specified in the scheme of examination of the laboratory course.

If the candidate fails in the viva voce examination of the thesis he has to reappear for the viva voce. The candidate has to bear the charges for re-conducting the viva voce.

The prerequisite for submission of the M.Tech. thesis is that one should have published a paper in a reputed international journal/ proceedings of an annual conference.

(d) Supplementary Exam:

There will be **NO** Supplementary examination for M.Tech courses.

IX. Attendance Regulations:

Attendance of a student is computed by considering total number of periods conducted in all courses as the denominator and the total number of periods actually attended by the student in all courses, as the numerator. It is desirable for a student to put in 100% attendance in all the subjects. However, a candidate shall be permitted to appear for the semester end examination provided he/she maintains a minimum of 75% overall attendance in the semester.

The shortage of attendance on medical grounds can be condoned up to a maximum of 9% provided the student puts in at least 66% attendance and provided the Principal is satisfied with the genuineness of the reasons. The Medical Certificates are to be submitted to the Head of the Department when the candidate reports to the classes immediately after the leave. Certificates submitted afterwards shall not be entertained. Condonation fee as fixed by the college for those who put in attendance between ≥ 66% and <75% shall be charged before the semester-end examinations.

In the case of students who participate in co-curricular, extra-curricular activities like student seminars, N.S.S, N.C.C, Inter-collegiate tournaments and any such other activities involving the representation of the Institute, with the prior approval of the Principal, the candidate may be deemed to have attended the classes during the actual period of such activity, solely for the purpose of attendance.

A student, who could not satisfy the minimum attendance requirement of 66% in any semester, shall be declared 'Detained'. He/she is not eligible to appear for the semester end examinations. He will not be promoted to the next semester and shall have to repeat that semester with the next batch(es) of students. Such students who are detained and seek

readmission, should submit undertaking/declaration that they will abide by the regulations existing at the time of readmission.

X. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item No. IX.

- A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory subject if only he secures not less than 40% marks in the semester-end examination and a minimum of 50% marks in the sum of the internal evaluation and semester-end examination taken together. In the labs/projects, the student should secure a minimum of 50% marks in the external examination and a minimum of 50% marks in the sum of internal evaluation and external examination evaluation taken together.

- A student will be promoted to the next semester, if only he satisfies the minimum attendance requirement.
- Students, who fail to complete their two year course study within Four academic years from the year of their admission or fail to acquire the credits stipulated for the course shall forfeit their seat in M. Tech course and their admission shall stand cancelled.

XI. Award Of Grades:

The absolute grading system is adopted as follows:

S.No.	Range of Marks {%}	Grade	Description	Grade Points
1	90-100	O	Outstanding	10
2	80-89	A	Excellent	9
3	70-79	B	Very Good	8
4	60-69	C	Good	7
5	55-59	D	Fair	6
6	50-54	E	Satisfactory	5
7	49 and below	F	Fail	0
8	The grade 'I' represents absent (subsequently changed into pass or higher grades.)	I	Absent	0

The performance of a student at the end of the each semester is indicated in terms of Semester Grade Point Average (SGPA). The SGPA is calculated as below:

$$SGPA = \frac{\Sigma \text{ (Credits of a course x Grade points awarded for a course)}}{\Sigma \text{ (Credits of a course)}}$$

SGPA is calculated for the candidates who have passed in all the courses in that semester.

Cumulative Grade Point Average (CGPA) will be calculated from II semester onwards up to the final semester and its calculation is similar to that of SGPA, considering all the courses offered from the first semester onwards.

CGPA is calculated for those who clear all the courses in all the previous semesters.

XII. Award of Class:

For the award of class, a total of best 74 credits are considered. A candidate, who becomes eligible for the award of M.Tech. Degree, shall be placed in one of the following classes.

