Sl. No.	Code	Course Type	Course Title	L	P	T	C
1	AVTE 316	Core	Microprocessors & Microcontroller	2	3	5	6
2	AVTE 317	Core	Airplane aerodynamics-Stability & Control., Avionics Navigation System.	2	2	4	6
3	AVTE 323	Core	Antenna & Transmission Lines	2	0	2	4
4	AVTE 324	Core	Analogy & Digital Communications.	2	3	5	6
5	CREQ 347	Core	Training	-	-	-	-
6	AVTE 325	Secondary	Digital Signal Processing	2	3	5	6
7	CREQ 346	Secondary	Engineering and Numerical Analysis.	3	0	3	6
8	AVTE 318	Secondary	Analog and Digital Control	2	3	5	6
9	UREQ 364	General	Technical Writing and Presentation Skills, International Relations.	1	0	1	2
Total				16	14	30	42

The perce. of core hours = 54%	The perce. of theoretical hours = 53%
The perce. of secondary hours = 43%	The perce. of practical hours = 47%
The perce. of general hours = 3%	

Subject Number: AVTE316
Subject : Microprocessors & Microcontroller
L T P C
2 0 3 6

Objectives of The Course:
To develop understanding of principles, structure, programming and applications of microprocessors and microcontroller.

Theoretical syllabus

Weeks	Contents
1-2	**Memory** types of memory - semiconductor memories - ROM - RAM - Memory expansion - word length expansion - word capacity expansion - Types of buses.
3	**Introduction** Introduction to Intel family microprocessor - Architecture of 8085 microprocessor - Block diagram - Registers - ALU - Control unit.
4-5	**Instruction set architecture(ISA)** Instruction classification - Instruction set of 8085 - Assembly language programming - Opcode instruction format.
6-7	**Pin out of 8085 microprocessor, Buses system, and Control signals.**
8-9	**Stack and Subroutine**
10-11	**Looping - Counting - Time delay - Counters - Code conversion.**
12-13	**Timing diagram** Definition - Machine cycle - Instruction cycle - Clock signal representation - Types of machine cycle.
14-15	**Interrupts** Introduction - Types of interrupt (maskable and non maskable, vectored and non vectored, single-level and multi-level) - Overall 8085 interrupt structures - Interrupt instructions. Addressing modes
16-17	**Memory and I/O devices interfacing**
18	**A microcontroller Survey** 4-bit MC - 8-bit MC - 16-bit MC - 32-bitMC
19-20	**The 8051 MC** Introduction - Features - Hardware - Pin-out of 8051 - Interrupt structure -
21-23	**Instruction set and programming of 8051 MC**
24-25	8051 MC programming in C
26-27	Introduction of PIC 18F series
28-30	Arduino

Practical syllabus

1	Understanding of the 8085 kit program
2	Data transfer operations
3	Arithmetic operation (8-bit summation)
4	Logic operation (multiply by 2 using rotate instruction)
5	Clear of memory locations
6	Summation of odd order numbers
7	1s and 2s complement for 8-bit number
8	16 bit operations (summation and complement)
9	8-bit subtraction
10	8-bit multiplication
11	Find larger number

12	BCD to binary
13	Binary to BCD
14	Hexadecimal to ASCII code
15	ASCII TO binary
16	I/O ports
17	Time delay
18	Maximum repetition for block of data
19	8-bit division
20	Microcontroller Kit
21	Arithmetic operation
22	Logic operation
23	Interfacing
24	Control operation
25	Flowcode definition
26	Arduino
27	Arduino applications

Recommended Books:

Text Books:

- Digital Computer Electronics by Malvino Brown.
- Microcomputer systems 8086/8088 family, Architecture, Programming and Design, by Yu-Cheng Liu & Glenn A Gibson, 2nd Edition- July 2003, Prentice Hall of India.

Reference Books:

- Microprocessor and Interfacing, Programming & Hardware, by Douglas V Hall, 2nd Edition, Tata McGraw Hill .
- Microprocessor Architecture, Programming and Applications with the 8085, by Ramesh S Gaonkar, 4th Edition, Penram International.
- The 8051 Micro Controller by Scott Mackenzie

Subject Number: AVTE 318

Subject : Airplane aerodynamics - Stability & Control, Avionics Navigation System.

L T P C
2 0 2 6

Objectives of Course:
To build on the knowledge of basic aerodynamics and extends it to airplane aerodynamics. In additive, providing an introduction to the fundamentals of missile guidance systems, the science of aerial navigation and its related technology.

Theoretical syllabus

Week	Contents
1-3	**Concepts** Related to flow over airfoils - Compressibility effects on lift - Drag generation.
4-6	Differences between infinite and finite wings
7-10	Simplified analysis of aircraft performance
11-15	Various key concepts related to static stability of aircraft.
16-20	**Guidance** Introduction to missile guidance - Navigation systems - Kalman filtering and flight controls - principles proportional guidance and various factors affecting acceleration requirements and miss distance.
21-25	**Navigation** Major thrust on GPS - INS & their integration via the Kalman Filter
26-30	**Controls** Introduction to the 6-DOF Flight Dynamics model and methods of stability augmentation via linear feedback.

Practical syllabus

1	Simulation of nonlinear homing guidance
2	Comparison of linear and nonlinear solutions
3	Miss distance computation using method of AD joints
4	Noise propagation in command guidance
5	Simulation of beam rider guidance
6	Introduction to mapping toolbox
7	Simulation of Kalman filter
8	GPS, Aircraft dynamic,
9	Phugoid and short period modes
10	Effect of flight control transfer on aircraft stability
11	Demonstration of flight control on twin rotor MIMO System

Recommended Books:

Text Books:

- Introduction to Flight by J. D. Anderson, Jr. (2nd/3rd) Edition.
- Tactical and Strategic missile Guidance, 3rd Edition by paul Zarchan.
- Avionics Navigation Systems 2nd Edition by Nyron Kayton and Walter.
- Flight Dynamics Principles by M. V. Cook.

Reference Books:

- Gas Dynamics by E. A. John.
- Fundamentals of Aerodynamics by J. D. Anderson, Jr(2nd Ed.).

- Aeroplane Aerodynamics by Domasch, Sherby and Conally.
- Aerospace Sensor Systems and Applications by Shmuel Merhav.
- Global Positioning System, Inertial Navigation and Integration by M. S. Grewal.

Subject Number: AVTE 323
Subject : Antenna and Transmission Lines
L T P C
2 0 0 4

Objective of course:
To provide an introduction to the fundamentals of electromagnetic wave propagation in both guided structures and open media. In additive, introducing a unified manner, the fundamentals of antenna theory, parameters, principles, arrays, and apply them to antenna analysis and measurement.

Theoretical syllabus

Week	Contents
1-3	Maxwell equations - Continue equation - Maxwell Equations for Time Varying Fields - Boundary Conditions - Time Varying Potentials - Heuristic Approach - Retarded Potentials - Maxwell Equation Approach - Helmholtz Theorem - Solution of The Wave Equation - Poynting Vector
4-6	Antenna Definition - Properties of Antenna - Types of Antenna - Block Diagram of Communication Systems - The Isotropic - The Ideal Dipole - Radiation Mechanism.
7-11	Antenna Parameters - Radiation Pattern - Field Regions - Radian And Steradian - Radiation Intensity - Directivity - Power Gain. Radiation Efficiency - Effective Length - Effective Area - Front To Back Ratio - Antenna Bandwidth - Antennas In Communication(Friis Formula) - Antennas in Radar System - Antenna Polarization - Polarization Mismatch - Reciprocity Theorem - Input Impedance of Antenna - Antenna Temperature.
12-15	Thin Linear Antenna - Short Dipole - Monopole - Dipole Antenna - Small Loop Antenna - Plot of Radiation Pattern - Image Theory.
16-19	Antenna Arrays - Linear Array - Pattern Multiplication - Two Element Array - Uniform Array - End Fire Array - Broad Side Array - Non Uniform Array - Binomial Array - Chebychev Array Synthesis - Planer Array
20-24	Special Antenna - Aperture Antenna - Folded Dipole Antenna - Yagi-Uda Antenna - Helical antenna - Biconical antenna - Spiral antenna - Microstrip patch antenna
25-27	Antenna Measurements - Antenna Measurement Range - Radiation Pattern Measurement - Gain and Directivity Measurement - Polarization Measurement - Input Impedance and Input Reflection Measurement.
28-30	Radio Wave Propagation - Ground Wave - Free Space Propagation - Ground Reflection - Surface Waves - Diffraction - Wave Propagation in Complex Environment - Troposphere Propagation - Troposphere Scatter - Ionosphere Propagation.