S.No.	Class	CGPA
1	First Class with Distinction	7.5 or more*
2	First Class	6.5 or more but less than 7.5
3	Second Class/Pass	5.0 or more but less than 6.5

***First class with Distinction will be awarded only to those students who clear all the subjects of the program in first attempt of regular examinations.**

The CGPA can be converted to aggregate percentage by multiplying CGPA with 10, in case of requirement by any other university or for any other purpose.

XIII. Eligibility for Award of M.Tech. Degree:

A student shall be eligible for the award of the M.Tech degree if he/she fulfils all the following conditions:

1) Registered and successfully completed all the components prescribed for eligibility in the programme of study to which he/she is admitted within the stipulated period,
2) Obtained CGPA greater than or equal to 5.0 (Minimum requirement for Pass),
3) No disciplinary action is pending against him/her and
4) Has no dues to the Institute including hostels.

XIV. Malpractices:

The Controller of Examinations/Dean of Examinations shall refer the cases of suspected malpractices in mid examinations and semester-end examinations to Malpractice Enquiry Committee constituted by the Institute. Such committee shall follow the approved scales of punishment. The Principal shall take necessary final action against the erring students based on the recommendations of the committee.

XV. Amendments to Regulations:

The Institute may, from time to time, revise, amend, or change the Regulations, Schemes of Examinations, and / or Syllabi and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institute.

XVI. General:

(i) Where the words 'he', 'him', 'his', occur in the regulations, they include 'she', 'her', 'hers'.

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

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

COURSE STRUCTURE FOR M TECH (CONTROL SYSTEMS ENGINEERING)

DEPT. OF ELECTRICAL & ELECTRONICS ENGINEERING: ANITS

I Year – I Semester

Semester – I:

Code	*Subject Title*	*Credits*	*Periods/week*		*Sessionals*	*Sem end exam marks*	*Total*
			Theory	*Lab*			
PEEECNS111	Systems & Control	4	4	-	40	60	100
PEEECNS112	Engineering Optimization	4	4	-	40	60	100
PEEECNS113	Advanced Drives and Control	4	4	-	40	60	100
PEEECNS114	Control Systems Components	4	4	-	40	60	100
PEEECNS115	Digital Control Systems	4	4	-	40	60	100
PEEECNS116	Elective-I	4	4	-	40	60	100
PEEECNS117	MOOCs course-I	4	-	-	100	-	100
PEEECNS118	Control System Simulation Lab-I	3	-	3	50	50	100
	Total	**31**	**24**	**3**	**390**	**410**	**800**

ELECTIVE -I:

(a) Large Scale Systems (b) Digital Signal Processing (c) Data Structures.

Semester – II:

Subject Code	Subject Title	Credits	Periods/week		Sessionals	*Sem end exam marks*	Total
			Theory	Lab			
PEEECNS121	Advanced Control	4	4	-	40	60	100
PEEECNS122	Nonlinear Control	4	4	-	40	60	100
PEEECNS123	Advanced Control System Design	4	4	-	40	60	100
PEEECNS124	Intelligent Systems and	4	4	-	40	60	100
PEEECNS125	Optimal & Adaptive	4	4	-	40	60	100
PEEECNS126	Elective-II	4	4	-	40	60	100
PEEECNS127	MOOCs course-II	4	-	-	10	-	100
PEEECNS128	Control System Simulation	3	-	3	50	50	100
	To	**31**	**24**	**3**	**390**	**410**	**800**

ELECTIVE -II:

(a) Sliding Mode Control (b) Robotics (C) Process Control & Automation

SEMESTER III & IV: THESIS WORK

Semester	Credits	Periods / week	Sessionals	Sem end exam marks	Total
Semester-III	6	6	100	---	100
Semester-IV	14	6	---	200	200
Total	**20**	**---**	**100**	**200**	**300**

I YEAR – I SEMESTER

SYSTEMS & CONTROL

Course Code: PEEECNS111

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	0	0	3	40	60	100

UNIT-I:
Transfer functions of linear systems-impulse response of linear systems- -signal flow graphs-reduction techniques for complex block diagrams and signal flow graphs.