Recommended Books:

Text Books:

- Antenna Theory Analysis and Design by C.A> Balanis, John Wille Sons.
- Elements of Electromagnatics by Matthew N. O. Sadiku (2nd Edition)

Reference

- Antenna Theory and Design by Stutzman
- Field Wave Electromagnetic by Daived K. Cheng (2nd Edition).
- Engineering Electromagnetic by William H. Hayt (2nd Edition).

Subject Number: AVTE 324
Subject : Analogy & Digital Communications.
L T P C
2 0 3 6

Objectives of Course:
To introduce fundamentals of digital communications systems with emphasis on system architectures, signal-to-noise ratio, and bandwidth requirements. Also, introducing an introduction to the fundamentals of microwave devices with emphasis on distinctive features of their construction and understanding of the differences between electrical characteristics in lower frequency bands and RF/Microwave Frequencies.

Theoretical syllabus

Week	Contents
1-2	**Linear modulation** Double sideband modulation AM and DSB modulators and transmitters - SSB and VSB - Frequency conversion - Detection and receivers - Frequency division multiplexing.
3-4	**Amplitude modulation** The AM transmission - The AM spectrum - Power considerations - Phase representation - AM modulators - Other AM transmitter.
5	**Exponential modulation** Fundamental concepts - FM spectral analysis - FM bandwidth phase modulation (PM) - Transmitters and receivers
6	**Frequency modulation** The FM spectrum - Phasor representation - Narrowband FM - Broadband FM - FM generation - FM transmitter - Interference and noise - The PM spectrum PM/FM transmitter.
7-8	**Noise in CW modulation** System models and parameters - Interference noise in linear modulation - Noise in exponential modulation - Comparison of CW modulation system
9-10	**Sampling and pulse modulation** Sampling theory and practice - Analog pulse modulation - PAM, PDM and PPM - Pulse code modulation PCM, DM, and DPCM - Time-division multiplexing
11-12	**Transmission line theory** Transmission line equations - I/P impedance of lines with arbitrary loads - Distortion less lines - VSWR - Reflection coefficients - Matching of transmission lines
13-14	**Quantization process** - Pulse Code Modulation (PCM) - Representation of binary data - Noise consideration in PCM system - S/N performance of PCM - Limitations and modifications of PCM - Delta modulation - Delta-Sigma modulation - Adaptive delta modulation - Differential PCM (DPCM) - Inter-Symbol Interference (ISI) - pulse shaping to reduce ISI - Equalization - Equalizer types - Matching filter
14-16	**Digital Modulation** Amplitude Shift Keying (ASK) - Frequency Shift Keying (FSK) - Phase Shift Keying (PSK) - Coherent and non-coherent detection - Differential PSK (DPSK) - Error performance of binary systems - Quadrate Amplitude Modulation (QAM) - Quadrate Phase Shift Keying (QPSK) - Offset-QPSK (OQPSK) - Minimum Shift Keying (MSK) - Multilevel modulation techniques (MFSK, M-ray PSK& M-ray QAM) - Error performance of M-ray systems - Comparison between performance of