UNIT-II:
Mathematical modeling of physical systems-equations of electrical networks-modeling of mechanical systems- equations of mechanical systems.

UNIT-III:
Time domain analysis of control systems- time response of first and second order systems with standard input signals-steady state performance of feedback control systems-steady state error constants-effect of derivative and integral control on transient and steady state performance of feedback control systems.

UNIT-IV:
Concept of stability and necessary conditions for stability-Routh-Hurwitz criterion, relative stability analysis, the concept and construction of root loci, analysis of control systems with root locus.

UNIT-V:
Correlation between time and frequency responses- Polar plots- Bode plots-Log magnitude versus phase plots-all pass and minimum phase systems-Nyquist stability criterion-assessment of relative stability-constant M&N circles.

Text books:

1. Control systems engineering by I.J. Nagrath & M.Gopal, wiley eastern limited.
2. Automatic control systems by Benjamin C. Kuo, prentice hall of India.

Reference book:

1. Modern control engineering by Ogata, prentice hall of India.

I YEAR – I SEMESTER

ENGINEERING OPTIMIZATION

Course Code: PEEECNS112

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	0	0	3	40	60	100

UNIT-I:

Introduction to Optimization: Introduction, Historical Development, Engineering Applications of Optimization, Statement of Optimization Problem.

UNIT-II:

Classical Optimization Techniques: Introduction, Single variable optimization, Multivariable optimization with no constraints; Multivariable optimization with Equality constraints – Solution by Direct Substitution method, Method of constrained variation, Method of Lagrangian multipliers; Multivariable optimization with inequality constraints: Kuhn-Tucker conditions.

UNIT-III:

Linear Programming: Introduction, Applications of Linear Programming, Standard Form of a Linear Programming, Basic Terminology and Definitions, Exceptional cases, Simplex method, Big-M method, Two- phase method, Revised Simplex method, Duality, Decomposition Principle.

UNIT-IV:

Non-Linear Programming-I: Unconstrained optimization-Univariate method, Pattern Directions, Hook and Jeeves Method, Powell's method, Gradient of a function, Steepest descent method, Conjugate Gradient Method, Newton's method, Marquardt Method, Quai-Newton Methods, Davidon-Fletcher-Powell Method, Broyden-Fletcher-Goldfarb-Shanno Method.

UNIT-V:

Non-Linear Programming-II: Constrained optimization- Characteristics of a Constrained Problem, Sequential linear programming, Basic approach in the methods of feasible directions, Zoutendijk's method of feasible directions, Sequential Quadratic Programming.

TEXT BOOK:

1. Engineering Optimization: Theory and Applications' By S.S.Rao, New Age International Publishers, Revised Third Edition,2005.

I YEAR – I SEMESTER

ADVANCED DRIVES & CONTROL

Course Code: PEEECNS113

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	0	0	3	40	60	100

UNIT-I:

DC Drives: Introduction to four-quadrant operation, motor rating, motor mechanism dynamics, 1-ph fully controlled converter and chopper fed separately excited dc motor, effect of armature current waveform, torque pulsations. Dual converter fed separately excited dc motor.

UNIT-II:

Machine Modeling: Fundamentals of machine modelling. Modelling of separately excited dc motor. Park's transformation. Dynamic dq modelling of 3-ph induction motor and 3-ph synchronous motor.

UNIT-III:

Induction Motor Control: Scalar control techniques of 3–ph induction motor: Variable Voltage, Variable frequency, Variable voltage and variable frequency with constant v/f ratio, Rotor resistance control. Slip power recovery schemes. Comparison between VSI and CSI. (Using Power Electronic Converters).

UNIT-IV:

Vector Control & DTC of Induction Motor: Direct and Indirect vector control, sensor less vector control, direct torque and flux control.

UNIT-V:

Synchronous Motor Drives: Permanent magnet materials and their properties,
Synchronous reluctance, sinusoidal and trapezoidal back emf permanent magnet motors, wound field machine drives, switched reluctance motor drives.

Text Books:

1. B. K. Bose, "Modern Power Electronics and AC drives", Pearson Education, Asia, 2003.
2. G. K. Dubey, "Fundamentals of Electrical Drives", Narosa Publishing house.
3. Power Electronics: converters, applications and design Ned Mohan 2nd edition john wiley sons Inc Nov 2002.
4. R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", PH, 1998.

Reference Books:

1. V. Subrahmanyam, "Electric Drives-Concepts and Applications", TMH.
2. G. K. Dubey, "Power Semiconductor controlled drives", PH 1989.
3. P. Vas, "Sensor less vector and direct torque control", Oxford Press, 1998.
4. W. Leonard, "Control of Electric Drives", Springer Verlag, 1985.
5. M. H. Rashid, "Power Electronics", Third Edition, PHI.
6. Generalized Theory of Electrical Machines By Dr.P.S. Bhimbra, Khanna Publications.

I YEAR – I SEMESTER

CONTROL SYSTEM COMPONENTS

Course Code: PEEECNS114

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	0	0	3	40	60	100

UNIT-I:

Gyroscopes and Potentiometers: Working of gyroscopes, types of gyroscopes and their generalized mathematical model, applications of horizontal and vertical gyroscopes . Types of potentiometers, applications of potentiometers and selection of potentiometers.

UNIT-II:

Tachometers and Synchros: Construction details, e.m.f equation of tachometers, types of tachometers, characteristics of tachometers, tachometer applications. Constructional details and working of Synchros, Principles of Resolvers and Decoders,

UNIT-III:

Stepper Motors and Servomotors: Working principle of Stepper motor, types – permanent magnet stepper motor, reluctance type stepper motor, hybrid stepper motor, Applications of stepper motor. Servomotors types, DC servomotors, AC servomotors – transfer functions, speed control methods (armature controlled & field controlled).

UNIT-IV:

Magnetic Amplifiers and Servo Amplifiers: construction, types of magnetic amplifiers – series, parallel and self saturated magnetic amplifiers, Characteristics of magnetic amplifiers, features of servo amplifiers, DC and AC servo amplifiers.

UNIT-V:

MEMS and Accelerometers: Introduction to MEMS, definitions, classification and applications. Introduction to the Accelerometer and types of accelerometers.

TEXT BOOK:

1. Gibson T.E. and Tetuer F.B, "Control System Components", McGraw Hill, New York 1993.

REFERENCE BOOKS:

1. Greenwood, "Mechanical details of product design", McGraw Hill, New York, 1990.
2. Nadim Maluf and Kirt Williams "An Introduction to Micro electro mechanical Systems Engineering" Second edition

I YEAR – I SEMESTER

DIGITAL CONTROL SYSTEMS

Course Code: PEEECNS115

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	0	0	3	40	60	100

UNIT-I:

Discrete –Time Systems: Why Digital Control?, The Structure of a Digital Control System, Analog Systems with Piecewise Constant Inputs, Difference Equations, the Z-Transform, Computer-Aided Design, Z-Transform Solution of Difference Equation, The Time Response of a Discrete-Time System, The Modified Z-Transform, Frequency Response of Discrete-Time Systems, The Sampling Theorem, Resources, Problems.

UNIT-II:

Modeling of Digital Control Systems: ADC Model, DAC Model, Transfer Function of the ZOH, Effect of Sampler on Transfer Function of a Cascade, Transfer Function for the DAC, Analog Subsystem, ADC Combination, Systems with Transport Lag, the Closed-Loop Transfer Function, Analog Disturbances in a Digital System, Steady-State Error and Error Constants.

UNIT-III:

Stability of Digital Control Systems: Definitions of Stability, Stable Z-Domain Pole Locations, Stability Conditions, Stability Determination, Jury Test, Nyquist Criterion, Resources, Problems, Computer Exercises.