	digital modulation types - Band width efficiency - Power spectra of modulated signals - Carrier recovery & clock recovery.
17-20	**Channel coding** Error detecting codes - Error correcting codes - systematic and nonsystematic codes - hamming distance - hamming weight - linear block codes - Hamming Bound - Hamming code - Encoding of linear block codes - Decoding of linear block codes - cyclic codes - nonsystematic cyclic codes - systematic cyclic codes - Encoding with an (n-k) stage shift register - Encoding with a k-stage shift register - Syndrome calculation and Error detection - Convolution codes - Decoding of convolution codes (Viterbi algorithm)
21-23	**Spread Spectrum System** Types of spread spectrum systems - Frequency hopping - Time hopping - Chirp & hybrid - Linear code generation - Synchronization of spread spectrum systems - Acquisition SSS & tracking SSS - Application of SSS.
24-25	Overview of wireless communication system - Type of wireless systems - Generations of wireless communication system.
26-27	Introduction to cellular system - Frequency reuse - Channel assignment strategies - Handoff strategies - System capacity
28-29	Mobile communication system - GSM - CDMA 2000 - UMTS - WCDMA - Handoff management
30	Wireless network - Limitation of wireless network- GSM network hierarchy - Signaling and traffic
Practical syllabus	
1	Pulse generation circuit
2	Sampling circuit
3	ASK modulation
4	ASK demodulation
5	FSK modulation
6	FSK demodulation
7	PSK modulation
8	PSK demodulation
9	PFM modulation
10	PFM demodulation
11	PWM modulation
12	PWM demodulation
13	Random coding circuit
14	Difference modulation
15	Difference Demodulation
16	Power characteristics of transmit diodes
17	Transmission of AC voltage
18	Transmission of 2 analog signals in frequency division multiplex
19	Transmission of frequency-modulated signals
20	Transmission of pulse-frequency modulated signals
21	Transmission of a PCM signal
22	Transmission of a PCM signal
23	Waveguide wavelength and VSWR for different loads
24	Properties of an isolator
25	E-plane & H-plane TEE junction
26	Magic Tees
27	Coupling and Directivity of a directional coupler
28	Measurement of normalized impedance of unknown load.

Recommended Books:

Text Books:

- Modern Digital and Analog Communication System by B. P. Lathi, 3rd Edition.
- Microwave Devices & Circuits by Samuel Y. Liao
- Passive and Active Microwave Circuit by J. Helszajn.

Reference

- Introduction to Communication System by Ferral G. Stremler.
- Principles of Communication System by Herbert Taub & Donald L. Schilling.
- Electronic Communication System by George Kenned.

Subject Number: AVTE 325
Subject : Digital Signal Processing (DSP)
L T P C
2 0 3 6

Objectives of Course:
Learning the student to understanding the mathematical analysis for signals and how can processing it.

Theoretical syllabus	
Week	**Contents**
1-3	**Continuous and discrete signals and systems**
4-5	**Linear time-invariant system** Introduction (Impulse response, unit step response) - Properties of DSP system (linearity, time-invariance, causality)
6-8	**Discrete convolution** Linear convolution - Properties of convolution - circular convolution.
9-11	**Discrete correlation** Cross-correlation and auto-correlation sequence - Properties of Cross-correlation and auto-correlation sequence.
12-16	**Z-Transform** Definition of the Z-transform (Region of Convergence(ROC)) - Properties of the Z-transform - Stability - Evaluation of the inverse Z-Transform - Long division method - partial fraction expansion.
17-18	**Solution of the linear difference equations.**
19-20	**Frequency analysis of signals and systems**
21-24	**Discrete Fourier Transform (DFT) - Fast Fourier Transform (FFT)**
25	**Feedback system**
26-28	**Implementation of discrete time system** Structure of FIR system (direct form structure, cascade form structure) - Structure for IIR system (direct form structure, cascade form structure, parallel form structure)
29-30	**Introduction to programmable DSPs - Architecture of TMS 320C5X.**
Practical syllabus	
1	Study of DFT
2	IIR Filter Design
3	FIR Filter Design
4	FIR Kaiser and Equiripple Filter Design
5	Comparison of FIR and IIR Filter Design
6	Study of Simulink and Signal Processing Tool Box
7	Multi-rate Signal processing
8	DSP Processor, TMS 320C6713,DSK Experiments
9	TMS 320C6713-Real Time Processing

Recommended Books:

- Discrete Time Signal Processing, by Alan V Oppenheim, Ronald W Schafer, John R Back, PHI, 2nd Edition 2000.

- DSP Implementation using DSP microprocessor with Examples from TMS32C54XX, by Avtar singh, S. Srinivasan, Thamson / Brooks cole Publishers, 2003.
- Digital Signal Processing, by S. Salivahanan, A. Vallavaraj, Gnanapriya, McGraw-Hill / TMH, 2000.