UNIT-IV:

State Space Representation: Discrete-Time State Space Equations, Solution of Discrete-Time State Space Equations, Z-Transfer from State Space Equations, Similarity Transformation, Resources, Problems, Computer Exercises. Stability of State Space Realizations, Controllability and Stabilizability, Observability and Detectability.

UNIT-V:

State Feedback Control: On State and Output Feedback, Pole Placement, Servo Problem, Invariance of System Zeros, State Estimation, Observer State Feedback, Pole Assignment Using Transfer Functions, Resources, Problems, Computer Exercises.

Text Books:

1. Digital Control Engineering: Analysis and Design**,** By M. Sami Fadali, Antonio Visioli,
   Academic Press; 1 edition (February 16, 2009)

I YEAR – I SEMESTER

ELECTIVE-I (A)
LARGE SCALE SY STEMS

Course Code: PEEECNS116

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	0	0	3	40	60	100

UNIT-I:
L.S.S. Modelling: Time Domain: Introduction, Aggregation methods, exact and model aggregation by continued fraction, chained aggregation descriptive variables approach, descriptive variable systems, solvability and conditionality, time invariance, shuffle algorithm.

UNIT-II:
L.S.S. Modelling - Frequency Domain: Introduction, Moment matching, Pade approximation, Routh approximation, continued fraction method, error minimization methods, mixed methods and unstable systems.

UNIT-III:
L.S.S. Modelling - Frequency Domain: Pade model method, Pade-Routh method, multi input and multi output systems, reduction, matrix continued fraction method, Model continued fraction method, Pade model method, frequency comparison method.

UNIT-IV:
Time Scales: Introduction, problem statement and preliminaries, numerical algorithm, basic properties, relation to model aggregation, feedback control design, singularly perturbed linear systems.

UNIT-V:
Singular Perturbations: Fast and slow sub systems, eigen value distribution, approximation to time scale approach, system properties, design of optimal controllers, fast and slow controllers, lower order controls.

TEXT BOOKS:

1. 'Large Scale Systems Modeling and Control', Mohammad Jamshidi,1989, North Hollard
   (Series in systems science and engineering, vol.9).
2. 'Large Scale Systems Modeling', Magdi S. Mohamoud and Madan G. Singh, Pergamon
   Press (International series on Systems and Control), 1981.

I YEAR – I SEMESTER

ELECTIVE-I (B)
DIGITAL SIGNAL PROCESSING

Course Code: PEEECNS116

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	0	0	3	40	60	100

UNIT-I:

DISCRETE FOURIER TRANSFORM : DFT and its properties, Relation between DTFT and DFT, FFT computations using Decimation in time and Decimation in frequency algorithms, Overlap-add and save methods

UNIT-II:

INFINITE IMPULSE RESPONSE DIGITAL FILTERS: Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain - Design of IIR digital filters using impulse invariance technique - Design of digital filters using bilinear transform - pre warping - Realization using direct, cascade and parallel forms.

UNIT-III:

FINITE IMPULSE RESPONSE DIGITAL FILTERS: Symmetric and Antisymmetric FIR filters - Linear phase FIR filters - Design using Hamming, Hanning and Blackmann Windows - Frequency sampling method - Realization of FIR filters - Transversal, Linear phase and Polyphase structures.

UNIT-IV:

FINITE WORD LENGTH EFFECTS: Fixed point and floating point number representations - Comparison - Truncation and Rounding errors - Quantization noise - derivation for quantization noise power - coefficient quantization error - Product quantization error - Overflow error - Roundoff noise power - limit cycle oscillations due to product roundoff and overflow errors - signal scaling

UNIT-V:

MULTIRATE SIGNAL PROCESSING: Introduction to Multirate signal processing- Decimation-Interpolation-Polyphase implementation of FIR filters for interpolator and decimator -Multistage implementation of sampling rate conversion- Design of narrow band filters - Applications of Multirate signal processing.

TEXT BOOKS:

1. John G Proakis and Manolakis, " Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fourth Edition, 2007.
2. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, TMH/McGraw Hill International, 2007.
3. E.C. Ifeachor and B.W. Jervis, " Digital signal processing - A practicalapproach",Second edition, Pearson, 2002.

4. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata Mc GrawHill, 1998.
5. P.P.Vaidyanathan, Multirate Systems & Filter Banks, Prentice Hall, Englewood cliffs, NJ, 1993.
6. Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006.

I YEAR – I SEMESTER

ELECTIVE-I (C)
DATA STRUCTURES

Course Code: PEEECNS116

Credits	Instruction periods per Week			Exam Hrs.	SESSIONAL MARKS	SEMESTER END MARKS	Total Marks
	LECTURE	TUTORIAL	PRACTICAL				
4	4	0	0	3	40	60	100

Course Objectives:

1. To teach efficient storage mechanisms of data for an easy access.
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To develop application using data structures.
5. To teach the concept of protection and management of data.
6. To improve the logical ability

Introduction to Data Structure: Types of Data Structure, Arrays, Strings, Recursion, ADT (Abstract Data type), Concept of Files, Operations with files, types of files.

Linear Data Structure:

Linked List: Linked List as an ADT, Linked List Vs. Arrays, Memory Allocation & De-allocation for a Linked List, Linked List operations, Types of Linked List, Implementation of Linked List, Application of Linked List polynomial, sparse matrix.

STACK: The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation.

Queues: The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Circular Queue, Priority Queue, & Dequeue, Application of Queues – Johnsons Algorithm, Simulation.

Non-linear Data Structure

Trees: Basic trees concept, Binary tree representation, Binary tree operation, Binary tree traversal, Binary search tree implementation, Thread Binary tree, The Huffman Algorithm, Expression tree, Introduction to multi way search tree and its creation(AVL, B-tree, B+ tree).

Graphs: Basic concepts, Graph Representation, Graph traversal (DFS & BFS)

TEXT BOOKS:

1. Data Structures A Pseudo code Approach with C, Richard F. Gilberg & Behrouz A. Forouzan, second edition, CENGAGE Learning.
2. Data Structures using C, Reema Thareja, Oxford University press.
3. Introduction to Data Structure and its Applications Jean-Paul Tremblay, P. G. Sorenson.

Reference Books:

1. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India.
2. Data Structures Using C, ISRD Group, Second Edition, Tata McGraw-Hill.

Data Structure Using C, Balagurusamy

SEMESTER III & IV: THESIS WORK

Semester	Credits	Periods / week	Sessionals	Sem end exam marks	Total
Semester-III	6	6	100	---	100
Semester-IV	14	6	---	200	200
Total	**20**	**---**	**100**	**200**	**300**

Candidates can do their work in the department or in any industry/research organization for two semesters (ie 3rd and 4th semesters). In case of thesis to be done in an industry/research organization, the advisor/advisors should be from the industry/research organization.

It is mandatory that two seminars at least one per semester related to thesis work/ general topic in III and IV semesters and publication of a paper in conference proceeding/communicated to Journal for the submission of the Thesis at the end of 4th semester.

At the end of 4th semester, four spiral bound copies of the thesis are to be submitted to the department, out of which 2 to be retained by the department for evaluation purpose. The thesis is to be evaluated by an examiner external to the Institution with minimum M.E./M.Tech qualification with relevant specialization and must have minimum 5 years of experience in service.

A Viva-voce examination is to be conducted by a Committee consisting of Head of the department, the External Examiner who evaluates the thesis and the Advisor of the thesis, after receiving the evaluation report from the External Examiner.

In case the advisor happens to be HOD or Chairman, Board of Studies or from industry/research organization one more member from the department with relevant specialization is to be recommended as examiner by Chairman, Board of Studies for Viva-voce examination.

The Board will submit a report stating whether the thesis **is approved with grade (A - Excellent, B - Good, C – Fair, D-reappear for viva-voce)/ not approved.**

The credits obtained in thesis work will also be included for the calculation of CGPA.