Subject Number: CREQ 346
Subject : Engineering and Numerical Analysis.
L T P C
3 0 0 6

Objectives of Course:
To prepare students to solve complex problems of engineering using discrete mathematical concepts.

Week	Contents
1	**Laplace Transformations (L.T)** - Introduction - Definition of L.T
2	**Inverse Laplace Transformations (I.L.T.)** - Introduction - Definition of I.L.T
3	**Solution of differential equations using L.T** - Method of solution - Examples
4	**Applications** - Using L.T. for solving practical - Problems
5	**Solution of 2nd order D.E. using power series method** - Introduction - Solution near the ordinary point and singular point
6	**Bessel's equation + Legendre's equation** - Introduction - Application of solution
7	**Solution of partial D.E** - Definition - Methods of solution of P.D.E.
8	**Using of separation method** - Definition of separation method - Examples
9	**Applications of heat transfer** - Solution of unsteady one dimensional heat equation
10-12	**Matrices** - Introduction and definitions - Special matrices -Properties of matrices, Adj A, A^{-1} - Rank of a matrix - Vectors - Linear transformation - Orthogonal transformation - Eigen values - Eigen vectors
13	**Solution of non- linear equations** - Introduction - Application of non- linear equations
14	**Simple iteration method + Bisection method** - Introduction - Description of methods - Examples
15	**Newton –Raphson method** - Derivation - Applications - Square Roots - Roots of an arbitrary order - Reciprocal of any number.
16	**Solution of simultaneously linear equations** - Definition of equations - Methods of solution
17	**Direct methods** - Matrix inversion - Gauss- Elimination - Gauss -Jordan Elimination.
18	**Indirect methods** - Jacob's method - Gauss- Seidle method
19	**Applications** - Examples - problems

20	**Curve fitting** - linear Regression - Applications of linear regression - Transformation of nonlinear regression to linear regression
21	**Numerical interpolation** - Introduction - Linear interpolation - Quadratic interpolation
22	**Finite differences method + Forward and Backward and center expressions** - Introduction to finite differences method - Derivation of formulas with equal step size
23	**Newton and Lagrange forms** - Using this method for equal segment and unequal segments
24	**Numerical differentiation** - First derivative - Second derivative
25	**Numerical Integration** - trapezoidal rule - Simpson Rule (1/3) - Simpson Rule(3/8).
26	**Two dimensions integration** - Applications - Examples
27-28	**Solution of ordinary differential equations O.D.E.** - Taylor series method - Simple Euler method - Modified Euler method - Runge-kutta method.
29-30	**Finite differences method for solution of differential equations** - Ordinary differential equations - Partial differential equations Elliptic equation Parabolic equation Hyperbolic equation

Recommended Books:

Text Books:

- Fundamentals of numerical analysis by Stephen G. Kellison.

Reference Books:

- A First Course in Numerical Analysis by Anthony Ralston.
- Methods in Numerical Analysis by K. I. Nielsen.

Subject Number: AVTE319
Subject : Analog and Digital Control
L T P C
2 0 3 6

Specific Objectives of course:
To provide an introduction to the classical control systems for developing mathematical models to design electromechanical systems using transfer function, root locus and frequency response design techniques. In additive, analysis and implementation of digital control system.

Theoretical syllabus

Week	Contents
1	**Introduction** Introduction to control system - Definitions - Historical background - Mathematical background - General natural of engineering control problem - Basic elements of control system - Type of control system - Closed loop - Open loop - Time variant - Time invariant system - linear & non-linear system.
2-3	**Mathematical model of dynamic system** Mathematical model of writing differential equation - Electrical circuit components - Resistance - Capacitance - Inductance - Analogy of electrical system - Mathematical model of mechanical system - Translation system - Mass - Spring - Dashpot - Rotational system - Analogy of mechanical system- Transfer function - How to determine the transfer function - Advantage - Disadvantage - Properties of transfer function - Multivariable of transfer function.
4	**Block diagram** Definition of basic block elements - Procedure of drawing lock diagram - Block diagram reduction algebra - Mason's formula
4-5	**Time response analysis** Transient and steady-state region of response - Standard test signals - How to determine order of system from transfer - First order system - Second order system - Time response specification - Example of first order and second order - Higher order system response.
6	**Steady-state error response** Type of control system - How to determine order from transfer function - Position velocity and acceleration error constant - Method of dynamic error constant.
7	**System stability** Routh-Hurwitz criteria - Poles and zeros definition - Relation between system parameter and poles location.
8-9	**Root-locus analysis.**
10-13	**Frequency response analysis** Advantage and disadvantage of frequency analysis - Time concept of frequency response - Plotting of frequency response - Frequency response specification - Phase margin - Gain margin - Bode plot phase margin and gain margin of bode plot.
4-15	**Nyquist stability analysis**
16-17	**Design of control system** Design of control system from frequency response - Lead compensator - lag compensator - lead-lag compensator.
18	**Sample and hold systems**
19	**Jury stability criterion**
20	**Implementation of digital controllers**

21-23	**Tunable PID controllers**
24-25	**Linear versus nonlinear systems**
26	**Describing function analysis**
27	**Common nonlinearities**
28	**Analysis of non-linear systems using phase plane technique**
29	**Nonlinear control system design problem**
30	**Structure controller and sliding control**
Practical syllabus	
1	Open & Closed loop systems
2	Simulink Overview
3	Time response of First order system
4	Time response of First order system Using M-FILE
5	Residues value of First order system
6	Error steady state
7	Practical applications of 1'st order system
8	Time response of 2'nd order system
9	Characteristics of 2'nd order system
10	Time response Using M-FILE
11	Error steady state to 2nd order system
12	Pode plot of 2'nd order system
13	Analog communications system using Simulink
14	Digital communications system using Simulink
15	Nyquist theorem to 2'nd order system
16	Practical applications to 2'nd order system USING Simulink

Recommended Books:

Text Books:

- Feedback Control Systems by philips and Harbor (3rd Edition).
- Digital Control and State variable methods: Conventional and Intelligent control systems, by M.Gopal, Tata McGraw Hill, 3rd Ed., 2009.

Reference Books:

- Modern Control System by Richard C. Dorf (5th Edition).
- Control Sytem Design using MATLAB by Bahram Shahian & Michael Hassul.
- User's Guide for The Student Edition of MATLAB by Duane Hanselman & Bruce Littlefield.
- H. K. Khalil, 'Nonlinear Systems', Prentice Hall, 3rd Ed., 2002.
- S.Sastry, 'Nonlinear Systems: Analysis, Stability and Control', Springer, 1999.

Subject Number: UREQ 364
Subject : Technical Writing and presentation Skills, International Relations.
L T P C
1 0 0 2

Specific Objectives of course:
To introduce the complex and ever-changing geo-political environment through a study and analysis of the behavior of nation states in the contemporary international states system.
Also enhancement of language skills and development critical thinking.

Theoretical syllabus

Week	Contents
1-3	**Presentation skills**
4-8	**Essay Writing:** Descriptive - Narrative - Discursive - Argumentative.
9-11	**Academic Writing:** How to write a proposal for research paper/ term paper - How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency)
12-13	**Technical report Writing**
14-15	**Progress Report Writing**
16-20	**The new realities after the 9/11 emphasized new geo-political dimensions of the international relations.**
21-25	**The old concepts have been replaced by the new ones to cater for the complex and ever-changing global geo-political environment.**
26-30	**Apart from the basic concepts of the subject, some current issues such as new world order, terrorism, Iraq crisis, Afghanistan problem, ISIS grwoing and its effects on the people and indo-pak dialogue, have also been introduced in the syllabus which makes it more relevant and updated for the students.**

Reference Books:

- Writing. Advanced by Ron White. Oxford Supplementary Skills. Third mpression 1992. ISBN 0194354073 (particularly suitable for discursive, discursive, argumentative, and report writing).
- College Writing Skills by John Langan. McGraw-Hill higher eduction 2004.
- pattern of College Writing (4th edition) by laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.
- The Mercury Reader. A Custom Publication. Compiled by nother Llinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and maurice Scharton. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students.